```
SCIENCE EDUCATION AND THE mEDIOM OF INSTRUCTION:
CHINESE OR ENGLISH?
                                    BY
CNOK KEUNG HO
. B. SC.. The Chinese University of Hong Kong, 1971
M.Sc., Ohio University. 1974
A THESIS SUBMITTED IN PARTIAL FULPILMENT OF
THE REQOIREAENTS FOR THE DEGREE OF
DOCTOR OF EDUCATION
                                    in
the faculty of graduate studies
(Science Education Department, Faculty of Education)
    We accept this thesis as conforming
    to the required standard
```

THE UNIVERSITY OF BRITISH COLUMBIA 1980

(C) Kwok Keung Ho, 1980

In presenting this thesis in partial fulfilment of the requirements for an advanced degree at the University of British Columbia, 1 agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the Head of my Department or by his representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Department of Math \& Sci. Eduratim

The University of British Columbia
2075 Wesbrook Place Vancouver, Canada V6T lW

Date


## ABSTRACT

This study investigated the relationship between academic achievement and proficiency in the language of instruction in a situation where instruction was in the second language of both students and teachers., The subjects were grade 10 physics students in Hong Kong whose first language was Chinese. After an extensive review of the literature, five specific problems were identified and a major hypothesis formulated. For the study, data were gathered from one hundred seventy six subjects selected from four classes in two secondary schools, one chinese and one Anglo-Chinese.

The first part of the study was to compare the physics achievement of groups receiving instruction in Chinese and English respectively. For three months (with four lessons per week), two classes of students learned the content material (Light and Sound) in Chinese and two classes learned the material in English. Group differences were controlled by using the individual aptitude scores (measured by an aptitude test battery) as covariates in the analysis.

The second part of the study was to compare the physics achievement of the two classes of students in the same school. For two months (with five lessons per week), one class learned the content material (Mechanics) bilingually uhile another class learned the material in English. The third part of the study used the same subjects as in the second part. One class learned the material (Atomic Physics) for four lessons only, in English while the other learned the material in Chinese. The same kinds of procedures were used to control group differences as in the
first part of the study.
The fourth part of the study investigated the relationships among (i) physics achievement, English proficiency and other factors (motivation, etc.) and also among (ii) English proficiency and the affective factors. English proficiency of the students was measured by a test battery consisting of five subtests. The motivational, affective factors and background variables were measured by a set of questionnaires. The English proficiency test battery and the questionnaires were administered to the students at different times during the controlled study periods.

The following conclusions were drawn:

1) Achievement in physics at the grade 10 level in the secondary schools of Hong kong did not depend on the language of instruction.
2) Achievement in physics at the grade 10 level in the AngloChinese schools of Hong Kong depended heavily on proficiency in English. .
3) There seemed to be no significant differences in motivation in learning English between the Chinese and Anglo- Chinese school students.
4) The important factors in acquiring proficiency in English by the Chinese students appeared to be: self concept of academic ability, Chinese language usage, motivational intensity in

English and Chinese verbal reasoning.
5) It did not take the students extra time and effort to learn physics at the grade 10 level when instruction is done in English rather than Chinese.

The present study had certain weaknesses in its design. . It would be desirable to replicate if using an improved method of sampling, refined tests and scales and also doing it in a longitudinal manner.

Table of Contents
ABSTRACT ..... 1
CHAPTER 1. INTBODUCTION ..... 1
1.1 GENERAL AND SPECIFIC PROBLEMS INVESTIGATBD ..... 1
1.2 THE PROBLEM OF BILINGUALISM ..... 2
1.3 THE USE OF SECOND LANGUAGE AS THE MEDIOM OF INSTROCTION ..... 3
1.4 TEACHING SCitence IN the SECond Language ..... 4
1.5 THE EPPECTS OF AFFECTIVE FACTORS IN SECOND Language learning ..... 5
1.6 the general sitdation of education and language TEACHING IN HONG KONG ..... 6
1.7. SCOPE AND LIMITATIONS OF THE PBESENT STUDY ..... 12

1. 8 SIGNIPICANCE OF THE STUDY ..... 14
CHAPTER 2. REVIEW OF RELATED INVESTIGATIONS ..... 17
2. 1 Studies on the uSe of a second language as the MEDIUM OF INSTRUCTION ..... 19
2.2 Studies related to the teaching of science Through a second Language ..... 32
3. 3 STUDIES REGARDING APFECTIVE FACTORS IN SECOND LANGUAGE LEARNING ..... 36
2.4 RELATED STUDIES DONE IN HONG KONG ..... 39
2.5 SUMMARY OF INVESTIGATIONS ..... 48
4. 6 meaknesses IN THE RESEARCH ..... 52
CHAPTER 3. METHOD OF STUDY ..... 53
5. 1 RESEARCH HYPOTHESES ..... 53
3.2 THE SELECTION OF SUBJECTS ..... 55
6. 3 METHOD OF ESTABLISHING THE COMPARABILITY OF THE
GROUPS ..... 56
3.4 INSTROMENTATION ..... 60
3.5 COMPARISON OF PHYSICS ACHIEVEMENT BETGEEN
ChINESE AND anglo-chinese SChools ..... 76
3.6 ADDITIONAL STUDIES ..... 81
CHAPTER 4. RESULTS AND ANAYSIS ..... 87
4.1 COMPARABILITY OF THE CS AND ACS GROUPS ..... 87
4.2 RESULTS ON ADDITIONAL STUDIES ..... 100
CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS ..... 105
5.1 CONCLUSIONS ..... 105
5.2 DISCUSSION ..... 106
7. 3 IMPLICATIONS ..... 112
5.4 RECOMMENDATIONS FOR FUTURE RESEARCB ..... 116
BIBLIOGRAPHY ..... 119

## LIST_OF TABLES

## Table

2. 1 Identification of Groups According to the Time of Introduction of Second Language for Reading and as a Medium of Instruction128
3. 2 Categorization According to the Research Methods Used in the Studies ..... 128
2.3 Categorization According to the Effects of the Studies ..... 129
2.4 Recategorization According to the Effects of the Studies ..... 130
2.5 Categorization according to the Levels of Samples Osed in the studies ..... 130
4. 1 Statistics of the Achievement Tests ..... 131
3.2 Statistics of the Scales ..... 132
5. 6. Distribution of Subjects (or Subject Scores)
on 9 Different Variables ..... 134
4.2 Comparison of Pretest Results ..... 135
4.3 Aptitude Tests Results of the Two Schools ..... 135
4.4 Vector of Scales Weights of the Two Schools ..... 136
4.5 ANCOVA Table of the Two Schools ..... 136
1. 6 Means Before and After Adjustment for the Two Schools ..... 136
4.7 Comparison of Variables Affecting Physics Achievement ..... 137
4.8 Results on English Proficiency Tests ..... 137
4.9 Comparison of Variables Affecting English Proficiency ..... 138
2. 10 ANOVA Table for the Multiple Regression Analysis of the ACS Physics Achievement ..... 138
3. 11 Summary Table of Stepwise Multiple
Regression Analysis for the Physics Achievement of the ACS ..... 139
4. 12 ANOVA Table for the Multiple Regression Analysis of the ACS, English Proficiency as the Dependent Variable ..... 1.40
5. 13 Summary Table of Stepwise Multiple Regression for the ACS. English Proficiency as the Dependent Variable ..... 140
6. 14 Distribution of Subjects (or Subject Scores) on 9 Different Variables of the Two Classes ..... 141
7. 15 Aptitude Tests Results of the Two Classes ..... 142
8. 16 Vector of Scaled Weights of Variables in the Discriminant Analysis for the Two Classes ..... 142
9. 17 ANCOVA Table of the Two Classes Learning Mechanics ..... 143
10. 18 Means Before and After Adjustments for the $T$ wo Classes Learning Mechanics ..... 143
11. 19 ANCOVA Table of the Two Classes Learning Atomic Physics ..... 144
12. 20 Means Before and After Adjustment for the Two Classes Learning Atomic Physics ..... 144

## Figure

3.1 Schematic Chart of the Research Plan ....... 145
4.1 Aptitude Profile of the CS and ACS Groups. 146
4.2 Aptitude Profile of the Two Classes ........ 147
VOLUME II Original Appendices with 6.1 in Special Collections
APPENDIX 1 Pretest ..... 149
APPENDIX 2 Content Analysis of Pretest ..... 157
APPENDIX 3 Chinese Translation of Pretest ..... 159
APPENDIX 4 Teaching Schedule of Optics ..... 17.0
APPENDIX 5 Teaching Material in Optics ..... 175
AFPENDIX 6 Questionnaire ..... 181
APPENDIX 7 Chinese Translation of the Questionnaire ..... 225
APPENDIX 8 Optics Posttest 2 ..... 269
APPENDIX 9 Retest in Optics ..... 275
APPENDIX 10 Chinese Translation of Optics Posttest 2 ..... 281
APPENDIX 11 Teaching Schedule of Mechanics ..... 285
APPENDIX 12 Test in Mechanics ..... 289
APPENDIX 13 Lesson Plan in atomic Physics ..... 296
APPENDIX 14 Test in Atomic Physics ..... 324
APPENDIX 15 English Proficiency Test Battery ..... 344
APPENDIX 16 Scores of Individual Students ..... 363
APPENDIX 17 Discussion about Item Deletion in Some Scales ..... 371
APPENDIX 18 Item Intercorrelation Matrix for Scale Having Low Reliabilities ..... 374
APPENDIX 19 Intercorrelation matrix for
Significat Variables in Predicting Physics Achievement and English Proficiency ..... 376
APPENDIX 20 Intercorrelation Matrix for the Aptitude Scores ..... 378

## Acknouledgement

The author whes to express his deep appreciation to Professor Walter B. Boldt, for his advice, guidance, encouragement and support throughout the course of this study. Without Professor Boldt's critical comments, helpful suggestions for improvement, and excellent editing, the author would never be able to complete this thesis.

The author wishes to thank Professors S. F. Foster, P.J. Gaskell, G.E. Johnson and T.D. M. McKie for their valuable suggestions, comments, and participation as members of the thesis committee.

The author would also like to thank Dr.
Gail Fu for her valuable advice and comments on the research work and the thesis during
the on-site work in Hong Kong.
The author would like to thank his school principals Mr. J.K. Walls and Mr. H.T. Chan for granting him a one year leave of absence so that he could start his doctoral work at U.B.C.

The author wishes to thank all his friends and students who helped and participated in the study. They are so numerous that he cannot name them all although some of their names appear in the footnotes of the thesis. Particularly, the author would like to thank mr. c.C. Wong who helped the author carry out the first part of the study and Mrs. Amy Pao who commented on the preliminary draft of the thesis.

The author would also like to express his deep appreciation to his typists, Miss M.K. Tse who typed the preliminary drafts patiently and consistently under a very tight schedule and Mrs. Jenny Lau who did the FMT typing of the final draft.

Finally, the author wishes to thank his wife, Belinda Wan-Kam, for her patience, understanding, encouragement, company, and help throughout the course of study and writing of the thesis.

## CHAPTER 1

## INTRODUCTION

### 1.1 General and specipic probleus Investigated

The general problem investigated is the relationship between academic achievement and proficiency in the language of instruction in a situation where instruction is in the second language of both students and teachers.

The investigation was carried out in Hong Kong and focused specifically on the following questions related to the general problem stated above:

1) How does achievement in physics at the grade 10 level in the secondary schools of Hong kong depend on the language of instruction, Chinese and English?
2) To what extent does achievement in physics at the grade 10 level in Anglo-Chinese schools in Hong Kong depend on proficiency in English?
3) How much time and effort is required to achieve proficiency in English as needed for teaching and learning in physics? Is the time and effort spent commensurate with the level of proficiency attained?
4) What factors are important in acquiring proficiency in

English by Chinese students? How can these factors be manipulated to improve proficiency in English and achievement in physics?
5) In terms of cost-effectiveness (cost in term of time and effort) in the light of (1)-(4) above, should physics be taught in Chinese at grade 10 instead of English?

### 1.2 THE PROBLEM OF BILINGUALISM

The problem of using different languages appeared to be partly solved about half a century ago because several major European languages were widely used around the world. After the Second forld Gar, the picture changed quickly as many new nations were born.

Many of these new nations were former colonies of developed countries. Ever since that colonial period, the ability to speak a foreign language has been considered necessary for political and professional advancement in these newer nations (Kehoe, 1968, p. 1). Following the achievement of independence, the pressure for a wider use of local languages for the sake of national pride and identity increased. At the same time, due to the rapid development of international business, technology and science, the need for using a second language as a tool for political, technological, and socioeconomic proyress also increased. Even for a predominantly monolinguistic society like the United States, the increasing number of immigrants in recent years has forced eductors to question the truth of the 'melting pot' idea and to pay more attention to the study of learning in
a second language. Hence the problem of bilingualism is a universal concern rather than a local matter.
1.3 THE OSE OF SECOND LANGUAGE AS THE MEDIUM OF INSTROCTION

As the need for learning a second language grows, many people seem to feel that 'immersion' in a second language is the key to fluency in the language. For this reason, schools often use the second language of the nation as the medium of instruction. Evidently, the second language which served the colonists as a culture- controlling tool, has now become an important key to success for the average citizens in developing nations and, consequently, is often the preferred medium of instruction in the higher grade levels in spite of the language difficulties encountered.

Generally, educators consider the use of a second language as the medium of instruction as problematic in teaching and learning. On the other hand, administrators and politicians, from financial, practical and political points of view, consider the use of a second language as the medium of instruction to be beneficial, at least for a certain period of time (Daum, 1976).

There have been many studies and much discussion in the use of the second language as the medium of instruction. Using this large body of literature, Engle (1975) has done a very comprehensive comparison between schooling using the mother tongue and schooling using the second language. Though her study is mainly concerned with early school years, most of the findings are probably applicable to other levels too. Engle concludes that there is still no substantial evidence as to

Which approach is better since there are so many variables to be controlled and existing studies are inadequate in this aspect.

The purpose of the present study is to meet this problem of control to a greater extent and to shed more light on this controversial area of using the second language as the medium of instruction. Hopefully a clearer picture will eventually be formed as more carefully controlled studies are carried out.

### 1.4 TEACHING SCIENCE IN THE SECOND LANGOAGE

Science education requires students to have the ability to read and understand scientific material as well as the ability to communicate these concepts. In order to do this, complex modes of thought have to be used. Quite of ten, science teachers assume that it is only the technical vocabulary which is special about the language of science. In practice, introducing new vocabulary may in fact be relatively the easiest part of science teaching. The scientific meaning of an experiment or a principle is often more difficult to teach and learn. Another difficulty which often occurs is the use of common words in a special sense, for example, the term "work" refers to quite a different meaning in the "common sense" than in the "scientific sense". (Strevens, 1972).

It is possible to view students who use their second language to learn science in at least two ways. some people believe that the learner is likely to encounter additional language problems. One problem is that, although science lessons provide subject matter in the same way that the language teacher does in language lessons, the language proficiency of the
science teacher may affect the eventual language standard of the students in science. If the language proficiency is not high the effeciency of science teaching may be lower as well as the standard of achievement in the second language. (Bolger, 1967)

Others take the second point of view. They note that scientific study is customarily pursued in several languages which are widely used throughout the world and that the switch from learning in the mother tongue to learning using a second major language is desirable. This is due, in part, to the fact that most vernaculars do not have the technical terms essential for advanced study. The adaptation of a vernacular to a language suitable for science teaching takes time and money. This is not possible at the present stage for most developing countries.

Part of the present study deals with the learning of physics at a grade level equivalent to the Canadian grade 10 level. In particular, it examines the effectiveness of the second language as the medium of instruction.
1.5 THE EFFECTS OF APFECTIVE FACTORS IN SECOND LANGUAGE LEARNING Carroll (1962) suggests that second language achievement varies as a function of three general variables: language aptitude, general intelligence, and motivation. It also depends on two instructional variables: the opportunity for learning and the adequacy of presentation of the material to be learned. Jakobovits (1970) even estimates the variance contributions of various factors in predicting success in second language learning as follows: aptitude $33 \%$, intelligence $20 \%$, motivation or perseverance $33 \%$, others $14 \%$.

For the last two decades, there has been an increasing amount of research on the socio-psychological aspects of second language learning. Emphasis has been placed on the affective factors of language learning, such as the learner's attitudes and motivation. over time, a socio-psychological theory of language learning has emerged. As Lambert (1972) has noted,

This theory, in brief, holds that an individual successfully acquiring a second language gradually adopts various aspects of behaviour which characterize members of another linguistic-cultural group. The learner's ethnocentric tendencies, his attitudes toward language learning are believed to regulate or control his motivation to learn and ultimately his success or failure in mastering the new language.: (p.291)

Part of the present study is to probe further the relationship between affective factors and second language learning. In particular, what is the variance contribution of individual affective factors to second language achievement?

[^0]
### 1.6.1 General Background

Hong kong is a 400 square mile territory located on the southern coast of China. When Hong Kong first became a British Colony in 1842, there was a Chinese population of about 7,000,
made up of fishermen, farmers and villagers. There are now $4.720,200$ people crowding into this small place. The great bulk are urban dwellers, three quarters of Hong $K$ ong's population being compressed into an area of about 15 square miles. The population density for the metropolitan areas of Hong Kong Island, New Kowloon and Tsuen man is 25,400 persons per square kilometer (Hong Kong, 1979, p. 220).

About $98 \%$ of the population is Chinese, and $86 \%$ usually speak Cantonese, a southern Chinese dialect (Agassi, 1969). About $55 \%$ of the urban population is Hong Kong born while the remainder come from Mainland China (Fu, 1975, p.79). A large proportion of the older generation (age over 30) did not plan to remain in Hong Kong when they first went there during the 1949 Chinese civil war. They thought that, someday, they might be able to return to the Mainland again. This waiting time has been extended indefinitely. Though most of the people have a negative feeling toward the colonial government (Mitchell, 1972, pp. 3645). they generally keep silent or to react only to grossly unfair policies that affect them immediately. The main reason for this is that they do not want to 'turn the boat over' since any change of the present political:state might be even more disastrous. But by 1997, when the lease of the New Territories (365 square miles) from China expires, nobody (not even the Chinese or British governments) really knows what will happen politically.

Up to the outbreak of the Second lorld Var, Hong Kong was an entrepot, owing its life to trade, banking and shipping. The Japanese occupation, the Chinese civil war and the U.N. embargo
of Chinese trade after the outbreak of the Korean war ruined the entrepot trade fatally. . But a thriving industrial economy was built up at the same time, wich was able to absorb millions of immigrants that poured into the colony in the $1950^{\prime} \mathrm{s}$. The building up of an industrial economy was a result of series of historical coincidences rather than any well thought out plan on the part of the government. Even to this day, the Hong Kong government interferes as little as possible in the affairs of the local econoly. One of the key factors in the economic growth of Hong Kong over the past decades has been the great influx of Chinese capital, skill and entrepreneurship (Johnson, 1971, pp. 6-8).

In brief, Hong Kong is a place of great contrasts. Fu (1975) offers a general description of Hong Kong:

The city on the edge of the "Middle Kingdom" attracts businessmen and refugees, missionaries and dope peddlars, tourists and prostitutes. It exhibits "cultural clash, time lag and future shock. - all at once"; sophisticated technology and coolies with rattan baskets, unimaginable stench and the latest from Chanel, imperial banquets and skimpy bouls of rice, pop cassettes and shrill Cantonese opera, strobe lights and muted Chinese scrolls. Hong Kong is as beautiful as it is squalid, as exciting as it is depressing, as modern as it is dilapidated. It is a city dedicated to money, and anything that makes it is done here and implicitly condoned - business, exploitation, corruption,
prostitution, ingenuity, diligence, sheer hard work .... It is a hard city where everyone has to look out for himself. No one else is going to.' (p. 79)

### 1.6.2 Education

There are $1,323,098$ school students in Hong Kong, of whom 563,384 are primary students and 529,712 are secondary students (Hong Kong, 1979, p. 274). Some students in Hong Kong start school between the ages of three and five at one of the many private kindergartens. Almost every child gets into primary school at the age of six. At present, the admission policy of primary schools is not unusual except for a few famous schools Which have exceptionally high admission standards. Although every child has the right to nine years of free education, this does not mean that he will stay in the same school for nine years. In the past, the secondary school attended would have been determined by aptitude, choice of school, and area of residence at the end of the sixth year. In the future, each student will be sent to a senior high school for further studies up to grade 11 at the end of the ninth year. The details of selection and allocation have not been fully established as yet (Hong Kong, 1979; p. 57). at present, almost every student writes the Certificate of Education Examination at the end of the eleventh year. Following this, the great majority leave

[^1]school to look for jobs, while only one third continue to grade 12 and 13 pre-university classes. The chance of entering university is very small: out of every eight candidates, only one is admitted. Education in Hong Kong is like a pyramid with a very broad base wich narrows sharply at grade 10 and 12. This is topped by pinnacle of very few select students who manage tc get through the entrance examination into university.

### 1.6.3 Language Teaching

As pointed out by Fu (1975, pp. 85-87), one fundamental problem which all Hong Kong students have to face is the complex and frustrating beauty of their oun language (s). They are exposed to Cantonese from birth. Since there is no written Cantonese, Hong Kong students do not use their spoken language as a medium for written expression. When children learn to read and write, they have to use a new language, Mandarin. The books in Mandarin are written in a style very different from their spoken mother dialect. Linguistic insecurity is deepened in the later stages when students go to higher forms of schooling. It is then that they have to learn classical Chinese which is as unrelated to Mandarin as Mandarin is to Cantonese. It is no wonder that Chao (1953) says that English is a third language to a Chinese student.

The schools in Hong Kong can be divided into tuo types according to the language of instruction: Chinese and AngloChinese schools. These schools, respectively, use Chinese and English as the medium of instruction. At the primary level (grade 1-6), about $90 \%$ of the schools are Chinese and pupils
start to learn English as a subject from grade 2 upwards. At the secondary level (grade 7-11), the situation is just reversed. About $81.8 \%$ of the schools are anglo-chinese wile only the remaining 18.2\% are Chinese schools (Chan, Hinton, and Yau, 1979). This abrupt change in enrollment does not mean that the Chinese school curriculum is inferior to the Anglo-Chinese one. It is a mere personal choice of the students or their parents Who think that learning more English will enhance their prospect for the future. Further, a sound knowledge of English is rated equally as important as the students' intelligence or academic achievement by many employers (Simpson, 1966, P. 42). From the discussion above, one might get the impression that the standard of English in Hong Kong is high. But only a small fraction of the population can speak fluent English. Even among the elite group of students who can get into university, the average standard of English is not as high as expected by university educators (Vince, 1970).

Curiously enough, the academic pressure and the economic benefits of studying English seem insufficient to override a basic emotional and psychological hesitation on the part of the students. Though students are not actively hostile toward English, they seem to resist dedicating themselves to its study for personal and psychological reasons. This may be the chief reason, as noted by Lambert (1972) why, after studying English for so many years, their average achievement is still

[^2]unsatisfactory.
It is not surprising that $F u$ (1975. p. 185) suspected that the fluency in English of many Hong Kong students was incommensurate with the amount of time and effort they put into that second language. This is so, in part, because their attitudes toward the language are ambivalent and because the $y$ might be uncertain about aligning themselves with the English who governed Hong kong and who more than any other people humiliated China in the 19 th century. After all, Hong. Kong is not and has never been a cosmopolitan melting pot like Singapore, but remains basically Chinese (Chaney, podmore, and Lu, 1973, pp. 2-3). She is flexibly westernized at the superficial level but 'stubbornly Chinese' underneath (Jarvie and Agassi, 1969, p. 156).

### 1.7 SCOPE AND LIMITATIONS OF THE PRESENT STUDY

The purpose of the present study is to shed some additional light on the relationship between school achievement and the medium of instruction. In particular, it explores the relationship between achievement in high school physics, second language proficiency, and attitudes toward the second language, in a situation where the medium of instruction is the second language of both students and teachers. The scope of the study is confined to a particular problem of practice in teaching science, the use of a second language in teaching and learning high school physics.

In reading the conclusions of the present study, the readers must bear in mind the following limitations.

1) Strictly speaking, the results are not generalizable to other schools and classes since the selection of subjects was very restrictive. However, cautious generalizaions based on the results might be made to other similar school situations, i.e., the government subsidized secondary schools which are academically above average in Hong Kong.
2) In the controlled-teaching study, the students were exposed to instructions given by the author and the assisting teacher. Although every effort was made to ensure that the instruction in both groups was equivalent, it was questionable whether the character and teaching style of the teachers might affect the learning of the students. Furthermore, certain parts of the instructions, 2 which might pose problems due to the language barrier, might have been eqphasized by either the author or the assisting teaching.

1 Secondary schools in Hong kong can be broadly divided into three types according to their financial situation. They are government, government subsidized, and private schools respectively. Government schools are completely controlled by the government. Government subsidized schools are partially controlled by the goverament since they receive quite a large proportion of their funds from the government. private schools are independent as long as the schools are obeying the general educational laws set up by the government. In general the academic standard of the government and government subsidized school is higher than that of the private ones. (0f course, there are also variations within each type of schools.)
2 For example, when students learnt Chapter 7 (mork, Energy and Power) of the text book, they might find that learning it bilingually was easier than in English alone since that chapter involved a lot of things which were closely related with their daily life experience.
3) The reliability of the tests and scales was, in general, not too high. This condition was not conducive for detecting small differences which might exist. It might have led to the acceptance of a null hypothesis when small but significant differences existed.
4) Due to the shortage of money, time and manpower, the number of subjects (i.e. students) involved in the study was comparatively small. This might affect the power of the study and hence might miss the actual result as stated in the hypothesis) if the difference was small.
5) The study was confined to bilingual physics programs only. This was not a study of the desirability of bilingual programs in general. Extrapolations to other subject matters like social science, mathematics, etc. might not be applicable.
6) The study involved only Chinese high school students from Hong Kong. Generalization to other students might be inappropriate.

### 1.8 SIGNIFICANCE OF THE STODY

As far as the uriter has been able to determine, there has been very little research done in teaching and learning; in a second language at the senior secondary level. In particular. studies of the relationship between achievement in physics and the language of instruction have been almost totally neglected.

A study of this problem is particularly timely, from a political- economic viewpoint in Hong Kong and in nations of the world which are immersed in second language problems and in adoption of western science and technology.

Furthermore, the considerable increase of the chinese population in Canada, especially in the Vancouver area, and the politically unsettled situation in Asia in recent years indicate that studies comparing the achievement of chinese students under various teaching conditions are timely and appropriate. This is an important period for Chinese adults and children alike since the next few decades may well determine whether Canadians of Chinese ancestry will be partially or totally integrated into Canadian society.

From an educational standpoint, if one accepts the position of Broudy that the "interpretive use" of learnings acquired in school is more important than the "replicative use" or even "applicative use" of school learnings in everyday life. the problem of how teaching and learaing in a second language affects the acquisition of such learnings is of major educational importance. To illustrate, can the ideas of physics be used to make problems of societal concern sensible when these ideas have to be "filtered through the screen" of a second language? How distorted are the ideas? Would the learner even attempt to overcome the language barrier unless under considerable pressure to do so?

Finally, if we accept the following points of view:

1) that prevalent Canadian educational philosophy
supports provision of equal educational opportunity for all, hoping that ultimately each individual who has been educated will achieve happiness;
2) that each new Canadian is potentially a useful human resource for the nation:
3) that the integration of immigrant children into the Canadian society is a responsibility of the schools;
4) that immigrants from China, Hong Kong and elsewhere will continue to increase in number;

Then this study should also serve as providing insight into how the use of English as a second language would affect the school learning of immigrant children in Canada, especially Chinese.

## CHAPTER 2

REVIEW OF RELATED INVESTIGATIONS

Many studies have been done in the field of bilingualism. Most vere concerned with the effect of bilingualism upon the linguistic or cognitive development of bilinguals. Very little reseach has been done on the effect of teaching in a second language on achievement in particular subject areas, e.g., science, and attitudes (Cooper, 1971: Macnamara, 1967)..

It is not possible to give a thorough account of all the studies wich have been reviewed, so it will be necessary to go over many studies with just a indication as to what the findings were, and where they were carried out, and concentrate on those few that are particularly interesting or closely related to the present research.

For the sake of quick reference, three symbols are given at the end of each study. The first symbol refers to the research method or design used in the study. Educational research designs are broadly divided into three categories:

Survey (S).
Post hoc comparative (PH).
Experimental (E).

The second symbol refers to the result of the study. The results

[^3]are classified as follows:

Using the second language as the medium of instruction is not detrimental (St)

Using the second language as the medium of instruction is detrimental ( $\mathrm{S}-$ )

Using the second language as the chief medium of instruction and the first language as an assisting medium is not detrimental ( $B+$ )

Inconclusive (I)
Not applicable (NA).

The third symbol refers to the levels of the sample selected for the study. They are classified as follows:

## All levels (A)

College (C)
Senior high school (SH)
Junior high school (JH)
Primary or preschool (P)
Not specified (N).

For example, the symbols (S, B+, P) after a study means that: (1) it was a survey study: (2) the result indicated that using the second language as the chief medium of instruction and the first language as an assisting medium is not detrimental: (3) the sample was chosen at the primary or preschool level.
2. 1 Studies on the use of a second language as the medium of

## INSTRUCTION

This section is a general review on the use of a second language as the medium of instruction. since this section consists of a review of 18 studies, it is broken into two subsections according to chronological order. At first sight, the choice of 1970 as the line of division seems to be quite arbitrary. But closer examination reveals that studies done before and after 1970 are quite different. The details of their differences can be found in Section 2.5.1 and 2.5.2.
2.1.1 Research done before 1970
2.1.1.1 The earliest study in this era was probably that done by Bovet (1932) in Geneva. He reported that after four years of education in a bilingual school, students had scores equivalent to those in a monolingual school. Students vere probably from middle class families, although no further details about the groups were reported. (PH, B+, P)
2.1.1.2 Malherbe (1946) reported that a careful survey of 18,773 students in over 200 representative primary and secondary schools in South Africa was done in 1938. The results indicated that in the bilingual school situation in which the second language was used as the medium of instruction, the duller students were not hindered any more than the brighter students in regard to content and that they could still maintain their normal standard of achievement in their first language. The most
significant result was that their relative gain in their second language was nearly twice as great as that registered by the higher intelligence group. This is one of the few studies that questioned the belief that brighter students are not handicapped by the use of the second language as a medium of instruction while the duller students suffer badly. Furthermore, he found that the bilinguals using the second language as the medium of instruction were behind at first, but managed to catch up by the sixth grade. (S, St, P \& JH)
2.1.1.3 Fife and Manual (1951) reported that for the Spanishspeaking students in Puerto Rico, the use of English as a medium of instruction hindered academic achievement. ( $\mathrm{PH}, \mathrm{S}, \mathrm{P}$ )
2. 1. 1.4 Taylor and Grieve (1952) carried out a survey in Ghana to find if there was any measurable difference in the relative efficiency of English and the native language as the medium of instruction. Because of methodological difficulties they could only tentatively conclude that the English medium resulted in higher scores in English tests while the native medium resulted in higher scores in other subjects. ( $S, S-, N$ )
2.1.1.5 one of the most famous studies on the medium of instruction was carried out by the department of Education, Manila, during the period, 1948-1955. : The study, called the Iloilo Experiments, was designed to analyze the effects of initial instruction in the mother tongue on the eventual learning of the curriculum in English. The study was well
designed. The experimental group received all instruction in the mother tongue (Hiligaynon) in grades 1 and 2 and then in English in grades 3 to 6. The change of language was abrupt. The control group ere taught in English in grade 1 through 6. The teaching materials vere the same throughout, with the exception of grade 1 and 2 where the materials were translated to the native language for , the experimental group. Students' abilities and achievements were assessed before grade 1 and after each grade through grade 6. The experimental group was assessed in the native language while the control group was assessed in English during grade 1 and 2. Subsequently all were assessed in English. The assessment included tests of reading, arithmetic problems, social studies, and language skills for each grade.

The sample consisted of fourteen elementary schools, equated for teacher quality, socio-economic status (SES), the principals and supervisors' qualifications. Experimental teachers were generally of higher SES than the control teachers. Students were also equated on school attendance, chronological age and scores on the Philippines Mental Ability Test. When the project began, there were 1164 control students and 758 experimental students. The sample size decreased to 188 experimental subjects and 189 control subjects when matching was done. However, the drop-out rate was very high; only $28 \%$ of the sample remained at the end of the study.

The method used to teach the second language was different from standard methods used in most schools. It was based on language patterning and drills with emphasis on both structure and phonetics. Teachers vere trained in the teaching of both the
native language and English as a second language.
At the end of the first year of the study, the experimental group was significantly superior in reading and social studies While the differences in arithmetic were not significant. At the end of the fourth year, there was no significant difference between the two groups in reading and arithmetic, while the control group was significantly superior in language. At the end of the study, there were no significant differences in any of the areas. At the end of grade 4, 5, and 6, the experimental group members reported themselves significantly higher on one of the four or five dimensions of a personality inventory test, though the dimensions varied from grade to grade. "Furthermore, the majority of parents thought that their children showed more enthusiasm for school when they were taught through the mother tongue than when they were taught in English. The results of this study were widely accepted in the Philippines. All students were then taught in their mother tongue for the first two years of school and in English in the following years.

Engle (1975. p. 294) pointed out that the study had a number of problems.: The tests were inadequately validated in English and then simply translated into the native language. Variables were not isolated. A new method of teaching was confounded with the basic hypothesis. No control for the Hawthorne effect was made. 1 The two curricula in grades 1 and 2

[^4]were not equivalent as the English materials were carefully presented wile the native lessons vere on rough dittoes, often poorly edited. The standard of English of the teachers was low. The high attrition rate suggested that the final sample was extremely selective in terms of the factors which allowed a student to stay in school.

On the whole, severe criticisms were raised about the interpretation of the study, it could probably be taken as support for using the mother tongue in early school years or support for using the second language in later school years. (E, I, P)
2.1. 1.6 Carroll (1961) studies the mastery of English by Ghanaian students in five primary schools. It was reported that the native language vocabulary of the Ghanaian students was consistently better than their English vocabulary.

Furthermore, the native language was a much more efficient medium of instruction for them than was English. It was also discovered that the educational standards of secondary school and college students educated under the most favorable conditions with native English speaking teachers, seemed to be far below that of the comparable English groups. Two surveys of teachers' opinion indicated that African students could not show their true intellctual abilities in English alone. (PH, S-, A)
2.1.1.7 Macnamara (1966) studied the effects of teaching arithmetic in Irish to students from English speaking homes in Ireland. Groups of schools belonging to the two linguistic
categories were selected at random and the fifth-standard students were given a problem arithmetic test and mechanical arithmetic test printed in Irish or English according to the medium of instruction used in the school. The multiple regression technique was used to analyze the results with the subject's non-verbal reasoning ability, socio-economic status, and the teacher's teaching skill as independent variables.. The results showed that teaching arithmetic in Irish to native English speaking students hindered the students' proress in solving verbal problems, but not in mechanical skills in arithmetic. Macnamara explained that the difference between the findings was probably due to the fact that in mechanical arithmetic, the student was simply required to do an arithmetic operation indicated by an arithmetic symbol. However, in solving verbal problems he was required to read and understand verbal statements. Hence, language played a very important role in the second type. He concluded that the findings relating to the teaching of other subjects through the medium of the second language were quite discouraging. It seemed that the teaching of other subject through the medium of the second language did not benefit the second language, but was detrimental to the students' progress in mathematics. (E, S-, P).
2.1.1.8 Another research project (the Rizal study) was completed in the philippines on the medium of instruction by Bamos, Aguilar and Sibayan (1967). It was designed to find out the most appropriate time to introduce reading in the second language (English) and the second language as the medium of instruction.

Five groups were chosen as shown in Table 2.1 according to the grade level of the student at the introduction of second language for reading and as medium of instruction.

Table 2. 1 is here

Schools were systematically chosen, equated on what were thought to be relevant variables and carefully matched. Teachers received training in the teaching of the second language, and in teaching various subjects in the second language. They received no training in the teaching of, or with, the native language and continued to use the old material made after the first Iloilo Experiment.

The dependent variables were arithmetic and second language scores.

The results were as follows: (i) The time at which reading in the second language was introduced apparently made little difference on the second language reading test. (ii) Changing the medium of instruction did not have a great influence on educationally relevant skills. The only effects were on arithmetic and language scores. Those who had been taught in the second language most recently scored highest on the arithmetic test while those who had experienced the second language as the medium of instruction for the longest time had the highest scores on the second language tests in grade six. (E, S-. P).
2.1.1.9 Trevino (1968) used students of Spanish speaking background as subjects for his experiment. The subjects were
assigned randomly to a monolingual or bilingual program of study. The subject matter taught was mathematics. Students under the bilingual program were taught through both their mother tongue and English, while students under the monolingual program received all instruction through the medium of English. Achievement tests vere administered to the students afterwards to find out their progress in the two programs. Since inconsistent results were obtained, no firm conclusions were drawn. (E, I, P).

## 2. 1. 1. 10 Discussion

Almost all of the studies done before 1970 took subjects from primary schools, so any conculsion drawn from these studies might be applicable to primary school students only. Among these 9 studies, Macnamara's study and the Rizal study were among the better and more well designed ones. Both of their results pointed in one direction: the use of a second language as the medium of instruction might not be good for primary school students. For the remaining 7 studies, though they had deficiencies which rendered them less dependable than the two noted above, more than half of them uere still pointing toward the same direction.

## 2. 1. 2 Research Done in the 70is

2.1.2.1 Tucker (1970) studied three classes in a laboratory school of a university in the urban Philippines. one class was
taught only in English, one only in Filipino, and the third was taught in English and Filipino on alternating days. The subjects taught on those alternate days were not exactly the same. All the students came from midde class families. After one year of the experiment, the results were conflicting; all did equally well on reading in Filipino and on oral English. This suggested that the students using only English learned to read by themselves or by transferring skills, and there was a fair amount of English in all of the students' environments. one strange result was this: Filipino-trained students scored higher than English-trained students on the English social studies test, and vice versa. Tucker concluded that there were no substantial gains for the bilingual group over the other two groups and the year was not detrimental to the students. (E, S*, P).
2. 1. 2. 2 Gile (1971) did a research study in Toronto making use of a model similar to Lambert's Direct Method (which will be discussed later). English speaking students from middle class families were taught in French from the time they were three years old. Then English and French were used alternately as the mediam of instruction every half year. Students started to read French in grade one, and started to read English in grade two. The students were not handicapped in the process, and gradually achieved as much as monolingual speaking students. (E, S., :P).
2.1.2.3 Heffer (1972) used primary students of Spanish back ground as subjects. The subjects were assigned randomly to a
monolingual or a bilingual program of study. The subjects were taught language, arts, and mathematics. students in the bilingual program were taught both their mother tongue and English, while the students in the monolingual program received all instruction in English. Achievement tests were administered to the students afterwards to find out their progress in the two programs. Weffer reported that the two groups progressed at the same rate in English language and mathematics (in English), but the bilingual group achieved significantly better results in Spanish language and mathematics (in Spanish) than the monolingual group. ( $\mathrm{E}, \mathrm{B}+\mathrm{P}, \mathrm{P}$ ).
2. 1.2.4 Gallop and Kirkman (1972) compared the performance of two matched groups of melsh bilingual students on mathematics test. All the subjects used Welsh as their first language. The test was presented in English to one group, but bilingually (English and welsh) to the other group. No significant difference was found between the mean scores obtained by the two groups. A follow-up study found that when the students vere given the choice when responding to bilingual mathematical questions, there was far more bias towards the use of English than that of Welsh. The study just brought to light the linguistic preference of the Welsh children in that sample. No other conclusion was reached. (E, I, N).
2.1.2.5 Duyne and Gutierrez (1972) used four to seven year old bilingual children of Spanish background to perform a complex perceptual-motor task. They were given only Spanish or English
verbal instructions. These were repeated until the child made four consecutive correct verbal responses to each instruction. The child was asked to perform the task when he had met the above criterion. The scoring of performance for both treatment groups was the number of correct responses. The results showed that the children performed better when spanish instructions were given. It might be that the children's ability to decode and encode verbal instructions in Spanish into specific perceptual-motor connections was more fully developed than in English. (E, S-, P).
2. 1. 2. 6 one of the most thoroughly conceived and well-conducted studies in this area was the famous Saint lambert Experiement carried out by the South Shore Protestant Regional School Board of Montreal. The intent was to determine (i) whether reading and content matter learned in the second language would transfer to the first language without systematic instruction, (ii) whether students would learn the second language as well as students who were native speakers of that language, (iii) whether students would be handicapped cognitively or emotionally by the experiment.

Students from English speaking homes were introduced to French in kindergarten. From grade 2 to $6,60 \%$ of the instruction was in French and $40 \%$ was in English. The language of the school as a whole was English. Students spoke English to each other outside the classroom. The subjects taught in French were alvays taught by a native French speaking teacher and English language arts was taught by a native English speaking
teacher.
Two treatment groups were used. The pilot group started first and the follow-up group enrolled in the kindergarten in the following year. The follow-up group was a replication of the pilot group. The control groups were monolingual English speaking or French speaking groups. All were from similar socioeconomic situations and home background (middle class). The progress of the experimental group was compared each year with the contrcl group.

An attempt was made to control for a Hawthorne effect by seeing that control groups were also special in some way. The French control group was engaged in an experimental mathematics program. One of the two English control groups was taken from a school that was well known for excellent language teaching. The second English control group was in the same school as the experimental groups. This attempt at controlling the Hawthorne effect vas quite unique among other studies in the same area.

After five successive years of assessments, the results indicated that this program of second language teaching was not detrimental either in the native language or in the subject areas. Furthermore, there appeared to be no adverse cogitive or emotional effects due to participation in this program. (E, St, P).
2.1.2.7 A replication study using working-class students from Montreal, ranging from lower middle to upper middle-class students also was carried out by Tucker, Lambert and dianglejan (1973). The results were quite similar to those of the original

St. Lambert experiment. (E, St, P) .
2. 1.2.8 Collison (1974) took Ghanaian students of age 12 to 14 as his subjects. The subjects were divided into 2 groups. The medium of instruction of the first group was their native language and of the second group their second language. Students had to express their questions and opinions in one of these languages according to wich group they belonged to. The results indicated that the majority of the second language group were not able to express their conceptual potential wile the native language group was more fruitful for enhancing language-thought interaction. He concluded that when the medium of commancation was foreign to the students, they might mimic adult concepts without any appreciable contribution to their own conceptual growth and that this was detrimental to the students. (E, $S$, JH).
2. 1. 2.9 After Lambert's comprehensive study of the use of a second language as the medium: of instruction, a number of replication studies were done in Canada, especially in the Eastern part of the country. Stern and his associates (1976) reported that the available evidence did not suggest that students in an extended French program fell behind in the academic subjects taught in French. Students encolled in these programs became more proficient in french and their learning of academic subjects taught through french did not lag behind that of students in the regular program. Furthermore, students and teachers' attitudes towards the program vere found to be

```
positive.(E, S*,N)
```


### 2.1.2. 10 Discussion

All the studies done after 1970 and revieved here vere experimental studies. In general, they were of higher quality than those done before 1970 since many relevant variables were under control. The: st. Lambert experiment is probably representative of this group of studies. These studies (except for Duyne's and Collison's studies) seem to suggest that learning through the second language is not detrimental to the achievement of the students. One special feature was that all these studies were carried out by Canadian researchers, and mainly in canada. Recalling that canada is a bilingual country and that the Canadian government is trying very hard to push the country from a predominantly monolingual society to a bilingual one in the past ten years, the results from these studies might be heavily influenced by political atmosphere. Furthermore, French and English are two language quite close together in linguistics. Learning one language may help the learning of the second. For countries whose native language is very different from the second language, whether research will arrive at the same kind of result is questionable.
2. 2 STUDIES RELATED TO THE TEACHING OF SCIENCE THROUGH A SECOND LANGOAGE
2.2.1 Raisner (1967) selected puerto Rican students at the
junior high level in the city of $N e w$ york as his subjects. The subjects were divided into two groups. one group was taught science in Spanish while the other was taught in English. The achievement of the two groups was compared. The results showed that the students achieved better in Spanish and also showed improvement in their own self-image. (E, $S_{-}, J H$ ).
2.2.2 Bolger (1967), basing his hypothesis on the same program (i.e. Raisner's study), found that: (i) grade seven students taking the bilingual science program achieved significantly better results than comparable students taking the regular program; (ii) the bilingual science program was effective only when conducted by fluent bilingual teachers., Bolger also discovered that the amount of Spanish spoken at home was not the same among the groups. The experimental group spoke more Spanish than the control groups. Hhen analysis of covariance us used to take this factor into account, the achievement of the groups taught in Spanish showed no significant difference when compared with the achievement of the control groups. He concluded that the language ability of both teacher and student had an effect on the program. (E, I, JH).
2.2.3 Knight (1969) investigated the effects on elementary school students of the bilingual science materials developed by the Southwest Educational Laboratory. He found that the achievement of the spanish speaking students was statistically not significantly higher when the science materials were presented in Spanish than when they were presented in English.

He speculated that this inconclusive results might be due to the variation of $S$ panish fluency among the teachers chosen for the study. ( $\mathrm{E}, \mathrm{I}, \mathrm{P}$ ).
2.2.4 Ng (1970) chose 51 Chinese immigrant students of the fifth and sixth grade in the Los Angeles area as his subjects of study. The subjects were assigned randomly to a monolingual or a bilingual program of study. Students in the bilingual science program were taught through both their mother tongue and English, while students in the monolingual program were taught through the medium of English. The subjects were given both a pretest and a posttest. The duration of the study was four weeks with two one hour lessons each week for each group. He found that students taught bilingually achieved better in vocabulary and conceptualization when compared with the monolingual group. He explained that using the students mother tongue may especially motivate the students in the bilingual group, enabling them to learn vocabulary better and to conceptualize better since both required the children's memory and the teachers' explanation to facilitate recall. But this method might not help comprehension achievement which requires understanding of the reading materials in which the relationships of ideas and reasoning processes are involved. (E, B+, P).
2.2.5 Cooper (1971) investigated problems of teaching physics to Latin american college students. His study was divided into many parts which investigated different questions. For simplicity.
just those related to the language of instruction are reviewed here. The first part tried to evaluate the teaching of physics units in both Spanish and English to two groups of students from Latin America. The experiement was first performed in 1969 and repeated in 1970 with a slight variation of design. He found that the differences in physics achievement between units taught in Spanish and those taught in English were small.

The third and fourth part evaluated tests of reading in both Spanish and English. He found that the language in which the tests were given did not significantly affect the scores when the reading material contained mathematical components, but it did significantly affect the scores when the reading material was non-mathematical. Furthermore, the scores on the tests given in Spanish were significantly higher.

The fifth part tried to compare the improvement in. English ability of a group which was taught physics in English and Spanish and that of a control group taught only in Spanish. He found that students in the experimental group did not show as great an improvement in English as those in the control group. (E, S-, C).
2.2.6 Juarez (1976) tried to determine if single language instruction was more effective than bilingual instruction in a science context. He found no significant difference between treatment groups receiving instruction bilingually, and those receiving single language instruction through: English and Spanish. (E, I, P)
2.2.7 Goh (1978) reported that there was a significant drop of science achievement and no improvement in English after switching from Chinese to English as the mediua of instruction in teaching science and mathematics at the primary level in Singapore. Goh concluded that language exposure: time was not the sole determining factor for the learning of a language. (PH, $S_{-}$, P).

### 2.2.8 Discussion

among the seven studies reviewed here, there are several features which might be very distinct when compared with Section 2.1.2. First, none of the studies suggested that using the second language as the medium of instruction would benefit the students, achierement in science and the second language. Secondly, five of the studies were using immigrants as subjects and two studies used developing country students as subjects. There were no studies based on, say, Canadian students as the subjects. Thirdly, none of these studies focused on the senior high school level when students began to learn science by choice. (This is also the case in Section 2.1.2.)
2.3 STUDIES REGARDING AFPECTIVE FACTORS IN SECOND LANGUAGE
LEARNING
2.3. 1 Lambert and Gardner (1972) have been doing studies in this area since 1959. The first studies were carried out with English- speaking high school students who were studying Freach
in the Montreal area. They were tested for language aptitude, intelligence, attitudes toward the French community and intensity of motivation to learn french. Factor analysis of these variables shoved that language aptitude and intelligence formed a single factor independent of a second factor interpreted as a composite of orientation toward language learning and attitudes (i.e. affective factors) toward french Canadians. The general findings from this set of studies can be summarized as follows:

1) Motivation and attitude functioned in second language learning as an independent variable by itself.
2) A favourable attitude toward another culture, a desire to learn about that culture and a favourable attitude toward the second language were conducive to foreign language learning.
3) Integrative motivation was more characteristic of successful second language learning than instrumental motivation except for certain areas like the Philippines where there was an urgency about mastering the second language. ( E , NA, JH).
1.Integrative' refers to learners who wish to acquire a new language in order to identify with members of that language community. In other words, they wish to integrate themselves into the culture of the new language group. 'Instrumental' refers to those who wish to use the language as a way of gaining social recognition or an instrument to help them achieve their goals.

Similar studies were carried out in other schools and areas. Results obtained tended to support the above findings, except for the following two cases. In a study of learning Hebrew, the attitudinal measures were found to change from one school to another, depending on the social class of the communty. American students learning French in a total immersion program were found to have increased feelings of unrest, uncertainty, and dissatisfaction during that period.
2. 3. 2 Spolsky (1969) tested three groups of foreign students attending universities in the onites States in regard to the affective factors of language learning. He also found that integrative motivation accompanied higher scores in English. (E, NA, C).
2.3.3 Lukmani (1972) studies the relationship between motivation to learn the second language and second language proficiency in Bombay. The subjects vere 60 girls from a high school graduating class. They had studied English as a second language for about seven years. The factors, type of motivation, attitude towards their first language, attitude towards English speaking Indians, self concept, and ideal self concept were investigated. The results indicated that instrumental motivation socres correlated significantly with English proficiency scores. This result is opposed to Lambert's general findings but agreed with Lambert's Philippine study. lukmani argued that the situation of language learning in India and the Philippines was completely different
from that of French-speaking Canadians learning English, English- speaking Jews learning Hebrew, English-speaking Americans learning English. India and the Philippines are postcolonial societies which were torn by a struggle between tradition and modernization. Since they were trying to establish their own identity, new reference groups had to be forged. These groups might draw heavily on certain aspects of Western society but would ultimately be of indigenous origin. Hence the instrumental orientation towards English was healthy in this kind of situation. (S, NA, SH).

### 2.3.4 Discussion

There are only three studies reviewed here regarding affective factors in second language learning. Lambert and Gardner's study is probably representative in this field. It appears that there are very few researchers working along these lines, especially in assessing the predictive power of the affective factors on second language proficiency.
2.4 RELATED STUDIES DONE IN HONG KONG
2.4.1 Kvan (1969) did two studies in this area of using second language as the medium of instruction. In the first study, he administered a reading test in English to the first year undergraduate students of Hong Kong University. The subject were told to read as fast as possible, just as they yould read background materials. He found that $50 \%$ of the subjects read at
a speed of less than 150 words per minute and that 75 \% read at under 175. This speed was equivalent to that of children of 12 13 years of age in the U.S.A. or that of British students reading French as their second language. A similar reading test in Chinese vas then administered to the subjects. The average speed was 300 characters per minute, which was wuch higher than the average reading rate in English.

In the second study, Kvan wanted to compare the maturity of essays written by students in Chinese and Anglo-Chinese middle schools. Two sets of essays were obtained from the students on the same subject but written in the two languages. Judges were asked to assess the essays with regard to maturity but disregarding the linguistic expression of detail as far as possible. He reported that the chinese middle school students showed much more originality of thought and greater maturity in general than did the Anglo-Chinese middle school students. He commented that the results agreed closely with the impression of experienced educators who found that the Chinese middle school students were more responsive and more interested in their surroundings both in and out of the school. (E, S-, C E SH).
2.4.2 Vince (1970) held Lanugage Analysis Sessions for the 216 fresbmen of the Arts Faculty of University of Hong Kong. Besides various diagnostic tests and a reading test in Chinese, the analysis included a lengthy questionnaire about the sociolinguistic background, language background, language use, self rating in language proficiency, attitudes towards language and education of this intellectually elite group. The result
included the following:

1) $92 \%$ of the students being tested had spent more than ten years studying English, but some of these students were still in need of remedial English in university:
2) students were not actively hostile towards the English language but almost unanimously respected Chinese as a language having traditions and values of one of the world's greatest cultures. (S, S-, C).
2.4.3 Four young Chinese (Cheng, Shek, Tse and Wong) wo had been through the Hong kong education system and who felt compelled to point out what they saw as a serious weakness in the system, did a study in this area in 1973. The study. (called AT Heat COST) used portions of the above Language analysis Sessions questionnaire with a sample of 170 students in the Chinese University of Hong Kong. The questionnaire as revised and simplified to some extent. a major change was that the questionnaire was translated into Chinese. The results from this survey basically duplicated the results indicated by the previous study in Hong Kong Oniversity. The following were some of the results:
3) When rating their abilities in Chinese, most subjects felt that they had no difficulty in listening comprehension ( $88 \%$ ) and in reading ( $64 \%$ ). They were less certain of their productive skills: $56 \%$ of them thought
they had no problem in expressing themselves formally or informally in speech (Cantonese), and $52 \%$ of them felt they could express themselves fluently in written Chinese.
4) In self rating of English, only a minority felt they were good in reading (13\%), in oral abilities (4\%) and in uriting (4\%).
3). There was little difference in self rating between the students from Chinese or Anglo-Chinese middle schools.
5) The majority of Anglo-Chinese school graduates confessed that they encountered difficulty in understanding English, and more difficulty in expressing themselves in English than in Chinese. ( $\mathrm{S}, \mathrm{S}-\mathrm{C}, \mathrm{C}$.
2.4.4 Cheung (1974) : investigated the effects of medium of instruction on two samples of Form I and Form III subjects selected from an Anglo-Chinese secondary school. Each sample was randomly divided into two groups of equal size. A. lesson in topology was taught to both groups in each sample, but through different mediums of instruction.: The instruction was taped beforehand and reproduced in class. Relevant charts were shown to the class at appropriate times. After the lesson, a test in multiple-choice form was administered to the subjects to determine their understanding and retention of the lesson. The test results indicated that the two groups of students learning the lesson in Chinese performed consistently better on the
posttest. Cheung concluded that Chinese was a more effective medium of instruction for both of the Porm I and III samples tested. (E, S-. JH).
2.4.5 Fu (1975) designed a questionnaire to determine students' opinicns on certain aspects of the language situation in Hong Kong. The subjects vere 561 students from five different schools. After detailed analysis, Fu found several trends among the opinions of the students.
6) English was an important and necessary subject.
7) Students felt unesay about using English in speech.
8) Students were proud of their onn Chinese culture.
9) Students generally had negative attitudes toward western culture and toward English speaking people. (S, S-- SH).
2.4.6 Poon (1978) investigated difficulties among Hong Kong primary: school leavers in learning mathematics throgh English. Subjects for the study were chosen from the recently graduated grade 6 students of four primary schools. The schools were categorized according to the medium: of instruction and the school results on the Hong Kong Ability Test. The results follow:
10) Students whose mother tongue was Cantonese but ho had learned English as a foreign language would learn mathematics more efficiently in Chinese than in English except for those with high ability.
11) Chinese primary school students obtained higher scores in mathematics than their counterparts in Anglo-Chinese primary schools. In particular, they were better in specific vocabulary, concept differentiation, problem comprehension, and self-expression in the presentation of solution, but not in the speed of problem reading. (E. S-, P).
2.4.7 B. Chan, Hinton, and yau (1979) compared the Certificate of Education Examination (CEE) results for students who had completed the course of study in English with those who had studied in Chinese. Nine pairs of schools, each consisting of one Anglo-Chinese and one Chinese Middle School with similar Secondary School Entrance Examination (SSEE) allocation patterns vere chosen and their students uere taken as the subjects of the study.? Student questionnaires, school information sheets, medium of instruction sheets, SSEE results, and CEE results were collected from the subjects and their schools. The results of

[^5]the study were as follows:

1) The Chinese middle school students were culturally and socially less privileged (in terms of education of other family members and expectation and encouragement from the family than their Anglo-Chinese counterparts.
2) The Anglo-Chinese students generally obtained better CEE results than their Chinese counterparts with comparable SSEE results.
3) The medium of instruction' in Anglo-Chinese schools ranked as one of the most important predictors in the CEE results. ( $\mathrm{PH}, \mathrm{St}, \mathrm{SH}$ ).
2.4.8 Tam (1979) did a survey to compare the actual medium of instruction used in the Form I (i.e. Grade 7) classroor with that preferred by the students. Utilizing a stratified three stage sampling plan he distributed questionnaires to 71 classes of students in 53 schools. "The actual complex sample size was 2,471 students. Multivariate analysis of profiles using Wilk's Likelihood Batio revealed that students preferred Chinese as the language of instruction, and in classroom discussions in subjects such as English, Mathematics, Science and the Social Subjects. (S, B+, J).

[^6]2.4.9 Siu and his associates (1979a) did an extensive study in this area. On the basis of patterns of bilingual instruction identified in the sample survey earlier referred to by. B. Chan et al, nineteen schools were selected. Four classes in each form (Form II to IV) from each school were asked to take part in the study. A test battery consisting of eight tests and two questionnaires were administered to the students.

After detailed data analysis, the following conclusions were reached.

1) Students who started to use English as the medium of instruction in grade one did not achieve higher scores on English tests than those who started English as a second language at the Form II and III levels (i.e. Grade 8 and 9). The same students made lower scores on the Chinese tests.
2) Using English as the medium of instruction in the Anglo-Chinese secondary schools did not guarantee effective learning of it as a second language.
3) Students perceived that the Chinese language served the functions of communication, cultural and academic development while English language had social and economic values. (S, S-, JH).
2.4.10 P. Chan, Cheng, Fong and Tsui (1979), realizing the high educational cost of using English as the medium of instruction
in Hong Kong schools, constructed an English language test conforming to the grade 4 standard and gave it to a sample of 2.947 grade 7 pupils draun form 22 schools. The results obtained were disturbing. About $65 \%$ of the pupils failed the test.

The researchers also interviewed more than 50 secondary school teachers on the subject of English teaching and using English as the medium of instruction. on the basis of these interviews, they concluded that raising the standard of English and using it as the medium of instruction for school subjects other than English were two entirely separate issues and that it was extremely unrealistic to impose English as a medium of instruction on the majority of pupils. (S, S-, JH).

### 2.4. 11 Discussion

Of the ten studies reviewed in this section, only three studies deal with the effect of using English as the medium of instruction on the achievement of certain subject areas. Among these three studies, the two better designed ones (Cheung, Poon) concluded that the use of English would hamper the students' achievement while the remaining one (B. Chan) indicated that the use of English as the medium of instruction might be beneficial. However, B. Chan's study was not an experimental one, the SES of the students was not adequately controlled with the advantage going to the Anglo-Chinese schools, and hence the conclusions were weak. The authors (i.e. B. Chan et al) even mentioned that this result was contrary to their original expectation.

The remaining 7 studies were mainly concerned with the affective factors in second language learning. All of them
pointing in the same direction--students preferred more chinese and less English. Furthermore, they also found that the long hours of studying English in primary and secondary schools did not help to improve the standard of English as much as expected by society.

### 2.5 SUMMARY OF INVESTIGATIONS

A total of 38 studies have been reviewed in the last sections. Though most of them relate directly to the effects of the medium of instruction, teaching of science, and affective factors in learning a second language, they still cover a very broad area. The following is a summary of the studies according to the method used, effects, and levels of samples selected. The summary is in a tabular form showing the frequencies that occurred in different areas. Though each study is different and their individual contribution to knowledge may not be of the same veight, the author feels that it is hard for one to assimilate all the results (38 studies!) at once if one does not put it in some form (e.g. frequency tables) which is more comprehensible. In reading the tables, one must bear in mind that the result of each study is assumed to be approximately equal in weight.
2.5.1 The methods used in different students were roughly divided into three kinds: survey, experimental and post hoc comparison. The following is a table showing the frequencies that occurred in different areas.

Table 2. 2 is here.

In Table 2.2, one notices that among the 38 studies, 23 of them were experimental studies done after 1970. This indicates that recently there has been a trend towards more control of the variables in the studies in this area. This is a healthy sign since more control means that we are not being misled by nuisance variables.
2.5.2 Studies of the effects of the medium of instruction on academic achievement in the studies were divided into four groups as indicated in the following table:

Table 2. 3 is here.

In Table 2.3 one notices there was a tendency to conclude that using the second language as the medium of instruction was detrimental to students. An interesting point was that after 1970, there were six studies claiming that the use of the second language as the medium of instruction might be beneficial to the studeats. A closer look at these studies revealed that five of them were done by Canadian researchers. Four of the studies were actually carried cut in Canada. On the other hand, of the twelve studies that claimed that the use of the second language was detrimental, three of them were done in science and seven of them were done in Hong Kong. What do these diverging results mean? Does it suggest that English and Prench are two similar
languages and learning one might generally help the other?
In the case of Chinese, since it is very different from English, the same effect might not occur. J. Chan (1976) points out
.... The fact that the Chinese written language is "ideographic" whereas the English written language is "phonetic", and that spoken Chinese and written Chinese are quite different. Very often, too, the Chinese characters give away the answer to an item.....
2.5.3 In general, there are three different kinds of students using second language as the medium of instruction, hoping to improve their second language competency. They are students who are from developed countries, developing countries and immigrants respectively. Their motives of learning second language may be different. Students from developed countries probably have integrative motives while students from developing nations have instrumental motives., Immigrants will probably have both motives at the same time.

If Table 2.3 is recategorized with the column heading changed to different types of students using second language as the medium of instruction, the following table is obtained.

Table 2.4 is here.

From Table 2.4, more obvious trends are revealed. Students in the developed nations learn well when second language is used
as the medium of instruction wile students in the developing nations are hampered in learning when second language is used as the medium of instruction. Immigrants seem to be lying between the two extremes. Does it indicate that students in the developed countries are more gifted linguistically than others? Or, is it because they have confidence in their own mother tongue so that the learning of a second language is an addition to them (additive bilingualism)? In the case of students from developing countries, they may have an inferior feeling about their own mother tongue. The learning of second language which is usually a language of wider communication will make them become confused about whether they should give up the mother tongue. This kind of confusion vill hamper their learning in second language (subtractive bilingualism).

As for learning science, this requires the understanding of many concepts which depend greatly on a good command of language; the use of the second language as the medium of instruction may hinder the students' learning.
2.5.4 The samples selected for the studies were divided into four levels as shown in the Table. ${ }^{3}$

Table 2.5 is here.

[^7]Table 2.5 shows that of the four different levels, the senior high school students were seldom chosen as subjects of study. In particular, there was no study done on the teaching of science through the second language at the senior high school level.

### 2.6 MEAKNESSES IN THE RESEARCH

Thirty eight studies were revieved for this investigation, and while they covered many aspects of the problems relating to th medium of instruction, several areas have not been explored or fully investigated.

From the tables shoun in Secion 2.5.4, we note that there has been no research done in bilingual science education at the senior high school level. Besides that, there appear to be very feu studies focusing on the affective factors of learning in a second language. Furthermore, fey studies involving experimental research could be found among those done in Hong Kong.

Any problems that may be created by the use of a second language as the medium of instruction will affect thousands in Hong Kong and millions around the world, this gap in the research literature should be bridged. The present study is an attempt to address specific issues within this problem area.

## CHAPTER 3

METHOD OF STUDY

The Chapter describes how the specific questions raised in Section 1.1 were investigated. Included is a schematic chart of the research design to clarify the test. ${ }^{1}$

Figure 3. 1 is here.

## 3. 1 EESEARCH HYPOTHESES

Based on the finding in Section 2.5 and 2.6 , the following hypotheses were formulated, detailed rationale will be explained later in each relevant sections.

General Hypothesis I: Students whose first language is
Chinese but vho have been taught
English as a second language will
achieve higher scores in physics when
physics is taught through the medium
of Chinese than when it is taught
through the medium of English.

This hypothesis was formulated to answer Problem 1 raised in Section 1.1. To test this hypothesis, three specific

1 The two studies (No. 1 and 2) on the comparison of physics achievement between the two classes in the ACS group are not in the original proposal. The purpose of adding these two studies is to strengthen the credibility of the original study if the ACS and CS groups are very different from each other.
hypotheses were formulated. Specifically how these relate to the general hypothesis is elaborated in Chapter 5.

Hypothesis Ia: Grade 10 students in Chinese schools will achieve higher scores in physics than grade 10 students in Anglo-Chinese schools.

Hypothesis Ib: Grade 10 students of Anglo-Chinese schools will achieve higher scores in physics when it is taught bilingually than when it is taught through English only.

Hypothesis IC: Grade 10 students of Anglo-Chinese schools will achieve higher scores when physics is taught through the medium of Chinese than it is taught through the medium of English.

For Problem 2 and 5 in Section 1.1, multiple regression methods vere used to find out which factors (proficiency in English, motivation in physics, study habit in physics, etc.) would be significant in predicting the achievement of physics.

To answer Problew 3 and 4 in Section 1.1, similar methods were used to find out wich factors (aptitude, motivation in English, etc.) would be significant in predicting the proficiency of English.

Ideally, a probability or systematic sample of schools and/or subjects should have been chosen. Such a sample is required to safeguard the internal validity of the study and enhance generalization to the target population. por reasons given below, this method was not followed:

1) The study was done in a politically sensitive area. Because of the present government's language policy, very little cooperation from government agencies such as the Education Department (i.e. The Ministry of Education) could be expected for sampling purposes.
2) The research involved about 8 months of controlled instruction in physics to parallel classes in two different languages. Very close cooperation between the writer and assisting teachers was required. The demands of the study on the classes and teachers involved was extraordinarily heavy. These conditions necessitated using available, intact classes and carefully selected assisting teachers.

Following Fu's recommendation for further studies after her comprehensive research on language problems of Hong Kong students (Fu, 1975), two secondary schools (one Chinese and one Anglo- Chinese secondary school) were chosen for the study. The schools available to the writer for this purpose were government

[^8]subsidized and above average ${ }^{2}$ in academic achievement compared to all other secondary schools in Hong kong, and administered by the same Christian organization. The selection consisted of the students and teachers at the Form 4 level (i.e. Grade 10. level) in the two schools. There were two classes in each school at this grade level taking the same course in physics; thus the subjects consisted of four classes of grade 10 students in physics.

The reasons for making this selection for the present study were as follows.

1) Although the selection was too restrictive for unequivocal generalizations, experience and intuition led the uriter to believe that cautious generalizations based on the results of the selection could be made to other similar school situations.
2) The research program could fit quite naturally into the school program and thereby reduce a possible Hawthorne effect. This is in keeping with the principle of unobtrusive experimental design.

### 3.3 METHOD OF ESTABLISHING THE COMPABABILITY OF THE GROUPS

Since the two groups of subjects were not randomly chosen from the target population of all the grade 10 physics students in $H$ ong Kong, it was questionable whether they were comparable. If the comparability of the groups was unknown, it would be 2 The Chinese School - Pui Ying Middle School
The Anglo-Chinese School - Ming Kei College
Based on the annual mean Certificate of Education Examination scores, the two schools were consistently above the average of all the secondary schools in Hong Kong.
difficult to tell whether any difference found in achievement in this study was due to the treatment effect or the initial group difference. Hence the following method was used to establish the comparability of the groups.

### 3.3. 1 Pretest of physics Achievement

From the results of the Certificate of Education Examinations in Hong Kong, the two schools chosen for the present study were: evidently above-average in academic achievement when compared to other secondary schools in Hong Kong. To explore the possibility that the students in the experimental classes of the two schools did not have equivalent knowledge and experience in the content area to be taught, a pretest in physics achievement was administered to all four classes.

The pretest was given to the students in the first physics period in September 1978. Althogh the first periods of the two schools were at different times, there was very little, if any, possibility of students' exchanging information about the test because the two schools were quite far aparti and the students did not know they were participating in the same research study.

### 3.3.2 Equivalence of the Two Groups on other Factors

In oder to determine whether the Chinese and the AngloChinese groups were equivalent with respect to other factors

[^9]likely to threaten internal validity, the following steps vere taken.

1) Background information on the two groups of students including age, sex, socioeconomic background, S.S.E.E. results and their reasons for choosing or otherwise being in their present school was carefully investigated through a survey study ${ }^{1}$ in order to find out whether the groups could be presumed to be similar with respect to these factors.
2) To check whether the two groups were of equal ability, an aptitude test battery (Siu, 1978) was administered to the two groups of students. The battery consisted of eight subtests. They included the following: Chinese verbal reasoning (CVR), Chinese language usage (CLO), English language usage (ELU), English verbal reasoning (EVR), mathematical reasoning (MR), abstract reasoning (AR). mechanical reasoning (MER), and spatial reasoning tests (SR). Since the total time for administering all eight subtests was $41 / 2$ hours, it was not possible to administer the entire battery in one session. Instead, several shorter sessions were used to administer the

[^10]battery.?
3) Multivariate analysis of variance study (GANOVA), was used to study the equivalence of the groups. In this study the independent variable was group membership. Students enrolled in grade 10 physics in the chinese school ( $N=90$ ) constituted members of Group 1, and students in grade 10 physics in the Anglo-Chinese school ( $N=86$ ) constituted Group 2 in the analysis.

The dependent variables (potential covariates) in the study were physics background as measured by the pretest, and aptitude as measured by the subtests in the aptitude test battery. The central purpose of Manova was to determine whether the two groups differed significantly on the dependent : variables (criteria) identified above when considered together. In this analysis it would be possible 2 In the original thesis proposal, the writer did not know of any aptitude or intelligence test which was suitable. for grade 10 students in Hong Kong. So the writer proposed to take the grades on proficiency in Chinese, English and Mathematics as measured by the Secondary School Entrance Examination (S.S.E.E.) taken in May 1975 by the students as an indication of students' ability. This was not ideal since the S.S.E.E. was taken by the students three years before the present study. One did not know whether there were any changes due to other effects during that period of three years. Ghen the writer actually carried out the study, he found that out of the 176 students, only 126 students had S.S.E.E. grades. Since this large percentage of missing data would seriously hamper the consequent statistical analysis, the author was forced to abandon this idea and tried to find a substitute for S.S.E.E. Fortunately, Siu's aptitude test battery was just ready in the market and it was used to replace the S.S.E.E. Judging from the original purpose of finding a measure for the ability of the subjects, Siu's aptitude test battery would suit the purpose even better than the original proposed S.S.E.E. grades.

The correlation coefficients of S.S.E.E. grades and the aptitude test battery obtained from the 126 subjects mere as follows: S.S.E.E. Chinese vs Sum of CVE and CLU 0.38 S.S.E.E. English vs Sum of EVR and ELU 0.76 S.S.E.E. Mathematics vS Sum of MR, AR, MER, SR 0.56


#### Abstract

to detect significant differences between the two groups even if they differed only slightly on each criterion taken alone. The intent of the analysis was that if significant differences between the two groups would be found, subsequent discriminant analysis would be used to determine the nature of the group differences in order that these differences might be taken into account in subsequent analysis.


### 3.4 INSTBUMENTATION

The present study made use of a number of achievement tests and scales for measuring the background variables. Some of the tests vere existing tests for which test statistics from previous applications vere available. other tests which did not have developed test statistics were analyzed by making use of a computer program designated as the Laboratory of Education Research Test Anaysis Package (LERTAP). T. The purpose of the LERTAP program is to do item and test analysis.

### 3.4.1 The Achievement Tests

### 3.4. 1.1 Pretest of Physics Achievement (Appendix 1)

The pretest was a 40 -item multiple: choice written examination. The items in the test mainly covered the topic of

[^11]Light and Sound, to be taught under controlled conditions. The content validity of the test (see Appendix 2) was checked by a panel of judges consisting of the teachers involved in the present study and two not involved in the present study.

Since the test was presented to one group (2 classes) in Chinese and another group (2 classes) in English, the equivalence of the two versions had to be established. The original test was in English; the Chinese translation of the test was prepared by the teacher who taught in the Chinese school, with the help of the uriter (see Appendix 3). To make sure that the Chinese translation was accurate; it is translated back into English by another fluent bilingual teacher. 2 . The resulting two English versions were then compared by Dr. Gamal Nasr. 3 Out of the 40 translated items, 26 items were judged to be: exact translation, 10 items were good translations, and 4 items were acceptable. Hence the Chinese translation of the test was taken to be equivalent in content to the original version in English.
3.4.1.2 Post-test of Physics Achievement 1

[^12]The content of this test was the same as the pretest except for cne item (No. 27) which was deleted since its index of item discrimination in relation to total score was negative.

### 3.4.1.3 Post-test of Physics Achievement_2 (Appendix 8)

This was a 25 item multiple choice test. The items in the test mainly covered the topic of Light and Sound that was taught in the present study. The content validity of the test was judged by the assisting teacheri and the uriter. The original test items were in English. They were translated to Chinese by the writer with the help of the assisting teacher (see Appendix 10). The Chinese version was then retranslated back to English by another physics teacher.? The two English versions were then compared for equivalence by Dr. Gamal Nasr. out of the 25 translated items, 19 vere judged to be exact, 3 good, 2 acceptable and 1 different. Further checking of the item. that was judged to be different revealed that the Chinese translation was correct but the retranslation to English was not good. Hence the English and Chinese version of that item was still the same in meaning and the equivalence of the two translations was established.

### 3.4.1.4 Retest (Appendix 9)

Thirty good items of Posttest 1 and Posttest 2 were chosen to form the Retest. Good items referred to those having suitable

[^13]difficulty level (0.35-0.70) and discrimination index (0.200.70 . Furthermore content validity was taken into consideration in making the test.

The reliability of the post-tests was obtained by the testretest method. The test of the 'good items' (i.e. the Retest) was administered to the two groups of students at the end of May 1979. The students were notified that they would have a test just several days before the date of administration without being told that it was a retest of the previous test. As the test-retest method is seldom used in Hong Kong, the students would not expect to meet the same items they had seen several months earlier though they had copies of the item (it is a common practice in Hong kong to return the test items to students after each test). Hence memory and coaching effects were reduced. The correlation of test and retest scores constitute an indicator of the reliability of the test. The reason that the test-retest reliability coefficient was used rather than the internal consistency coefficient was mainly that it was also related to the purpose of the present study. What the research required was mainly the stability of the test results.
3.4. 1.5 Test on nechanics (Appendix 12)

Mechanics test items were chosen from some previous Certificate of Education Examination papers. They were first administered to the grade 11 students of the Anglo-Chinese schocl as a pilot studye only 41 items of suitable difficulty level and discrimination index were retained to form the present
test.

### 3.4.1.6 Test on Atomic physics (Appendix 14)

This test was developed by a research group in the School of Education, the Chinese University of Hong Kong. It was first used in a research project (Siu, 1979b) and was adopted here.

### 3.4.1.7 English Proficiency Test Battery (Appendix 15)

This test battery appears to be very similar to the Test of English as a Foreign Language (TOEFL). It consisted of five subtests to measure five different areas of English proficiency. They were respectively, listening comprehension, English structure, vocabulary, reading comprehension and writing ability.
3.4. 1.8 Aptitude Test Battery (Siu, 1978)

This test battery was developed by Dr. P. K. Siu, Lecturer of the School of Education of the Chinese Oniversity of Hong Kong. It was specially normed for an average grade 9 student in Hong Kong. Dr. Siu suggested that it was also a reliable instrument for grade 10 students. The reliability (KR-20) of the test battery was as follows: Chinese verbal reasoning (0.80), Chinese: language usage (0.71). English language usage (0.87), English verbal reasoning (0.91), mathematical reasoning (0.81), abstract reasoning (0.86), mechanical reasoning (0.69), spatial

[^14]reasoning (0.84). The above data on reliaility as the only available information obtainable from the author of the test, Dr. Siu. They were based on a random sample of about 3000 students taken from the whole grade 9 population in Hong Kong.

### 3.4.1.9 Sumary of Statistics on the_Achievement Tests

Table 3.1 gives the most important test statistics of the achievement tests discussed in this section.

Table 3.1 is here.

Of note in Table 3.1 is that the reliability of the pretest is somewhat low. But, recalling that when the test was administered, the students had not been taught the content being tested, low reliability can be expected since students presumably guessed blindly.

The test-retest reliability between the 'good' items of Posttest 1, posttest 2 and the Retest was 0.70 . The time between the tests was five months. In calculating this value, the scores of one whole class (the 4 B class of the Chinese school) were dropped because evidence of coaching was found. Before taking the Retest, the average score of these students was consistently lower than the average score of the students in the other three classes. However, on the Retest, the scores of the students dropped were the highest among the four classes. Interview of the students revealed the fact that they had reviewed only the content of posttest 1 and posttest 2 rather than all the things learned before the Retest. Hence, the scores of these students
were dropped in the calculation of test-retest reliablity. The five English tests were sub-tests of the English Proficiency test battery. The reliability (internal consistency proposed by Hoyt) of the complete battery of tests was 0.94.

### 3.4.2 Surver ouestionnaire

In order to facilitate a detailed analysis of the relationship between achievement in physics and the language of instruction, relevant background information was collected from the students and teachers involved in the research: study. a description of the variables measured is given below. The parentheses at the :. end of each description indicates the relevant section of the questionnaire.

### 3.4.2.1 The Scales

1) Socioeconomic_background (SES)

This refers to the background or environment indicative of both the social and economic status of an individual. The questionnaire was used to collect data on students, family income, social class, parents' education, and other miscellaneous matters (Set I, Section A).
2) Motivational intensity in physics (MIP)

Motivational intensity refers to the intensity of a student's efforts and desires to achieve a certain goal and educational objective. The present scale was used to find out the amount of homework students did in the study of physics, their intentions for further study, and the importance they attributed to learning physics (Set III, Section C) $\because$,
3) Desire to learn physics (DLP)

Desire refers to a conscious uish to achieve certain goals. The present scale was designed to find out the students' eagerness for doing assignments in physics and how much attention they paid in physics class (Set III, Section D).
4) Study habits in physics (SHP)

Habits refers to a pattern of behaviour which through practice has become easy and familiar, and is performed without conscious thought. The present questionnaire was designed to find out the students' study habits in preparing for physics classes (Set III, Section E).
5) Students: knowledge of English (SKE)

This includes the students' language history and use
of English in and out of the classroom (Set I, Section B).
6) Parents: knouledge of English (PKE)

Information about the parents' use of English (Set I. Section C).
7) Orientation toward English (OTE)

This refers to the process of making a person aware of factors in his environment for the purpose of facilitating effective adaptation in learning English. The present scale was a rating of possible reasons, instrumental andor integrative, for studying English in terms of students' sentiments toward learning English (Set $I$, Section D).
8) Attitude toyard English_as_a_mediumof_instruction

## in secondary schools (AEMI)

Attitude refers to a learned predisposition of favourableness or unfavourableness towards an object. In the present scale, the object was "English as a medium of instruction" (Set I, Section E).
9) Motivational intensity_in English (MIE)

The scale was used to find out the amount of homework students do in the stady of English, their intentions for further study, and the importance they attribute to learning English (Set II, Section A).
10) Parental en couragement (PE)

This is the amount of encouragement students receive from parents to do well in English (Set II, Section B).
11) Attitude toward English speaking_ Hesterners (ATES)

This scale was used to find out how a student felt about English speaking Westerners (Set $I$, Section G).
12) Desire to learn English (DLE)

This scale was designed to find out students' eagerness for doing assignments in English and how much attention they paid in Bnglish class (Set II, Section C).
13) Attitude toward foreign languages (ATFL)

This scale deals with students' general attitude toward learning foreign language (Set $I$, Section $F$ ).
14) Study habits in English (SHE)

This scale was used to determine students" study habits in preparing for English classes (Set II, Section D).
15) Reading habits (RH)

This scale was designed to determine the kind of books that students chose to read apart from those connected with their school work (Set II, Section E) .
16) Attitude toward life in Hong_Kong (ALHK)

This scale deals with how a student feels about present life in Hong Kong (Set II, Section F).

## 17) Authoritarianism (AU)

This refers to the general position that a source of control and order (external to the reasoned judgement of the individual and to the common persuasion of a free man) should prevail and settle human choices. The present scale consisted of items
chosen from the California f-scale of authoritarianism which were relevant to Hong Kong ${ }^{1}$ (Set II, Section G).
18) Ethnocentrism (ETH)

This refers to relatively consistent frame of mind concerning "aliens" generally. A. primary characteristic is the generality of outgroup rejection. The present scale was specially constructed for students in Hong Kong (Poon, 1977) (Set III, Section G).
19) Cultural allegiance (CA)

This refers to one's support of or loyalty to one's oun culture. The present scale was used to determine students' preference for Chinese and/or Western ways of life (Set III, Section B).
20) Anomie (ANO)

This refers to the feelings of social uncertainty or dissatisfaction which sometimes characterizes not

[^15]only the bilingual but also the serious student of a second language. The present scale was designed to measure the degree of satisfaction/dissatisfaction with Hong Kong society (Set II, Section H).
21) Rating of English skills (RES)

The reference here is competency in the use of language. The present scale was concerned with students' self rating and rating of parents' skill in English (Set II, Section I).
22) Self-concept of academic ability (SCAB)

The content of this scale deals with behaviour in which one indicates to self (publicly or privately) one's ability in academic work as compared with others engaged in the same work. The present scales consisted of self concept in four different directions: self, parent, friend and teacher (Set III, Section A).

The above information was collected both from the students and teachers involved in the study. In the case of the teachers, the following information was also required in addition to the information required of the students.
23) Self report of teaching

Behaviour in which one indicates to self one's teaching as compared with other who are engaged in the same task.
24) Qualification and experience
25) Teaching performance (TP)

This involved evaluation of teaching performances by students (Set III, Section F).

Background information 1 and 22 deal with variables which were suggested by Brookover (1967) and Mitchell (1968) as possibly having direct or indirect relation with the students' general academic achievement. Variables 2-4 are an indication of the students' interest in physics which might influence the students' achievement in physics. Variables 5-21 are those variables which Were suggested by $F u(1975, \quad$ pp. 187-189). Gardner and Lambert (1972) as possibly influencing proficiency in English of the students. Variables 23-24 deal with important factors about the teachers' ability to teach which might affect the students' learning.

Since the whole questionnaire was extremely long, it was broken into three sub-sets (see Appendix 6) so that each sub-set required not more than 35 minutes to complete. Purthermore, the data
were collected at the beginning, middle, and end of the first term in order to reduce possible fatigue and boredom.

The original questionaire was in English. Later, it had to be translated into Chinese for students expected to respond in chinese... The translation (see Appendix 7) was done by the writer and a professional translator. To make sure the Chinese translation vas accurate, it was translated back into English by another fluent bilingual.? The two English versions were then compared.

The equivalence of the two translated versions of the questionnaire was judged by Mr. Stanley Taylor. 3 out of the 296 translated items, ninetyfour were judged to be exact, ninety good, eightyfour acceptable, eleven bad and seventeen different. Among the twenty-eight items that were judged to be bad or different closer examination by another bilingual teacher4 revealed that the non-equivalence was mainly due to the retranslation of the Chinese version into English rather than the first translation of English into Chinese. Out of the above twenty-eight items, only six items were judged

[^16]
#### Abstract

to be bad or different when they were translated from English to Chinese. Hence the two versions of the Questionnaire were probably very much the same. Furthermore, out of the 176 students uho answered the Questionnaire, only one student chose to answer the English version in Set $I$ of the Questionnaire. The comparability of the scores between the two versions is thus not considered to be a serious problem affecting interpretation of results.


### 3.4.2.2 Statistics of the Scales

There were a total of twenty-three scales in the Questionnaire administered in this study which required statistical analysis. Table 3.2 is a summary of the statistics for the scales.

Table 3.2 is here.

In calculating the reliabilities of the scales, several scales were modified by dropping certain items in order to increase the reliability while at the same time not reducing the content validity (see Appendix 17 for detailed discussion). Even after this modification (i.e. with some of the items dropped), some of the scales still had low reliability (in the sense of internal consistency) . Upon Checking the origins of the scales (Gardner and Lambert, 1972), it came to light that the scales were probably not asking questions on exactly the same area and hence of low internal consistency (see Appendix 18).
3.5 COMPARISON OF PHYSICS ACHIEVEMENT BETGEEN CHINESE AND ANGLOCHINESE SCHOOLS

To study how much influence the language of instruction had on the students' achievement in physics, a research design following the quasi-experimental design designated Design 10 by Campbell and Stanley (1963) was used. To make the study feasible, the following specific hypothesis vas formulated.

Hypothesis Ia: Grade 10 students in the Chinese school will achieve higher scores in physics than grade 10 students in the Anglo-Chinese school.

This hypothesis was transformed to the following statistical hypothesis.

$$
\mathbf{A}_{c}: \mu_{1}=\mu_{2}
$$

$$
(\alpha=0.05)
$$

$$
H_{1}: \mu_{1}>\mu_{2}
$$

where $\mu_{1}=$ mean physics score of grade 10 students from Chinese schools
$\mu_{2}=$ mean physics score of grade 10 students from Anglo-Chinese schools.

This hypothesis was formulated to answer Problem 1. raised in Section 1.1.

In this study, all the selected subjects were involved. Two

[^17]teachers ${ }^{1}$ took part in the study. one taught the two classes in the Chinese school and the other taught the two classes in the Anglo-Chinese school. The two teachers were the regular physics teachers of the classes involved. The two schools are quite far away from each other, reducing the possibility of sharing of information between subjects.

### 3.5.1 Three Months of Controlled Teaching in Physics

During the period, September 4 to December 11, 1978, the two groups of students were taught the same content in physics, one group in chinese by the assisting teacher and the other group in English by the uriter. The content chosen for this study was "Light and Sound". The reason for selecting "Light and Sound" rather than other topics in physics was mainly that the physics content background of the two groups was different. For example, the Chinese group had studied some Mechanics in grade 9 While the Anglo-Chinese group had not. After careful consideration, the unit on light and sound was found to be suitable since the groups were judged to have about the same background in the subject and its difficulty level was appropriate for the grade 10 students.

In order to control as much as possible the teacher effect and the effect due to the methods of instruction, the two groups used the same text book (Abbott, 1969) but different translations (English or Chinese). The teachers followed the textbook as closely as possible. Their teaching schedules (see Appendix 4) were cross-checked every week to ensure that they were: teaching at about the same rate. The two groups did the
same experiments with approximately the same kind of apparatus. Furthermore, if there were any questions or discussions raised in class, they would be noted down and the other teacher would be notified so that he could present the salient points to his class in the pre-determined language of instruction. Some of the teaching materials are included in Appendix 5.

To sum up, every reasonable effort was made to maintain uniformity in teaching style and handing of content so that the two groups differed only in the language of instruction during that period of learning.

### 3.5.2 Post-test of Physics achievement

Upon completion of the controlled teaching-learning period, an achievement test (Posttest 1) on the content studied was given to the groups of students, in Chinese or English according to the medium of instruction used. After a month, another achievement test (post-test 2) (see Appendix 8) on the content studied was administered to the students. 1

Each student's score was the number of correct items over all the 'good' items. It was foreseen that comparison of these post-test scores might require that the scores first be adjusted for initial differences on factors revealed in the manova study. Differences in the adjusted post-test results, if any, could then be attributed to the language of instruction with great confidence, since other possible factors would have been taken

[^18]into account or balanced out across the groups as much as possible, (See the section Three Months of Controlled Teaching in Physics').
3.6 method of INVESTIGATING THE RELATIONSHIP BETGEEN PHYSICS achirvement, proficiency in english and other relevant factors

The present study was designed to answer Problems 2 and 5 in Section 1.1. Since the focus was on learning physics through the second language, only the data collected from the angloChinese group were analyzed in detail while those data collected from the chinese group vere taken as a reference.

The scores on physics achievement were obtained as described in 3.5.2. Proficiency in English was measured by a test battery similar to the Test of English as_a_Foreign Language (TOEFL). It consisted of five subtests: listening comprehension, English structure, vocabulary, reading comprehension and writing ability (see Appendix 15). The total administration time for the test was 140 minutes. Since the test was too long for the time period of an ordinary lesson, the administration of the test battery was broken into several shorter sessions. Purther, since the writer did not want the students to know they were under special study, the tests were given during the English lesson periods by the regular English teachers as a normal assessment. The total marks of all five of

[^19]the subtests were considered as a measure of proficiency in English.

When a Chinese student learns physics through English, his proficiency in English will definitely affect his learning of physics. Besides that, his aptitude, motivation to learn, etc. Will also affect his learning. What we want to know is how important English proficiency is in affecting the learning of physics when compared with other factors such as aptitude, motivation to learn, etc. So the scores of physics achievement were analyzed, using multiple regression with English proficiency (5 variables), aptitude (8 variables), socioeconomic background, motivational intensity in physics, desire to learn physics, study habits in physics, self-concept of academic ability and teacher factors as independent variables in order to find out which variables contributed significantly to the variance of physics achievement.

### 3.7 METHOD OF INVESTIGATING THE RELATIONSHIP BETGEEN ENGLISH

 proficiency, affective factors and other relevent factorsThis study was designed to answer problem 3 and 4 raised in Section 1.1. It made use of the data collected in the previous studies but focused on English proficiency rather than achievement in physics of the Anglo-Chinese subjects.

The Bnglish proficiency scores were treated as the dependent variable in the statistical analysis. The independent variables were: aptitude, socioeconomic background, students' knowledge of English, parents' knowledge of English, orientation toward English, attitude toward English as a medium of
instruction in secondary schools, motivational intensity in English, parental encouragement, attitude toward English speaking Hesterners, desire to learn English, attitude toward foreign languages, study habits in English, reading habits, attitude toward life in Hong Kong, authoritarianism, ethnocentrisw, cultural allegiance, anomie, rating of English skills and self concept of academic ability. Multiple regression was used to analyze the data in order to find out which variables contributed significantly to the variance of English proficiency.

## 3. 8 ADDITIONAL STUDIES

Since subjects in the present study were available (intact classes from two schools), there was always the possibility that the two groups would be very different if the two schools were very different (which should not be). Section 3.3 vas just a technique to find out initial group differences so that the experimental results might be adjusted accordingly. In case the two groups were very different, the results obtained from Section 3.4 might not be too reliable and major inference from the study would be seriously hampered. The present two additional studies were designed so that they would give extra support to the original study in Section 3.4.

Since our interest was focused on students' learning physics through the second language, the two classes of the Anglo-Chinese group were selected for the present two additional studies. This selection would eliminate errors due to the difference of school or teacher since subjects were studying in
the same school and under the same teacher (i.e. the writer himself).
making use of the method and the data collected on the Anglo-Chinese group in Section 3.3, the equivalence or initial difference of the two classes could be determined and so appropriate adjustment could be made in subsequent studies if required.
3.8.1 Comparison of Physics Achievement Betueen English and

## Bilingnal Instruction

In this study, the following hypothesis was investigated.
Hypothesis Ib: Grade 10 students of Anglo-Chinese
school will achieve higher scores in physics when it is taught bilingually than wen it is taught through English only.

This hypothesis was transformed to the following statistical hypothesis.
$\mathrm{H}_{0}: \mu_{1}=\mu_{2}$

$$
(\alpha=0.05)
$$

$$
H_{1}: \mu_{1}>\mu_{2}
$$

where $\mu_{1}=$ mean physics scores of bilingual class $\mu_{2}=$ mean physics score of English class.

During the period February 7 to April 20, 1979, the two classes of students were taught the same content in physics, one group in English only and the other group in English, but with
the help of Chinese explanations wenever necessary (i.e. bilingual instruction).

The content taught was 'Mechanics' (see Appendix 11). The reason for selecting 'Mechanics' were that the topic had not been taught before, and it was included in the syllabus for grade 10 physics in Hong Kong.

Since the two classes were from the same school, they had almost the same academic background. The teacher effect was minimized since only the writer was involved in teaching the two classes. Furthermore, the physics lessons of the two classes usually followed very closely in time. The writer had no difficulty in recalling wat he had taught the other class in the previous period. The writer also tried to follow the textbook as closely as possible during the lessons and the two classes did the same experiments with exactly the same kind of apparatus. Finally, if there were questions or discussions in one class, the witer would present the problem and a summary of the discussions to: the other class as vell.

Upon completion of the teaching-learning period, an achievement test on the content studied was given to the two classes of students in English only. The achievement test was piloted beforehand with another group of students in the same school. Only those items with suitable difficulty level were retained for the post-test. (See Appendix 12).

A comparison of the post-test scores might require that the post-test scores first be adjusted for differences on factors revealed in the MANOVA study. Differences in the adjusted posttest results, if any, would probably be due primarily to the
language of instruction, since other possible factors would have been taken into account or balanced out across the groups as much as possible.
3.8.2 Comparison of Physics Achievement Betyeen_Chinese_and

## English Instruction

The previous two studies (i.e. 3.5 and 3.8.1) were relatively long term studies compared with the present one. They were more practical, and closer to an ordinary class situation. This study mas more theoretical. It attempted to investigate just one question: if students are taught physics using English or Chinese only, through which medium do they learn more? To a certain extent, this study was better controlled than the second study mentioned above since it also limited the history (in the sense of Campbell and Stanley) of the two groups of students so that they would not be too different. The following hypothesis was investigated. .

Hypothesis IC: Grade 10 students of Anglo-Chinese school will achieve higher scores when physics is taught through the medium of Chinese than when it is taught through the medium of English.

This hypothesis was transformed to the following statistical hypothesis.

$$
\mathrm{H}_{0}: \mu_{1}=\mu_{2}
$$

$$
(\alpha=0.05)
$$

$H_{1}: \mu_{1}>\mu_{2}$
where $\mu_{1}=$ mean physics scores of the Chinese class
$\mu_{2}=$ mean physics scores of the English class.

During the period May 15-17, 1979, the two classes of students vere taught the same content in physics, one class in English only and the other class in Chinese only. The class which was taught in Chinese in this study was the class which was taught in English and the class which was taught in Eaglish in this study was the class which was taught bilingually in the previous study (Section 3.8.1). The reason for using this changeover design compared with 3.8.1, was that it seemed to be a more direct vay of finding out what effect the medium of instruction had on student achievement in physics if there were effect.

The content taught was 'Atomic Structure and Radioactivity'. The lesson plans for these four periods were produced by the School of Education of the Chinese University of Hong Kong ${ }^{1}$ in both Chinese and English (see Appendix 13). During the lessons, the teacher followed the lesson plan strictly to ensure reasonably equivalence of content taught to the two classes.

Opon completion of the four teaching-learning periods, an achievement test (see Appendix 14) on the content studied was given in the fifth period, to the two classes of students in Chinese or English, according to the medium of instruction used. The achievement test differed in several ways from those in

[^20]the previous studies. Firstly, the students were not informed about the test until the day before the test was administered. Secondy, the reading material they recieved on the first day of the project was collected to ensure that no student did any extra-study before the test. Hence one could be quite sure that the results obtained from the test indicated how much the student could understand and learn only during the class period. Any systematic achievement differences betveen the two groups would probably be due to the effects of the medium of instruction. Detailed comparison of the post-test scores followed the same plan described in 3.8.1.

## CHAPTER 4

RESULTS AND ANAYSIS
4. 1 COMPARABILITY OP THE CS AND ACS GROUPS

### 4.1.1 General Background

One hundred seventy-six subjects were selected for the study, eighty-six from an Anglo-Chinese secondary school and ninety from a Chinese secondary school. The following table shows the distribution of the subjects in terms of sex, age, place of birth, dialect spoken at home, socioeconomic background, choice of school and S.S.E.E. results on Chinese, English and Mathematics. ${ }^{2}$

Background Variables 1, 5, 7, 8 and 9 were analyzed by a ttest (two-tailed, 174 degrees of freedom), while background variables 2, 3, 4 and 6 were analyzed by a $x^{2}$-test (1 degree of freedom) • Significant age difference $(t=9.62)$ was probably due to the fact that comparatively more students in the chinese schocl were repeaters than in the anglo-Chinese school. In other

1 During the study (Section 3.5), one student in the CS group dropped out from school.
2 Since: not all the students sat for the S.S.E.E. only 126 students ( 85 of ACS and 41 .of $C S$ group) possessed results on choice of school and S.S.E.E.
For S.S.E.E. results, students received classification grades 1. 2. 3. etc. as an indication of their standard in that subject area. A smaller grade number means a better result (grade 1 is the best) in that subject area. (Note this fact in Table 4.1).
words, students in the Chinese school might probably be less able than students in the anglo-Chinese group. In fact. this agrees with the differences between the two groups on S.S.E.E. Chinese ( $t=6.87$ ). English ( $t=9.14$ ) and Mathematics $(t=8.39)$, all these indicate that the anglo-Chinese group was better than the Chinese group three years before when they first entered secondary school. Purthermore, there was also a significant difference $\left(x^{2}=44.13\right)$ between the two groups in their choice of schools. Almost all students in the Chinese school indicated that they did not choose to enter their present school but were forced to do so since they had inferior S.S.E.E. results.

Table 4.1 is here.

The present result also revealed the fact that even though both schools were above average in academic achievement when compared to other secondary schools in Hong Kong, they were not comparable on many background variables and hence appropriate adjustment in the subsequent comparison of achievement between the two groups would probably be required.

## 4. 1. 2 Pretest Results of Physics Achievement

The : Pretest was administered to the two groups of students during the first physics lesson periods of the two schools. The CS and the ACS groups took the Chinese and English version of the pretest respectively. Since students had not been taught the material, it was likely that they would guess. When correction for guessing, $\quad$ - , uas applied to the scores, the following
results were obtained (for individual scores, see Appendix 16).

Table 4. 2 is here.

Table 4.2 shows that the scores of both groups were not very different from zero. The assumption that both groups had not previously learned much of the content material seemed tenable. The table also shous that the Chinese group had a mean score that was higher (significant statistically at the 0.01 level. $t=2.88$, two-tailed) than the Anglo-Chinese group on what they did know. This may possibly be due to the difficulty in understanding the second language. questions about unfamiliar material might have made more sense when presented in their native language.

### 4.1.3 Aptitude Test Results

Having established that the two groups of students had essentially very little prior knowledge of the content learned, a check on the equivalence of aptitude scores was made. The following results were obtained from the aptitude tests. (See Table 4. 3 and Fig. 4. 1)

Multivariate analysis of variance was used to study the difference between the two groups on the various aptitudes measured. A computer program written by Cooley and Lohnes (1962) was used for the analysis. The F-value.with 8 and 166 degrees of freedom was found to be 94.99. If two populations are not different, then samples as extreme as these (or more extreme) yould occur extremely rarely. Indeed, $F$ values of 3.55 or
greater yould occur no oftener than . 001 of the time; the corresponding probability for an $F$ of 94.99 is of course far smaller. Hence the hypothesis that the groups differ in aptitude is tenable.

Table 4.3 is here.

Fig. 4.1 is here.

Discriminant analysis subsequently was used to determine the nature of the group differences. The computer program given by Cooley and Lohnes (1962) was used to carry out the analysis. The intercorrelation matrix can be found in appendix 20. The vector of the scaled weights is shown in Table 4.4. The scaled weights give the relative contribution of each variable in the discriminant function, they help to determine the qualitative nature of the dimension. Since there are just two groups, only one discriminant function exists.

Table 4.4 is here.

English verbal reasoning is outstandingly the most important variable for discriminating between the two schools. It is notably more important than mathematical reasoning and considerably more important than chinese verbal reasoning. Since English verbal reasoning demands a good command of word knouledge as well as the mastery of complex processes, such as
analysis, abstraction and generalization, it is a component of aptitude which serves quite well to discriminate the two (known) groups. Abstract reasoning is the least important variable for this purpose. Its relative importance is considerably less than that of English verbal reasoning. :

From the MANOVA study of the aptitude results, it is quite clear that the two groups were very different from each other. This also agrees with the results in Section 4.1.1.
4. 2 ANALYSIS of besults on physics achievement betgeen Chinese AND anglo-chinese schools

## 4. 2. 1 Comparing Results of physics Achievement

Since the two groups of students vere not equivalent, the posttest scores were compared by analysis of covariance (ANCOVA). By choosing suitable covariates, ANCOVA is a statistical technique to adjust the initial difference between two randomly chosen groups for comparison of treatment effect. If the groups are non-random, ANCOVA might be inadequate to cancel out all initial group differences since there are too many variables involved. However, it may be the best we can do for the present study.

The eight aptitude scores were chosen to be the covariates since they were thought to be more directly related to learning
than other background variables in Section 4.1.2 The computer program $B E D$ o 040 was used to carry out the analysis. ${ }^{2}$ The following anCova table was obtained.

Table 4.5 is here.

Since $.95{ }^{F}(1,120)=3.92>1.33$, the difference between the two adjusted means was not statistically significant and therefore the null hypothesis was considered tenable. The following table gives the means before and after adjustment.

Table 4.6 is here.

These results suggest that, to the extent analysis of covariance can adjust for pre-existing differences in aptitude, there was no statistical evidence that the groups differed in post test performance even though they had learned the content through different media of instruction in those three months. It was mainly due to the superiority in aptitude of the AngloChinese school students that the mean scores (unadjusted) on the achievement test favoured them.
4.2.2

The Effect of Motivational Factors on the Results of

[^21]
## Physics Achievement

The present result is unexpected. It does not agree with the general trend indicated in Table 2.3. Were the results comparable because teachers and students in the Anglo-Chinese school were compensating in some way for lack of proficiency in English, e.g., spending a lot of extra time and energy overcoming language difficulties, better teaching etc? a comparison on the response of the two groups on the scales (Section 3.4.2.1) like motivational intensity in physics (MIP), desire to learn physics (DLP), study habits in physics (SHP), and teaching performance (TP), would reveal to us the underlying facts. Table 4.7 shows all the mean scores and standard deviation of the two groups on the above four factors.

Table 4.7 is here.

It is clear from the table that the two groups were not statistically different on all the four variables. Referring back to the meaning of MIP, DLP and SHP on Section 3.4.2.1 and their individual items in Appendix 6, one could consider them as operational measures of students' motigation, time and effort spent in physics. Hence there was no strong evidence to say that (1) the students in the anglo-Chinese group were spending extra time and energy overcoming language difficulties, (2) they received better teaching, or (3) they had a higher motivation to learn physics when comparing with the Chinese group. So the effects of these factors on physics achievement should be about the same among the two groups.

### 4.2.3 <br> The Effect of English_proficiency on the Results of

Physics Achievement
One possible explanation of the results in Section 4.2.1 was that students and teacher in the Anglo-Chinese school were sufficiently proficient in English to produce no significant difference in achievement scores when compared with students in the chinese school. To find out the degree of English proficiency, the English Proficiency Test Battery was administered to the students.

The English Proficiency Tests were administered in the two schools at about the same time during the school year. Since the battery of tests took, a long time to administer, testing was done in five sessions. Attendance at these sessions varied and so the number of individuals taking the subtests was constant (see Table 3.2). The following table gives the results of the two schools on the English Proficiency Tests.

Table. 4.8 is here.

It is clear that the level of English proficiency of the Anglo-Chinese school was considerably higher: than the Chinese school on all five aspects of English proficiency. This level of English proficiency (of the ACS) has already reached the lowest acceptable standard for a foreign student applying for admission in some colleges in the United States. Bearing in mind that

[^22]these were just grade 10 students and that they were not living in an English speaking society as are the foreign students in the United States (which would require a higher level of English proficiency), the present level of proficiency should be good enough for the anglo-Chinese school students to pursue physics in the medium of Englsih.

Furthermore, the teacher in the Anglo-Chinese school (i.e.the writer) has been using English to teach the subject for eight years and has been studying abroad in English speaking countries the United States and Canada) for over two years. He should have no difficulty in teaching physics through English. So the two teachers should have taught fluently in their predetermined languages of instruction.

To sum up, students (and teachers also) in the AngloChinese school were sufficiently proficient in English to produce no significant difference in achievement test scores when compared with students in the Chinese: school. Thus it should be an acceptable explanation of the present result in Section 4.2.1.
as the anglo-Chinese students were sufficiently proficient in English and they did not suffer in learning physics through English, it would be interesting to know how much time and effort had been and was being (relative to the Chinese students) spent in attaining this level of proficiency in English. (Problem 3 in Section 1.1). A comparison on the response of the two groups on the scales (Section 3.4.2.1) like student's knowledge of English (SKE), motivational intensity in English (MIE), orientation toward English (OTE), desire to learn English
(DLE). study habits in English (SHE), and reading habit (RH) would reveal to us the underlying facts. Table 4.9 shows all the mean scores and standard deviations of the two groups on the above six factors.

There were no significant differences (MaNOVA and t-test) between the two groups on all the four motivational variables MIE, OTE, DLE, and SHE. This agrees with the result of Siu (1979b). It might be that the environmental pressure. encouragement, and stimulation were about the same among the two schools and had similar influence on the motivational variables. The highly significant results of $S K E$ and RH just confirm again the results indicated in Table 4.1 and 4.8. Since the AngloChinese students had better S.S.E.E. grades in English three years ago and higher scores in English proficiency Test Battery, they certainly had a better knowledge of English. Furthermore, as the Anglo-Chinese students were more proficient in English, they could of course read more books in English.

Table 4.9 is here.

Referring back to the meaning of MIE, OTE, DLE and SHE on Section 3.4.2.1 and their individual items in appendix 6, one could consider them as operational measures of students' motivation, time, and effort spent in English. Hence, though the Anglo-Chinese students were more proficient in English, it appeared that when compared with the Chinese students, they did not need to spend extra time and effort to attain this level of proficiency except for their normal immersion in English during
the school hours.
4.3 RELATIONSHIP BETVEEN PHYSICS ACHIEVEMENT ENGLISH

PROPICIENCY AND OTHER RELEVANT FACTORS
In order to investigate how physics achievement at the grade 10 level of Anglo-Chinese schools in Hong Kong depends on English proficiency and other relevant factors such as aptitude, motivation to learn etc., the scores on English proficiency test battery, aptitude test battery, and other relevant factors (i.e. MIP, DLP, SHP, SCAB, TP) were taken as independent variables while physics achievement scores (i.e.the scores used in Section 4.2.1) were taken as dependent variable. The computer program BMD O2R: wich computes a sequence of multiple linear equations in a stepwise manner was used to analyze the data. In the stepwise solution, tests are performed at each. step to determine the contribution of each variable already in the equation if it were to be entered last. It is thus possible that a variable that was initially a good predictor may be dropped. Criteria for removal of a variable are set at the 0.05 level of significance for the present study. Stepwise regression methods are described in Kerlinger and-Pedhazur (1973).

The following results (Table 4.10 and 4.11 ) were obtained

[^23]from regression analysis. 3 The intercorrelation matrix of the predictors can be found in Appendix 19.

Table 4. 10 is here.

Table 4.11 is here.

A component of English proficiency-English structure, is the best predictor of physics achivement. It explains more variance in physics achievement than those factors like mechanical reasoning or desire to learn physics which are usually considered to be more relevant factors in learning physics. Hence, a component of English proficiency did play a significant role in:physics achievement of the Anglo-chinese school students.
4.4 RELATIONSHIP BETREEN ENGLISH PROFICIENCY, THE AFPECTIVE factors and other relevant factors

Since English structure, a component of English proficiency appears to be an important factor in physics achivement, it is useful to know further what factors are important in acquiring proficiency in English by the Anglo-Chinese school students. The computer program BMD 02R was used to determine the relationship between English proficiency (dependent variable) and other relevant factors (independent variables, listed in Section 3.7). In particular, two aptitude scores (English verbal reasoning and English language usage) vere removed from the list of independent variables since high correlation with English
proficiency was obvious. Table 4.12 and 4.13 give results obtained from stepuise multiple regression analysis. The intercorrelation matrix of the independent variables can be found in Appendix 19.

Table 4.12 is here

Table 4.13 is here.

Table 4. 13 suggests that self concept of academic ability is the most significant independent variable for success in English. Referring back to Table 4.10 , self concept of academic ability is also a significant independent variable in physics achievement there. Since physics is usually considered to be one of the most difficult subjects in secondary school, and so is English (for Chinese students), it is understandable that a very strong self concept of academic ability is required to achieve excellence in both areas. The affective factors like cultural allegiance, anomie, etc. do not account for a significant amount of variance in English proficiency as expected by some researchers, for example, Fu (1975).

Inference of causal relations from a multiple regression equation is not mathematically justifiable. However, it is not unreasonable to speculate that manipulation of some independent variables may lead to improvement of English proficiency. Among

[^24]these four important factors which explain a significant variance of English proficiency, three of them fexcept for motivational intensity in English) cannot be manipulated easily because their formation is a long term process (in terms of years). Self concept of academic ability deals with behaviour in Which one indicates to oneself about one's ability in academic work as compared with others engaged in the same work. Since the measures of academic work are only carried out several times a year, one does not know whether one is really improving in academic work in a short period (less than a year) . Similarly. Chinese language usage and Chinese verbal reasoning are factors that start their formation since primary school, substantial improvement cannot be expected in a short period.

Motivational intensity in English is the only factor that can be changed in a short time. This will involve encouragement and help from teachers, friends, classmates, parents, etc. This is still not easy but possible if the people involved can cooperate well. Future experimental studies may shed light on this possibility.

### 4.5 RESULTS ON ADDITIONAL STUDIES

As revealed in Section 4. 1, the two groups of subjects were very different in many different aspects. Since these differences would seriously hamper inferences from the original design, the two additional studies were included to give extra support to the original study (i.e. Section 4.2) if the results of all three studies agree with each other.

### 4.5.1 The Comparability of the Two Classes_in the Anglo-Chinese School

There were 86 students selected from two grade: 10 classes of the Anglo-Chinese School. ${ }^{1}$ From now on, the two classes will be referred to as class 1 and class 2 for the sake of convenience. Table 4.14 shows the distribution of subjects in terms of age, sex, place of birth, dialect spoken at home, socioeconomic background, choice of school, and S.S.E.E. results on Chinese, English and Mathematics.

Background variables 1, 5, 7, 8, and 9 were analyzed first by MANOVA and then by t-test (two-tailed, 84 degrees of freedom) while background variables $2,3,4$, and 6 were analyzed by $x^{2}$ test (1 degree of freedom). Only mean age of the two classes was significantly different at the 0.05 level ( $t=2.01$ ), while other background variables were not significantly different among the two classes. Hence the two classes could be considered comparable except for age.

A check on the equivalence of aptitude scores was also made. The results were listed out on Table 4. 15 and Fig. 4.2.

Table 4.14 is here.

Table 4. 15 is here.

Pig. 4.2 is here.

[^25]Multivariate analysis of variance was used to study the difference between the two groups. The computer programuritten by Cooley and Lohnes (1962) was used to do the analysis. The calculated p-value with 8 and 77 degrees of freedom was 2.12. This value was significant at the 0.05 level (.95F(8,60)=2.10) and therefore the null hypothesis (i. e. no difference between the two groups) was rejected.

Discriminant analysis was then used to determine the nature of the group differences. The vector of scaled weights computed is shown on Table 4. 16. The intercorrelation matrix can be found in Appendix 20.

Table 4.16 is here.

The relative contributions of the eight variables to the discriminant function are shown in the Table. English verbal reasoning appears to be the most notable discriminator. This agree with the result obtained in Section 4.1.3. English language usage however, discriminates least between the two classes. This is reasonable as the two classes were both from the Anglo-Chinese school.
4.5. 2 Comparing Results of Physics_Achievement_Betyeen English and Bilinqual Instruction

During the experimental perid, class 1 was taught by bilingual instruction while Class 2 was taught by English instruction.

Since the two classes of students were not overall equal on
aptitude, the posttest scores on mechanics were analyzed by analysis of covariance (ANCOVA) with the 8 aptitude variables as covariates. The computer program BMD $04 V$ was used to analyze the data. The following ancova table was obtained from the computer.

Table 4. 17 is here.

Since the calculated F-value was less than 1, the null hypothesis that the groups did not differ significantly in achievement in mechanics was regarded as tenable. The following is a table of adjusted means for the two classes and shous that the adjusted means were almost identical.

It is reasonable to conclude, therefore, that to the extent that statistical adjustment compensates for initial differences in background variables, the difference in language of instruction (Bilingual or English) produces no discerable difference in performance on the Test on Mechanics.

Table 4. 18 is here.

### 4.5.3 Comparing Results of Physics_Achievement Betueen Chinese

 and English InstructionDuring the experimental period, Class 1 was taught by English instruction while class 2 was taught by Chinese instruction. Since the two classes of students were not overall equal on aptitude, the scores on Test on Atomic physics were
analyzed by anaysis of covariance (ANCOVA) with the 8 aptitude variables as covariates. The computer program BMD 04V was used to analyze the data. The following ancova table was obtained.

Table 4.19 is here.

Since $.95 F_{(1,60)=4.00>2.37 \text {, the null hypothesis (i.e. the }}$ two adjusted means are equal) was retained. It is reasonable to conclude, therefore, that to the extent statistical adjustment compensates for initial differences in background variables, the difference in language of instruction (Chinese or English) produces no clear difference in the performance on the Atomic Physics Test. The following table shows the mean scores of the two classes before and after adjustment. It is interesting that the means before and after adjustment are equal here. This is probably due to a balance of adjustment produced by the eight covariates. This is rare, but possible as can be seen from Table 4. 15 where each class is superior in four areas of aptitudes.

Table 4.20 is here.

## CHAPTER 5

## CONCLUSIONS AND RECOMMENDATIONS

## 5. 1 CONCLUSIONS

Based on the results discussed in Chapter 4, the following conclusions about the Specific Problems raised in Section 1.1 seem warranted bearing in mind the limitations expressed in Section 1.7.

1) Achievement in physics at the grade 10 level in the two secondary schools studied does not seem to depend on the language of instruction no matter whether it is chinese, English or Bilingual (Section 4.2.1, 4.5.2, 4.5.3).
2) Achievement in physics at the grade 10 level in AngloChinese schools of Hong Kong depends heavily on students! English proficiency, A component of English Proficiency (English structure) contributes to more than one-third of $52 \%$ of the explained variance (Section 4. 3).
3) There seem to be no significant differences in motivational factors in learning English between the AngloChinese and Chinese school students. In other words, the Anglo-Chinese school students do not see⿴ to be especially motivated to spend extra time and make extra effort to learn English (Section 4.2.3).
4) Important factors related to proficiency in English by Chinese students appear to be: self concept of academic ability,

Chinese language usage, motivational intensity in English, and Chinese verbal reasoning. of the above factors, self concept of academic ability, Chinese language usage, and chinese verbal reasoning cannot be manipulated easily because their formation is a long-term process. Motivational intensity in English is the only factor that can be changed in a short time if one wants to be more proficient in English (Section 4.4).
5) It does not take the students extra time and effort to learn physics at the grade 10 level when it is done in the English language. In terms of cost-effectiveness, there is no strong case to be made for using Chinese instead of English at the grade 10 level for the present Anglo-Chinese school students (Section 4.2.3).

### 5.2 DISCUSSION

5.2.1

The Effect of Language of Instruction_on Physics Achievement
5.2.1.1 Comparing the Results of physics Achievement in the Chinese and Anglo-Chinese Schools

Section 4.1.3 gives data to show that the two groups of students were very different in scholastic aptitude (as measured by the Aptitude Test Battery). This was contrary to the author's original expectation that since the two schools were both aboveaverage in academic performance among the secondary schools in

Hong Kong, they should be of comparable scholastic aptitude. The result that the anglo-Chinese school students were superior in aptitude to the other group was largely due to economic conditions in Hong Kong and the additional language problem the students had to face. Simpson (1966) has pointed out that a sound knowledge of English was rated as equally important as the students' intelligence or academic knowledge by many employers. Everyone wants to get into an Anglo-Chinese school and usually the better students are admitted. Furthermore, due: to the additional language problem students would have to face when using English as the medium of instruction, it was expected that the more academically capable students would choose to go to such a school.

Though the two groups were so different, their posttest results were compared by making use of the best available statistical methods as shown in Section 4.2.1. The results indicate that the difference in medium of instruction between the two schools did not significantly affect academic achievement in physics during the three months of controlledteaching. This was just opposite to the results obtained by Cheung (1974) and Poon (1978), but similar to those obtained by B. Chan et al (1979). A closer examination of these studies revealed that they focused on different grade levels. poon studied the grade 6 level. Cheung investigated grade 7and 9 , while $B$. Chan et al examined the grade 11 level. The present study filled the gap at the grade 10 level. Further, Cheung's study reported that the superiority of the Chinese group over the English group diminished considerably from grade 7 to grade
9. though the difference were still statistically significant. Maybe the present study has uncovered the possibility that the English proficiency of the Anglo-Chinese school students at the grade 10 level is high enough, so that the medium of instruction is no longer a significant factor affecting their academic achievement (see Section 4.2.3)..
5. 2. 1.2 Comparing the Results of Physics Achievement Betyeen the Two Classes in the Anglo-Chinese School

Section 4.5.1 indicates that the two classes of students were quite different in scholastic aptitude. The results were compared by making use of the best available statistical methods as shown in Section 4.5.2. They indicated that the anglo-Chinese school students at the grade 10 level did not perform better when bilingual instructions were used. This is consistent with the interpretation given in Section 5.2.1.1. Further, based on the results of Section 4.5.3, there was no difference in achievement between the two classes making use of chinese or English as the medium of instruction under controlled conditions. This is additional support for the interpretation in Section 5.2.1.1. The above results were contrary to many Hong Kong people's belief that if students don't understand in class when the class is conducted in English, it is probably due to the language barrier rather than to other problems. This belief may be true in junior forms like grade 7 or 8 , but in senior forms, unless the students' English standard is extremely poor, it is probably a rationalization of bad teaching or due to other unknown problems.

### 5.2.1.3 Recapitulation

Based on the above discussion of the influence of the medium of instruction on academic achievement, there seems no evidence that the medium of instruction is an important factor in physics achievement at the grade 10 level.. It would appear that the Anglo-Chinese school students have been immersed in the use of English long enough so that the language of instruction does not affect achievement in a significant way.
5.2.2 The Relationship Between Physics_Gchieqemente_English Proficiency and other Relevant Factors

Among all the variables tested in the multiple regression analysis, the score on English structure is the most significant predictor of physics achievement in the anglo-Chinese. School (Section 4.3). It may be queried why English structure is the most significant factor in predicting physics achievement while other factors are comparatively less important. The following are three plausible explanations.

1) Students have to learn the second language in some structural way, bearing in mind grammatical rules, patterns, etc. What they need to do is to plug appropriate words or phrases into the right pattern. This is very similar to the learning of laws in physics. What the students are required to do is to put the appropriate quantities into the right formula in order to find the unknown things required.
2) In English, the students have to pay attention to grammer in different parts of $a$ sentence and try to fit different parts into a complete whole which should be
grammatically correct. While they work at one part of the sentence, they have to keep in mind the other parts of the sentence.
e.g. Before the old man died, he made a will which said that all his money should be given to a local orphanage.

In this sentence, students have to attend to agreement of tense, word order, voice, pronouns and clause structure all at the same time in one sentence.

In physics, the same kind of process is called for in many places. For example, in designing an experiment, one has to know What to measure. If some quantities cannot be measured directly, one has to find out if there is any subsequent relation that can be derived so as to measure the required quantity indirectly. Further, one has to know what kind of equipment he can have, how to use it, and what its accuracy is. All these factors have to be considered before starting to do the experiment. So the learning of English structure and physics is quite similar in this respect.
3) The test items in the English structure paper may be better items in predicting the score in physics achievement than in the Aptitude Test Battery. To study the details of test items in each paper fi.e. the English structure and Aptitude tests), one needs to return to the content and construct validity of the tests. This is beyond the scope of the present study.

Another point to note is that there are no significant differences between the motivational variables of learning physics in the two schools as shown in Section 4.2.2. This


#### Abstract

could mean that the anglo-Chinese school students do not need to be more highly motivated to learn physics in order to get results comparable with the chinese school students. This speculation is somewhat contradictory to many Hong Kong people's opinion that learning a subject in English may require students to put extra effort in comparison with learning a subject in Chinese, On the other hand, this speculation is in accordance with the results discussed in Section 5.2.1: the students uere probably good enough or had been immersed long enough in English so that the difference of medium of instruction did not hinder achievement.


### 5.2.3 The Relationship Between English_Proficiency Affective

## Factors and the Background Variables

The results obtained in Section 4.4 were not in keeping with those discussed by Jakobovits (1970). In the present study, only about $37 \%$ of the variance of English proficiency could be explained by the proposed factors for the Anglo-Chinese school students. By comparison, Jakobovits proposed that about 86\% of the variance of second language learning could be explained by factors such as aptitude, intelligence and motivation. A closer look at the present study uncovered the fact that ELU and EVR had not been included in the analysis and some explained variance was lost. Hence the two results are not comparable.

Among those significant variables in anglo-Chinese school students shown in Table 4.13, the motivational variable (motivational intensity in English) contributed just about $15 \%$ to the explained variance. Though there was a noticeable
correlation between the two variables, 'self concept of academic ability' and 'motivational intensity in English' (about 0.35). the fraction of variance that could be explained by motivational variables was still small when compared with Jakobovits' estimation. The idea raised by Pu (19.75) that motivational and attitudinal variables might be very important factors in learning English for Hong Kong students is probably not valid.

Further, when mean scores on the motivational variables of the two schools were compared (Section 4.2.3), there also was no significant difference. Maybe more immersion in English has no significant effect on changing the motivation for learning English among Hong Kong students. Another possible reason is that the anglo-Chinese school students had already obtained a high proficiency in English, their motivation to learn it has presumably dropped.

### 5.3 IMPLICATIONS

## 5. 3. 1 bout the Medium of Instruction

The main purpose of the present study is to explore the relationship between academic achievement in physics and English proficiency in a situation where the medium of instruction (i.e. English) is the second language of both students and teachers. The results of the study are important to those who are involved in bilingual education. It shous that for students of above average aptitude, the use of their second language as the medium of instruction in some subject areas may not seriously hamper
their learning if they have been immersed in the second language long enough. This can be considered as a partial support in senior forms only) for the present education policy in Hong Kong which does not discourage the use of English as the medium of instruction in secondary schools as indicated in the Hong Kong Education Department White Paper (1974).

Taking Hong Kong as an example; previous studies (Cheung 1974. Poon 1978) indicated that using English as the medium of instruction might be harmful to students at grade 9 or lower. at the present time, it now appears that the use of English as the medium of instruction may not be detrimental if it can be postponed to grade 10 as suggested by Cheng et al (1973). This will not only allow the students to establish a firm background in English but will also avoid the adverse effects revealed by Cheung (1974). Poon (1978) and other research workers' as discussed in Chapter 2. $\mathcal{P}$ urthermore, it can still satisfy the demands for a higher English standard placed on the students by the parents and society. Finally, if ve take into consideration that secondary education is developing rapidly in Hong Kong, we have to accept the fact that there are more less able students attending school now and there will be more in the forseeable future. The delay of using English as the medium of instruction in secondary schools appears to be an unaidable step to cope with reality.

The results of the present study might also be applicable to countries which face the same problems as Hong Kong. A late immersion might not only avoid the detrimental effects as revealed in Chapter 2, but also facilitate the general
development of students' cognition and national pride. At the same time, late immersion could also produce students who can master the second language well enough for their future study or careers in science, technology or business.

If the results of the present study can really be generalized to other subject areas, to other schools in Hong Kong, and to other developing nations as mentioned in section 1.7. the problem of when is the best time to immerse students in the second lanugage could be solved gradually in the future. We can allow the teachers to use their mother tongue as the chief medium of instruction and the students to learn the second language as a subject until the end of junior high school (grade 9). After that the students tho would like to learn more about a second language will be put into schools using the second language as the medium of instruction while those whould like to continue their studies in the mother tongue will be put into school using their mother tongue as the medium of instruction.

### 5.3.2 About the Learning of Physics

No matter which argument is the true explanation of the high correlation between physics and Engliah structure as stated in Section 5.2.2, one has to be aware of this significant relationship. There is often a tendency for physics students in senior Forms to neglect second language learning (e.g. English in Hong Kong) and to concentrate just on the science subjects. of course, we know that this kind of attitude is counterproductive. The results of the present study can be an additional warning to the physics students who have this kind of
attitude. These students might have to be informed about the present results that the learning of a second language, especially its grammatical structure, might of an indirect help to their learning of physics, and vice versa.

## 5. 3. 3 About English Teaching

In the discussion of Section 5.2.3, readers might notice that the results of the present study are somewhat against fu's expectations in her comprehensive study of English. language learning and the Chinese students in Hong Kong. But the fact that the fluency in English of many Hong Kong students is incommensurate with the amount of time and effort they put into English still remains. What the present study indicates is that the cultural factors and affective factors may not be that important in the learning of English among fong Kong students. We may have ruled out one possible reason, but we still do not know what the actual causes are. Is it because expectation are too high that what parents, educators or employers want is a native-like standard of English which is too difficult for the majority of students to acquire? Is it necessary to have that high standard of English in a society that consists of more than 98\% non-native English speakers? Do all students, regardless of intelligence and career plans, require the same amount and the same kind of English? Would the standard of English be improved if the English the students did learn was of a better and more useful quality than that wich they are currently learning? Would it be better to offer intensive and well taught English language classes in their later school years to students who
will continue their education and wo begin to realize a real need for English in their prospective jobs?
5.4 RECOMMENDATIONS FOB FUTURE RESEABCH

The present study has certain weaknesses in its design, such as the non-random selection of subjects, the incomplete refinement of the tests and scales, the failure to take account the teacher variable, etc. It would be desirable to replicate the present study using an improved method of sampling, thoroughly refined tests and scales, and to conduct it on a much larger scale involving a more representative sample of students and teachers.

Further, the following recomendations are made for future researchers:

1) As indicated in Limitation (5) and (6) of Section 1.7. generalizability of the present study is very limited. Replication of the present study in other school-subject areas like chemistry, biology, geography, etc., in other developing nations, and in other grade levels is recommended.
2) Replication of the present study vith students of average or below average abilities is strongly recommended since the present results might only be applicable to students of above average abilities. Students of average or below average abilities might encounter difficulties when the second language is used as the medium of instruction.
3) Longitudinal studies such as the St. Lambert Experiment (Lambert 1972) but following the present design
during the whole secondary school period are recommended. This may be guite possible for some above-average secondary schools in Hong Kong since the changeover of students there is quite low. ${ }^{1}$ The only trouble is how to get two equivalent groups of subjects at the beginning of secondary school. This will not be too difficult if the Ministry of Education is villing to help.
4) To confirm the implications mentioned in section 5.3.1, another longitudinal study is recommended. As suggested above, students would be randomly assigned to two groups at the beginning of secondary school. One group would learn all the subjects, except English language, through the medium of Chinese from grade 7 to 9 inclusively. The other group ould learn all the subjects, except Chinese language, through the medium of English during the same period. At the end of each year, the two groups would be assessed by equivalent tests presented in different languages. The chinese group would write the tests in Chinese and the English group would write the tests in English. At the start of grade 10 , the two groups would learn all the subjects, except Chinese language, in English. Their achievements in different subject areas would be compared at the end of grade 10 and 11. This study would be a test of the suggestion made by cheng et al (1973) and others.

Afterall, Hong Kong lack research in many areas of education, language learning and teaching, student needs, motivation and attitudes. The present study is just a study

[^26]after $F u$ (1975), hoping to initiate a climate of interest and enthusiasm in research in this important but under- cultivated area.

## BIBLLOGBAPHI

Abbott. A.F. Ordinary Level_Physics. (2nd ed.), Hong Kong: Heinemann, 1969.

Agassi, J. Social Structure and Social Stratification in Hong Kong. In I.C. Jarvie (Ed.), Hong Kong: Society in Transition. London: Routledge and Kegan Paul, 1969.

Bolger, P.A. The Effect of Teacher Spanish Language pluency upon Student Achievement in a Bilingual Science Program. Doctoral Dissertation, St. John University, 1967.

Bovet, P. Bilinguisme et education, Report fait pour la Commission du Bilinguisme. Geneva, 1932. (Engle, P.L. Language Medium in Early School Years for Minority Language Groups. Revieu of Educational Research, 1975, 22, p. 304).

Brookover, W.B., Erickson, E.L., and Joiner, L.M. Self Concept of Ability and School Achievement III. U.S. Department of Health, Education and Welfare, February 1967.

Broudy, H.S. on 'Knoving Kith'. University of Illinois, Date Unknown. (Mimeographed).

Camptell, D.T., and Stanley, J.C. Experimental and Quasiexperimental Design for Research. In N. Gage (Ed.). Handbook
of Research on Teaching. Skokie, Illinois: Rand MCNally, 1963. Chap. 5.

Carroll, J. B. English as a Medium of Instruction. Educational Review, November 1961, 14:1, pp. 54-63.

Carroll, J. B. The prediction of Success in Intensive Foreign Language Training. In R. Glaser (Ed.) Training and Education, University of Pittsburg Press, 1962.

Chan, B.Y., Hinton, A. and Yau, B. L.L. A Comparison of the Hong Kong Certificate of Education Examination Results of Students from Two Different Language Streams. Educational Journal. Chinese Uni versity of Hong Kong, 1979. pp. 25-34.

Chan, J. Problems of Psychological Testing in Two Languages in Hong Kong. In $A$. Lord (Ed.), Studies_in Bilingual Education, Language Centre, University of Hong Kong, 1976, pp. 112-113.

Chan, P., Cheng, N.L., Fong, S., and Tsui, C.Y. Mythand Realitye A Survey of the English Standard of Porm_ Pupils and the English-medium Education in Secondary Schools. Hong Kong, May 1979.

Chaney. D.C., Podmore, D.B.L., and Lu, A. Young Adults in Hong Kong. Hong Kong: Centre of Asian Studies, University of Hong Kong, 1973.

Chao. S.C. The Teaching of English_to Cantonese Studentsea Critical Study of Some Cultural and Linguistic problems. Doctoral Dissertation, Columbia Teacher's College, 1953, p. 103.

Cheng, N. L., Shek, K.C., Tse, K.K., and Rong, S. L. At What Cost? Instruction through the English Medium in Bong Kong Schools. Hong Kong: Shum Shing Printing Co.. 1973.

Cheung, T.W. The Relatiye Effectivenessof.Teaching Comprehension through the Use_of Cantonese and English as Medium of Instruction. Masters Thesis, the Chinese University of Hong Kong. 1974, (Presented in Chinese).

Collison, G. O. Concept Formation in a Second language, a Study of Ghanaian School Children. Harvard Educational Review, 1974, 44, pp. 441-457..

Cooley, W.W., and Lohnes, P.R. Multivariate_procedure_for the Behavioral Sciences. New York: John Viley and Sons, 1962, Chap. 4.

Cooper, C.H. An Analysis of Instruction in Spanish_andin English Using Materials Deqeloped for Teaching Physics_to Latin American College Students. Doctoral Dissertation, University of Texas at Austin, 1971.

Daum, D. A. The Language Teacher and Language Choice. English

Language Teaching Journal, August 1976, 30, pp. 184-189.

Duyne, H.J.V., and Gutierrez, G. The Regulatory Function of Language in Bilingual Children. The Journal of Education Fesearch, November 1972, 66. pp. 122-124.

Engle, P.L. Language Medium in Early School years for Minority Language Groups. Review of Educational Research. 1975, 45, pp. 285-291.

Fife, R.T., and Manuel, H. T. The Teaching of English_in_puento Rico. San Juan, Puerto Rico: Department of Education Press, 1951.

Fu, G. A_Hong_Kong_Perspective: English_Language_Learning_and the Chinese Student. Doctoral Dissertation, Oniversity of Michigan. 1975.

Gallop, R., and Kirkman, D.F. An Investigation into Selective Performance on a Bilingual Test paper in Mechanical Mathematics. Educational Research, 1972, 15 : 1 pp. 63-71.

Gardner, R.C., and Lambert, W. E. Attitude and Motivation in Second Lanquage Learning. Rowley, Mass. : Newbury House publishers, 1972, pp. 21-24, 122-125.

Gay, L. R. Educational Research: Competencies for Analysis and Application. Columbus, Ohio: Charles Merrill Publishing Co.,

1976, Chap. 6.
Giles. W. H. Cultural Contrasts_on English-French Bilingual
Instruction in the Early Grades. (Paper presented at
Conference on Child Language. Chicago 1971.).

Goh, K.S. Beport on the Ministry of Education. Singapore, 1978.

Hong Kong. Hong Kong 1972. Report for the Year 1978. Hong Kong: Government Press, 1979.

Hong Kong. Hong Kong Education Department Ghite paper. Hong Kong: Government Press, 1974.

Jakobovits, L.A. Foreign_Language_Learning. Rowley, Mass.: Newbury House Publishers, 1970.

Jarvie, I.C., and Agassi, J. A Study in Resternization. In I.C. Jarvie (Ed.). Hong Kong: A Society in Transition. London: Routledge and Kegan Paul. 1969.

Johnson, G.E. Natives, Migrants and Voluntary Associations_ina Colonial Chinese Setting. . Doctoral Dissertation, Cornell Oniversity, 1971.

Juarez. J.R. Subordinate and_Superordinate Science process Skills: An Experiment in Science Instruction Using the English and Spanish Language vith Fifth Grade Children_in

Bilingual Schools. Dotoral Dissertation, University of Washington, 1976.

Kehoe. M. E. Applied Linquistics. New York: Macmillan, 1968.

Kerlinger, F.N., and Pedhazur, E.J. Multiple_Regressionin Behavioral Research. New York: Holt, Rinehart and Uinston, 1973.

Knight, L. N. A Comparison of the Effectiveness_of_Intensive oral-Aural English Instruction, Intensive oral-aural Spanish Instruction and Non-Oral-Aural Instruction on the Reading Achievement of Spanish Speaking Second and Third Grade Pupils. Doctoral Dissertation, University of Texas at Austin, 1969.

Kvan, E. Problem of Bilingual milieu in Hong Kong: Strain of the Two language System. In I.C. Jarvie (Bd.), Honq_Kong: $A$ Society in Transition. London: Routledge. and Kegan Paul, 1969.

Lambert, W.E. Lanquage. Psychology_ and culture: Essays_by Hallice E. Lambert. A.S. Dil (Ed.). Stanford, California: Stanford University Press, 1972.

Lambert, $\mathrm{T}_{\mathrm{A}}$ E., and Tucker, G. Bilingual Education_of Children (The St, Lambert Experiment). Rowley, Mass.: Newbury House Publishers, 1972.

Lukmani, Y.M. Motivation to Learn and Language proficiency. Language Learning. 1972, 22. pp. 261-73.


#### Abstract

Macnamara, J. Bilinqualism and primary Education: A.Study of Irish Experience. Edinburgh University Press, 1966.


Macnamara, J. The Effects of Instruction in a Weaker Language. Journal of Social Issues, 1967, 23, p. 133.

Manila Department of Education. The Relative Effectigenessof the Vernacular and of English as Media of Instruction. Bureau of Public Schools, Bulletin Nos. 9, 12, 14, 16, 1955.

Malherbe, E.G. The Bilingual School: A_Study of Bilingualismin South Africa. London: Longmans Green, 1946.

Mitchell, R.E. Pupile parente and_school: A_Hong Kong Study. Taipei: Orient Cultural Services. 1972.

Ng, J. P.L. The Effects of Bilingual Science Instruction on the Vocabularye Comprehension Achievemente and Conceptualization of Elementary School Chinese Children Whose Second Language is_Englishe Doctoral Dissertation, J.C.L.A., 1970.

Poon, S. K. An Investigation of the Language Differences Experienced by Hong Kong Primary School Leavers in Learning Mathematics through the Medium of English. Masters Thesis, University of Hong Kong, 1978.

Poon, Y. W. An Exploratory Investigation into the phenomenon of Bilingual Speech in H. K. U. Undergraduates. ; Unpublished Undergraduate Project Report, Department of Psychology, Oniversity of Hong Kong, 1977.

Raisner, A. Science Instruction in Sparish for pupils_of_spanish Speaking Background. An Experiment_in_Bilingualism. N N York: City Board of Education, 1967.

Ramos, M., Aguilar, J. V., and Sibayan, B. F. The Determination and Inplementation of Language Policy. Philippine Centrefor Lanquage Study Monograph Series_No. 2. Quezon City, Philippines: Alemar/Research, 1967.

Simpson, R.F. Manporer and Employment Problems. Hong Kong: Hong Kong Council for Educational Research, 1966.

Siu.
P. K. Intellectual Abilitye Language Backgrounde and Exposure Time in the Development of Bilingual Competence_of Secondary School Students. The School of Education, the Chinese University of Hong Kong, $1979(\mathrm{a})$.

Siu, P.K. The Effects_of the Medium of Instruction on Student Cognitive Development and Academic Achievement. The School of Education, The Chinese University of Hong Kong, $1979(\mathrm{~b})$.

Siu, P.K. Aptitude Test Battery. Summerson (Hong Kong) Educational Research Centre, 1978.

Spolsky, B. Attitudinal aspects of Second language Learning. Language_Learning, 1969. 19, pp. 272-83.

Stern, H. H. Swain, M.. McLean, L. D., Freidman, R.J., Harley, B. , and Lapkin, S. Three Approaches to Teaching French. Toronto: Ontario Institute for Studies in Education. 1976.

Strevens, P. Problems of Language in the Teaching of physics. In J.L. Lewis (Ed.), Teaching School Physics, Baltimore: Penguin, 1972, pp. 58-62.

Tam. P.T.K. A survey of the Language Mode Used in Teaching Junior Forms_in Anglo=Chinese Secondary School in Hong. Kong. The School of Education, Oniversity of Hong Kong, 1979.

Taplor, A., and Grieve, D.W. Gold_coast Education, 1952, 1, p. 36.

Trevino. B. A. G. Bilingual Instruction--An Analysis of the Effectiveness in the primary Grades. Doctoral Dissertation, University of Texas, 1968.

Tucker, G. R. An Alternate Days Approach to Bilingual Education. In J.E. Alatis (Ed.). Tuenty First Annual_Roundtable: Bilingualism and Language Contact. Washington, D. C.: Georgetown University Press, 1970.

Tucker, G.B., Lambert, W.E., and d'Anglejan, A. Are French

Immersion Programs Suitable for Working Class Children? A pilot Investigation. Lanquage_Sciences, 1973. 25, pp. 19-26.

Vince, V. Report of the Survey ouestionnaire Given to Eirst fear Arts Undergraduates as Part of the Language Centre's Language Analysis_Sessions, 1970. Hong Kong: language Centre, University of Hong Kong.

Weffer, R.C.E. Effectsof_First Language_Instruction in academic and Psychological Development of Bilingual Children. Doctoral Dissertation, Illinois Institute of Technology, 1972.

Identification of Groups According to the Time of Introduction of Second Language for Reading and as A Medium of Instruction

| Grade in which second language <br> is first used as a medium of <br> instruction | Grade in which reading in <br> the second language starts |
| :--- | :--- |
|  | One |
| One <br> Three <br> Five | Group 1 <br> Group 2 <br> Group 3. |

Pable 2.2

Categorization According to the Research Methods Used in the Studies

| Area of Interest | General Studies |  | Bilingual <br> Science <br> Education | Hone Kong | Affective Factors | Row Sum |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{aligned} & \text { Pre } \\ & 1970 \end{aligned}$ | $\begin{aligned} & \text { Fost } \\ & 1970 \end{aligned}$ |  |  |  |  |
| Method of Stucy: |  |  |  |  |  |  |
| Survey (S) |  | 0 | 0 | 6 | 1 | 9 |
| Post hoc comparison (PH) |  | 0 | 1 | 1 | 2 | 7 |
| $\begin{aligned} & \text { Experimen- } \\ & \text { tal (E) } \end{aligned}$ | 4 | 9 | 6 | 3 | 0 | 22 |
| Column Sum | 18 |  | -7 | 10 | 3 | 38 |

Table 2.3
Categorization According to the Effects of the Studies

| Area of Interest | GeneralStudiesPre19701970 |  | Bilingual Science Education | Hong Kong | Row Sum |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Effects: |  |  |  |  |  |
| ```Using the second language as the medium of instruction is not detrimental (S+)``` | 1 | 5 | 0 | 1 | 7 |
| Using the second language as the chief medium of instruction and with the first language for explanation is not detrimental ( $\mathrm{B}+$ ) | 1 | 1 | 1 | 1 | 4 |
| Using the second language as the medium of instruction is detrimental (S-) | 5 | 2 | 3 | 8 | 18 |
| Inconclusive (I) | 2 | 1 | 3 | 0 | 6 |

Table 2.4
Recategorization According to the Effects of the Studies

|  | Developed | Immigrant | Developing |
| :--- | :---: | :---: | :---: |
| S+ | 4 | 0 | 3 |
| B+ | 1 | 2 | 1 |
| I- | 1 | 3 | 13 |

Table 2.5
Categorization According to the Levels of Samples Used in the Studies

| Area of Interest | General <br> Studies | Bilingual <br> Science <br> Education | Hong <br> KonE | Affective <br> Factors | Row <br> Sum |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Level of Sample |  |  |  |  |  |
| College (C) | 1 | 1 | 3 | 1 | 6 |
| Senior High (SH) | 1 | 0 | 2 | 1 | 4 |
| Junior High (JH) | 3 | 2 | 4 | 1 | 10 |
| Primary or (P) <br> Preschool (P) | 13 | 4 | 1 | 0 | 18 |
| Not specified | 4 | 0 | 0 | 0 | 4 |


| Name | Number of Items | Highest Score | mean Score | Iowest Score | Standerd Deviation | Number of Individuals | $\boldsymbol{R e l i a b i l i t y ~}_{(\text {Hoyt })}$ | $\begin{aligned} & \text { Mest (Min.) } \\ & \text { Duration } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Pretest | 40 | 17 | 7.48 | 1 | 3.32 | 176 | . 50 | 30 |
| Posttest 1 | 39 | 30 | 17.45 | 3 | 4.94 | 176 | . 69 | 60 |
| Posttest 2 | 25 | 22 | 14.42 | 5 | 3.52 | 176 | . 60 | 35 |
| Retest | 30 | 29 | 20.34 | 8 | 5.05 | 174 | . 79 | 40 |
| Test in Mechanics | 41 | 34 | 20.51 | 9 | 5.81 | 86 | . 75 | 60 |
| Test in <br> Atomic <br> Fhysics | 35 | 32 | 23.15 | 11 | 4.69 | 85 | . 74 | 35 |
| Iistening Comprehension | 50 | 37 | 21.08 | 9 | 7.71 | 171 | . 84 | 40 |
| English Structure | 40 | 33 | 19.75 | 6 | 6.89 | 174 | . 85 | 20 |
| Vocabulary | 40 | 25 | 14.19 | 6 | 4.27 | 174 | . 61 | 15 |
| Feading Comprehension | 31 | 23 | 13.16 | 5 | 4.81 | 171 | .76 | 40 |
| Writing ability | 40 | 32 | 16.66 | 6 | 6.61 | 173 | . 82 | 25 |
| English <br> Proficiency <br> Test Battery | 201 | 138 | 84.84 | 32 | 25.83 | 174 | . 94 | 140 |

Table 3.1. Statistics on the Achievement Tests.

| Name | $\begin{aligned} & \text { io. of } \\ & \text { Items } \end{aligned}$ | $\begin{aligned} & \text { Total } \\ & \text { Score } \end{aligned}$ | $\begin{array}{r} \text { Highes } \\ \text { Score } \end{array}$ | Mean Score | Lowest Score | $\begin{aligned} & \text { Zero } \\ & \text { Foint } \end{aligned}$ | Standard Deviation | $\begin{aligned} & \text { Relia- } \\ & \text { bility } \\ & \text { (Hoyt } \end{aligned}$ | Items deleted in analysis | Meaning of High Score |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Attitude toward English Speaker (ATES) | 31 | 186 | 139 | 99.06 | 56 | 31 | 16.22 | . 89 | Nil | Like |
| Desire to Iearn English (DLE) | 6 | 23 | 23 | 15.6 | 9 | 6 | 2.76 | . 46 | 4, 7 | Desire <br> to Learn |
| Attitude Toward Foreign Language (ATFL) | 7 | 35 | 24 | 15.4 | 9 | 7 | 2.57 | . 39 | Nil | Dislike |
| Study Habit in English | 24 | 120 | 104 | 78.62 | 55 | 24 | 9.9 | . 76 | Nil | Good Habit |
| Reading Habit (RH) Attitude to Iife | 5 | 15 | 14 | 7.15 | 4 | 3 | 1.9 | . 65 | 1 | Read more English |
| in Fong Kong (ALHKP | P 10 | 70 | 63 | 37.84 | 20 | 10 | 7.68 | . 76 | Nil | Disslike |
| Authoritarianism (AU) | 13 | 78 | 72 | 53.01 | 20 | 13 | 7.93 | . 71 | Nil | Authoritative |
| Ethnocentrism (ETrip | 5 | 30 | 30 | 18.22 | 5 | 5 | 3.81 | . 45 | 4 | Ethnocentric |
| Cultural Allegiance (CA) | 11 | 66 | 56 | 38.29 | 20 | 11 | 7.09 | . 69 | 8 | Conservative |
| Anomie (ANO) | 8 | 48 | 44 | 27.13 | 13 | 8 | 6.44 | . 60 | 2, 7, 11 | Dislike Hong Kong |
| Fating of English Skills (RES) | 9 | 36 | 27 | 14.86 | 9 | 9 | 3.18 | . 78 | Nil | $\begin{aligned} & \text { Good } \\ & \text { English } \end{aligned}$ |
| Self Concept of Ability (SCAB) | 23 | 115 | 93 | 70.26 | $37^{1}$ | 23 | 10.54 | . 92 | Nil | $\begin{aligned} & \text { Poor } \\ & \text { Ability } \end{aligned}$ |
| $\begin{aligned} & \text { Teaching Per- } \\ & \text { formance (TP) } \end{aligned}$ | 22 | 154 | 128 | 91.6 | 51 | 22 | 14.1 | . 75 | Nil | Good Teaching |


| Name | No. of Items | Total Score | Highest Score | Mean Score | $\left\lvert\, \begin{aligned} & \text { Lowest } \\ & \text { Score }\end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { Zero } \\ & \text { Foint }\end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { Standard } \\ & \text { Deviation }\end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { Relia- } \\ & \text { bility } \\ & \text { (Hoyt) } \end{aligned}\right.$ | Items deleted in analysis | Meaning <br> of High <br> Score |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SES | 11 | 33 | 33 | 26.77 | 15 | 9 | 2.96 | . 56 | Nil | Low |
| Motivation in <br> Fhysics (MIF) | 7 | 21 | 21 | 13.93 | 7 | 7 | 2.37 | . 64 | Nil | High Motivation |
| Desire to Learn Physics (DLP) | 10 | 39 | 36 | 26.05 | 15 | 10 | 3.95 | . 59 | 7 | Desire to Learn |
| Study Habit <br> in Physics (SHP) | 22 | 110 | 97 | 69.41 | 43 | 22 | 8.94 | . 67 | 5,20,21 | Good Habit |
| Students' Knowledge of English (SKE) | 13 | 65 | 40 | 25.96 | 15 | 13 | 5.18 | .67 | Nil. | Goód English |
| Farents' Knowledge of English (PKE) | 7 | 28 | 24 | 8.5 | 7 | 7 | 2.54 | . 84 | Nil | Good <br> English |
| Orientation tovard Bnglish (OTE) | 7 | 49 | 43 | 32.15 | 20 | 7 | 4.37 | . 49 | 8 | Like English |
| Attitude to English as a medium of instruction (ABMI) | 9 | 63 | 63 | 32.41 | 13 | 9 | . 8.53 | . 86 | Nil | Dislike |
| Motivation in English (MIE) | 7 | 21 | 20 | 13.28 | 7 | 7 | 2.85 | . 58 | Nil | Highly motivate |
| Parental Encouragenent (PE) | 6 | 42 | 29 | 15.93 | $\sigma$ | 6 | 4.17 | . 58 | Nil | Discourage |
| $\begin{array}{r} 2 \mathrm{O}_{\text {Zero }} \text { poin } \\ \text { opposite to full } \end{array}$ | $t$ means score. | the | west po Table | ssible <br> 3.2 (con | score <br> ontinue | one can <br> d) | get in | e scal | - This | just |


| Background Variables |  | School |  |
| :---: | :---: | :---: | :---: |
|  |  | AngloChinese | Chinese |
| 1) Age (years)* | Average | 15.3 | 16.7 |
|  | Standard deviation | 0.8 | 1.1 |
| 2) $\operatorname{Sex}$ | Male (N) | 66 | 79 |
|  | Female (N) | 20 | 11 |
| 3) Place of. Birth | Hong Kong (N) | 82 | 85 |
|  | Other places (N) | 4. | 5 |
| 4) Dialect Spoken at Home | Cantonese (IV) Others (N) | 83 3 | $\begin{array}{r} 82 \\ 8 \end{array}$ |
| 5) SES | Average | 26.86 | 26.68 |
|  | Standard deviation | 2.53 | 3.33 |
| 6) Choice of School* | Their own choice (N) | 47 | 1 |
|  | Not their choice ( $N$ ) | 38 | 40 |
| 7) S.S.E.E. Chinese* | Grade average | 2.95 | 4.30 |
|  | Standard deviation | 1.01 | 1.06 |
| 8) S.S.E.E. English* | Grade average | 2.91 | 4.85 |
|  | Standard deviation | 0.97 | 1.35 |
| 9) S.S.E.E. Mathematics* | Grade average | 2.54 | 4.10 |
|  | Standard deviation | 0.78 | 1.28 |

Table 4.1 Distribution of Subjects (or Subject Scores) on 9 Different Background Variables of the CS and ACS.

* The difference of the two groups was statistically significant at the . 001 level.

|  | Anglo-Chinese <br> School | Chinese <br> School |
| :--- | :---: | :---: |
| Mean Score | 1.18 | 2.54 |
| Standard Deviation | 2.65 | 3.53 |
| Number of Subjects | 86 | 90 |

Table 4.2 Comparison of Pretest Fiesults.

| Components <br> of Aptitude <br> (Dependent Variable <br> for MANoVA Study) | Anglo-Chinese <br> School | Chinese School |  |
| :--- | :--- | :--- | :--- |
|  | Standard <br> Mean | Standard <br> Mathematical Reasoning (MR) | 32.0 |
| Mean Deviation |  |  |  |

Table 4.3 Comparison of Aptitude Test Results of the Two Schools.

| Dependent Variable | Scaled Weights |
| :--- | :---: |
| English Verbal Reasoning | 46.12 |
| English Language Usage | 25.07 |
| Mathematical Reasoning | 24.52 |
| Spatial Reasoning | -21.33 |
| Mechanical Reasoning | 17.35 |
| Chinese Language Usage | -10.57 |
| Chinese Verbal Reasoning | -5.47 |
| Abstract Reasoning | -1.21 |

Table 4.4 Vector of Scaled Weights for the Variables in the Discriminant Function.

| Source of Variation | df | Sum of Squares | Sum of Squares (due to reg.) | Sum of Squares (about reg.) | $\begin{gathered} \mathrm{df} \\ \text { (adjusted) } \end{gathered}$ | $\begin{gathered} \text { Mean } \\ \text { Square } \\ \text { (adjusted) } \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Ireatment | 1 | 487.89 |  |  |  |  |
| Error | 173 | 2971.39 | 492.07 | 2479.31 | 165 | 15.03 |
| Total | 174 | 3459.28 | 959.92 | 2499.35 | 166 |  |
| Difference for Testing |  |  |  |  |  |  |
| Adjusted Treatment Means |  |  |  | 20.04 | 1 | 20.04 |

$F=1.33$

Table 4.5 ANCOVA Table of the Two Schools.

| Ireatment | Means | Adjusted Means | S.E. (Adjusted Means) |
| :--- | :--- | :---: | :---: |
| Anglo-Chinese School | 17.42 | 14.91 | 0.76 |
| Chinese School | 14.08 | 16.51 | 0.74 |

Table 4.6. Means before and after Adjustment for the Two Schools.

| Variables |  | $\operatorname{ACS}(\mathbb{N}=56)$ | $\operatorname{CS}(\mathbb{N}=90)$ | t |
| :---: | :---: | :---: | :---: | :---: |
| 1) MIP | \# | 14.14 | 13.72 | - 0.97 |
|  | S | 3.01 | 2.72 |  |
| 2) $D \sim P$ | X | 25.59 | 26.59 | 1.57 |
|  | S | 4.49 | 3.31 |  |
| 3) SHP | $\bar{X}$ | 68.22 | 70.56 | . 1.75 |
|  | S | 8.93 | 8.85 |  |
| 4) TP | X | 91.00 | 92.17 | 0.55 |
|  | S | 15.20 | 13.03 |  |
| Critical value |  | $.975^{t} 120$ | 98 (two-t |  |

Table 4.7 Comparison of Variables affecting Physics Achievement.

| Name of Test | Anglo-Chinese School |  |  |  | Chinese School |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Mean |  | N | ```Standard Deviation of Raw Score``` | Mean |  | N | Standard Deviation of Raw Score |
|  | \% Score | $\begin{aligned} & \text { Raw } \\ & \text { Score } \end{aligned}$ |  |  | \% Score | Raw Score |  |  |
| Listening Comprehension | 54.44 | 27.22 | 86 | 4.88 | 32.34 | 16.17 | 85 | 3.46 |
| English Structure | 66.03 | 26.41 | 86 | 3.71 | 37.95 | 15.18 | 88 | 3.92 |
| Vocabulary | 42.98 | 17.19 | 86 | 2.94 | 28.85 | 11.54 | 88 | 2.93 |
| Reading Comprehension | 53.74 | 16.66 | 86 | 3.00 | 33.19 | 10.29 | 85 | 2.84 |
| $\begin{aligned} & \text { Writing } \\ & \text { Ability } \end{aligned}$ | 53.78 | 21.51 | 36 | 4.86 | 29.90 | 11.96 | 87 | 3.32 |
| the Whole Battery | 54.19 | 108.99 | 86 | 13.18 | 32.45 | 65.13 | 88 | 10.66 |

Table 4.8 Results on English Proficiency Tests.

| Variables |  | $\operatorname{ACS}(N=86)$ | CS ( $\mathrm{N}=90$ ) | t |
| :---: | :---: | :---: | :---: | :---: |
| 1) SKE | $\overline{\mathrm{X}}$ | 27.19 | 24.68 | 3.26* |
|  | S | 5.19 | 5.01 |  |
| 2) MIE | $\bar{X}$ | 12.92 | 13.63 | - 1.66 |
|  | S | 2.91 | 2.75 |  |
| 3). OTE | X | 31.97 | 32.33 | - 0.55 |
|  | S | 3.90 | 4.79 |  |
| 4) DIEP | $\overline{\mathrm{X}}$ | 15.71 | 15.49 | . 0.53 |
|  | S | 2.61 | 2.91 |  |
| 5) SHE | X | 78.77 | 78.48 | 0.19 |
|  | S | 9.33 | 10.47 |  |
| 6) PH | X | 7.5 | 6.82 | 2. $40 * *$ |
|  | S | 1.98 | 1.78 |  |
| * Significant at the 0.005 level <br> ** Significant at the 001 level |  |  |  |  |
|  |  |  | (two-tailed) |  |

Table 4.9 Comparison of Variables Affecting English Froficiency.

|  | df | Sum of Squares | Mean Square | F-ratio | p-value |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Regression | 6 | 798.6 | 13.3 .1 | 14.3 | .001 |
| Residual | 79 | 736.4 | 9.32 |  |  |
| Total | 85 | 1535.0 |  |  |  |

Table 4.10 ANOVA Table for the Multiple Regression Analysis of the Anglo-Chinese School Physics Achievement.

| Step No. | Predictor Variable | R | $\mathrm{R}^{2}(\%)$ | $\Delta R^{2}(\%)$ | F-ratio | p-value | Standard Error | Regression Coeff. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | English Structure | 0.42 | 17.75 | 17.75 | 18.13 | $<.001$ | 0.09 | 0.51 |
| 2 | Mechenical Reasoring | 0.58 | 33.99 | 16.24 | 20.41 | $<.001$ | 0.09 | 0.49 |
| 3 | Desire to Learn Physice | 0.65 | 42.41 | 8.42 | 11.99 | <. 001 | 0.08 | 0.20 |
| 4 | Self Concept of Ability | 0.68 | 45.61 | 3.20 | 4.76 | $<.05$ | 0.04 | -0.09 |
| 5 | Chinese Verbal Reasoning | 0.70 | 49.05 | 3.45 | 5.41 | $<.025$ | 0.09 | - 0.28 |
| 6 | Chinese Language Usage | 0.72 | 52.03 | 2.97 | 4.90 | $<.05$ | 0.09 | 0.19 |

Constant Term of the Regression Equation $=-7.16$

Table 4.11 Sumary Table of Stepwise Multiple Regression Analysis for the Physics Achievement of the Anglo-Chinese School as Criterion Variable.

|  | di | Sun of Squares | Mean Squares | F-ratio | p-value |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Regression | 4 | 5489.73 | 1372.43 | 11.99 | $<.001$ |
| Residual | 81 | 9275.14 | 114.51 |  |  |
| Total | 85 | 14764.87 |  |  |  |

Table 4.12 ANOVA Table for the Multiple Regression Analysis of the Anglo-Chinese School, English Proficiency as the Dependent Variable.

| Step No. | Predictor Variable | R | $\mathrm{R}^{2}(\%)$ | $\Delta R^{2}(\%)$ | F-ratio | p-value | Standard Error | Regression Coeff. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Self Concept of Academic Ability | 0.46 | 21.03 | 21.03 | 22.37 | $<.001$ | 0.12 | -0.37 |
| 2 | Chinese Language Usage | 0.54 | 28.62 | 7.59 | 8.83 | $<.005$ | 0.30 | 0.58 |
| 3 | Hotivationel Intensity in English | 0.58 | 33.85 | 5.24 | 6.49 | $<.025$ | 0.43 | 1.21 |
| 4 | Chinese Verbal Reasoning | 0.61 | 37.18 | 3.33 | 4.29 | $<.05$ | 0.32 | 0.65 |

Constant Term of Regression Equation $=71.57$

Table 4.13 Summary Table of Stepwise Wultiple Regression for the Anglo-Chinese Schools, English Proficiency as the Criterion Variable.

| Backeround Variables |  | Class 1 | Class 2 |
| :---: | :---: | :---: | :---: |
| 1) Age (years)* | Average <br> Standard deviation | $\begin{array}{r} 15.49 \\ 0.61 \end{array}$ | $\begin{array}{r} 15.21 \\ 0.68 \end{array}$ |
| 2) $\operatorname{Sex}$ | $\begin{aligned} & \text { Male (N) } \\ & \text { Temale (N) } \end{aligned}$ | 35 8 | 31 12 |
| 3) Place of Birth | Hong Kong (N) <br> Other places (N) | $\begin{array}{r} 40 \\ 3 \end{array}$ | $\begin{array}{r} 42 \\ 1 \end{array}$ |
| 4) Dialect Spoken at Home | Cantonese ( N ) Others (N) | 43 0 | $\begin{array}{r} 41 \\ 2 \end{array}$ |
| 5) SES | Average <br> Standard deviation | $\begin{array}{r} 26.93 \\ 2.61 \end{array}$ | $\begin{array}{r} 26.79 \\ 2.48 \end{array}$ |
| 6) Choice of School | Their own choice (N) <br> Not their choice (iv) | 23 19 | $\begin{aligned} & 24 \\ & 18 \end{aligned}$ |
| 7) S.S.E.E. Chinese | Grade average Standard deviation | 3.02 1.06 | 2.88 0.96 |
| 8) S. S. E. E. English | Grade average <br> Standard deviation | 3.09 1.07 | $\begin{aligned} & 2.71 \\ & 0.83 \end{aligned}$ |
| 9) S.S. T. E. Mathematics | Grade average <br> Standard deviation | $\begin{aligned} & 2.67 \\ & 0.81 \end{aligned}$ | $\begin{aligned} & 2.45 \\ & 0.80 \end{aligned}$ |

Table 4.14 Distribution of Subjects on 9 Different Background Variables of the Two Classes.

* The difference of the two classes was statistically significant at the 0.05 level.

| ```Components of Aptitude (Dependent Variable for MANOVA Study)``` | Class 1 |  | Class 2 |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Mean | Standard Deviation | Mean | Standard <br> Deviation |
| Mathematical Feasoning | 32.23 | 3.56 | 31.86 | 3.88 |
| Abstract Reasoning | 31.95 | 7.18 | 33.37 | 5.26 |
| Mechanical Reasoning | 34.26 | 3.65 | 33.07 | 3.96 |
| Spatial Reasoning | 31.19 | 5.95 | 31.05 | 5.28 |
| Chinese Verbal Reasoning | 40.49 | 4.50 | 40.16 | . 3.71 |
| Chinese Language Usage | 35.63 | 4.18 | 36.81 | 4.41 |
| English Language Usage | 37.58 | 4.79 | 39.42 | 5.33 |
| English Verbal Reasoning | 38.84 | 4.66 | 42.05 | 4.43 |

Table 4.15 Aptitude Tests Results of the Two Classes.

| Dependent Variable | Scaled Weight |
| :--- | :---: |
| English Verbal Reasoning | 28.61 |
| Chinese Verbal Reasoning | -15.68 |
| Mechanical Reasoning | -13.54 |
| Spatial Feasoning | -11.04 |
| Abstract Reasoning | 9.93 |
| Mathematical Reasoning | -9.47 |
| Chinese Language Usage | 8.93 |
| English Lenguage Usage | -1.89 |


| Source of Variation | df | Sum of Squares | Sum of Squares (due to reg.) | Sum of Squares (about reg.) | $\begin{gathered} \text { df } \\ \text { (adjusted) } \end{gathered}$ | Mean <br> Square <br> (adjusted) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Treatment | 1 | 40.48 |  |  |  |  |
| Error | 84 | 2680.98 | 753.41 | 1927.57 | 76 | 25.36 |
| Total | 85 | 2721.46 | 787.79 | 1933.67 | 77 |  |
| Difference for Testing Adjusted Treatment Means |  |  |  | 6.09 | $1{ }^{*}$ | 6.09 |
| $F=0.24$ |  |  |  |  |  |  |

Table 4.17 ANCOVA Table of the Two Classes Learning Mechanics.

| Treatment | Means | Adjusted Means | S.E. (Adjusted Means) |
| :--- | :---: | :---: | :---: |
| Bilingual Class | 19.84 | 20.23 | 0.81 |
| English Class | 21.21 | 20.82 | 0.81 |

Table 4.18 Means before and after Adjustment for the Two Classes Leaming Mechanics.

| Source of Variation | df | Sum of Squares | Sum of Squares (due to reg.) | Sum of Squares (About reg.) | $\left(\begin{array}{c} d f \\ \text { (adjusted }) \end{array}\right.$ | $\left\lvert\, \begin{gathered} \text { Mean } \\ \text { Squares } \\ \text { (adjusted) } \end{gathered}\right.$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Treatment | 1 | 35.17 |  |  |  |  |
| Error | 84 | 1295.59 | 370.26 | 925.32 | 76 | 12.18 |
| Total | 85 | 1330.76 | 376.62 | 954.14 | 77 |  |
| Difference for Testing Adjusted Treatment Means |  |  |  | 28.82 | 1 | 28.82 |
| $\mathrm{F}=2.37$ |  |  |  |  |  |  |

Table 4.19 ANCOVA Table of the Two Classes Learning Atomic Physics.

| Treatment | Means | Adjusted Means | S.F. (Adjusted Means) |
| :--- | :---: | :---: | :---: |
| English | 22.77 | 22.77 | 0.56 |
| Chinese | 24.05 | 24.05 | 0.56 |

Table 4.20 Means before and after Adjustment for the Two Classes Learning Atomic Physics.


Fig. 3.1 Schematic Chart of the Research Desien

Fig. 4.1 Aptitude Profile of the Two Schools


Fig. 4.2 Aptitude Profile of the Two Classes.


APPENDIX 1

THE PRETEST
to 86 Ming Kier $F .4$ standings
Lime: 30 minutes

A1. Whenever the centres of the sun, mon and earth are in a straight fie (in that order):
I. come part of the earth must be in the moon's umbra
II there is a total eclipse of the sun visible from somewhere on the cert
-III part of the earth is in the moon's penumbra
Which of the above statements.1s/are true?
A. I © orly
B. II my
(c. III only
D. I and. II only
E. Is II and III

A2. The effect of increasing the diameter of the pinhole in
the pinhole camera is
2ngintruss
of inge
A. increased
C. increased
sharper


of Ehifytes
(E) increased unchanged
B. reduced
Shartnis
stamper
shan
D. reduced blurred
blurred

A3. He can see the image of ourselves in the plane mirror but not on a plane sheet of white paper because
A. white paper absorbed all the light energy falling on It.
B. white paper is too rough to give regular reflection.
C. white paper transmitted nearly all the light falling on it.
D. the coefilciont of white paper is unknown.
E. the image formed in white paper is virtual.
A.


The rays $H$ and $K$ diverging from a point source $S$ are reflected from a plume mirror NM'. The reflected rays $X$ and $Y$ will now diverge at an angle of
A. $72^{\circ}$
(B. $15^{\circ}$
C. $30^{\circ}$
D. $40^{\circ}$
E. $75^{\circ}$

A5. Which of the following mirrors can give an image (real or virtual) of the same size as an object which is not in contact with the mirror?

A. I only
B. III only
C. I and II only
Fe Is II and III

A6. If an object is placed 20 cm from a convex mirror of focal
length 20 om , the image formed by the mirror will be
A. magnified.
B. mont and inverter.
(C. diminished and upright.
D. betwom the object and the mirror.
E. at infinity.

I17.
(i)

(iii)

The above diagrams sion a parallel beam of light entering from one noliun to another. Which of the bean will emerge as converging trays in the above 3 cases.
A. i only
C. iii only
E. $i$ and $i+i$

Cos es)

Bo ii only
(D. $i$ and ii

I move the mirror M further away from $S$
-II move the mirror M nearer to. S
III sep the source at $S$ and replace mirror $M$ by a suitably chosen concave mirror of shorter foscil length
A. I only
C. III oily
B. II only
E. II and III orly .

Rays from a point source at $S$ are reflected by a concave mirror $M$ and converge to a. point $F$ as show in the diagram above. If we wish to $12=$ obtain a parallel bean of light, after reflection we could

When a beam of monochromatic yellow light pass from air to class, there must be a change in the ...
i. speed e: which the light travels
ii directions $0=1$ oppagation of the light nave
iii frequency of the light wave
Cit
E. ii
C. iii

Do ii and iii
E. i, ii enc $\ddagger$ i

M10. Total internat. reflection cen occur at a surface of
separation between a cense medium $A$ and a rare medium $B$ on ny when

I the rat travels from towards $B$
II the male of incidence is greater then the critical augite
III the effractire index for light travelling from A to is is greater than 1
Which of the above sistements is/are correct?

1. I only
B.. II only;
C. I; II ml
D. II, III: only
E. I, II and III

H11.

A. res of light coming from point 0 in a clear liquid
approaches the surface, is shown by ray $O Q$ making an angle
with the normal which $\mathrm{i} s$ less than the critical angle.
After meeting the surface, the ray will continue along the
path or paths
i. $Q X$ only
B. QY only
c. $Q Z \mathrm{cmly}$
E. QY and QZ

Coat?
：12．
$\therefore$ black spot at X insicie a block of glass is observed from the point $Y$ ．Th inge $C i X$ appears to bo
$\therefore$ between $y$ and $3 . \quad$ B．between $Z$ and $X$ ．
$C$. at $X$ ．D between $X$ and $V$ ．
E．between V ain Y．
i．13．The angle of incidence of a ray of light on a liouid is $45^{\circ}$ and
 the Tigizil？
$\therefore \quad 15^{\circ}$
E． $30^{\circ}$

C． $1.5^{c}$
D． $60^{\circ}$
E． $75^{\circ}$
4.14.

$$
x_{1}: x_{2} ; x_{1}
$$



The fish in the above diagram will appear to the observer to be
I shorter than it actually is


II longer than it actually is
sphene doth IiI nearer to the observer
IV further array from the observer


B．III only
D．I and IV only
$\begin{array}{ll}\text { f．} & 1 \\ \text { C．} & 3 \\ \text { E．} & 5\end{array}$

The diagram shows e thin－ walled prism filled with ：ir． The air prism is immersed in water．$\therefore$ ray of light is incident along the line P？ dong wish line the diction of the light merges ．．．
6． 2
D． 4
 the eyミーriveer
A．Compound rico
B．prism monocular
C．Friar bizocuir
D．terrestrial telescope

817．in object is leos keture：a concave lens and its／focal point． Phat is the nature of the naze produced？
$\therefore$ Marizinuct，virtual and erect
B．Kagnixjan，in zee．ace inverted
C．Bimini hoc：res and inverted
D．Diminishec，rictal and érect
E．No ing：is prochuced of the arrangement

FOPM 4 PHYSICS TRST
1.18.


- 4 -


WHth a lens at x , a real, inverted and magnified image of the illurinated pir: is seen on the screen. When the lons is moved to position $Y$, in inage of the pin is scen again. This inage vill be
Gi real; invorted and diminished
B. real, invextud and magnified
C. real, cract and magnified
D. real, eruct and diminished
E. virtual, omect and magnificd


A parallel beam of rays after passing through a converging lens I converges to a point $F$. If the lens is non complotily surrounded by a clecir liquad. having the same rifroctive index as tine lens, you would/expect the bean to
L. converge to the point $X$.
B. convire; to tije point $F$ as before.
C. converge to the point $Y$.
D. emerge is a prizilel beam.
E. diverion froz the point $Z$.
:2.20.
A real image $I$ of an objoct is formed by a convex lens, Ircente at a distence of 25 cm from the lens. If a plane wirror incline at $45^{\circ}$ in the aris of the lens is placed at a distance of 15 cm from it, as shoint in the diesram above. What will be the nature and position of the fincl imergo formed.
(i. real, 10 ca balow the axis of the lens.
B. real, 15 ail balow the axis of the lens.
C. virtual, 15 cin below the axis of the lens.
D. virtual, 15 an above the axis of the lens.
E. virtull, 10 cm above the axis of the lens.

A21.


Tro parallal reys of light pass through a box containing a piece of glass and winige as shown.
(I) 1
(II)

(再)

(iv) I

Which of the rbove pieces of glass could produce this result?
A. I only
B. II only
C. III oilly
D. IV only

## Cont'd

122. Short-sight cen be T corrected by using a suitable concave lans.

## BEOAUSE the image secn through a-

 concave lens appears to bo closer than the object.| (A) True | True | (correct explanation) |  |  |
| :---: | :---: | :---: | :---: | :---: |
| B. true | True | (irrelevant or wrong explanation) |  |  |
| C. True | False | . | 23 | 2 |
| D. Falsc | Thue | . | 3 |  |
| E. False | False |  |  |  |

A23. The reason why a rainbow has several colours is that
(A) the refractive indices for colours in white light aro. not quite iduntical.

- B. all cir the colours in sunlight have the same refractive index.
C. the diffonut colours in sunlight heve travilled from the sum at che same velocity.
D. the different colours in sunlight have travcilid fron the sur at cifferent velocity.
E. the critics angle for different colours is alway the same, regercless of the colour.
n24. A red disc is placed on a green grass ground and is then
illuminated vicin coloured light given below, which could neke
the disc in-distinguishable from its background ...

| A. red | B. white | $1 \geq 2$ |
| :--- | :--- | :--- |
| C. green | D. blue |  |

425. Red and bluc filtars are placed directly in the wath of wite light. What is the colour of the light coming through?
A. magerit:

321
B. white
C. yellou:
D. grecr
W. black (no lizht pass through)
i26. Thich of the following will affect the velocity of sound in air?
I the frequancy of sound
II the lourness of sound
III the temperature of the air

| $\therefore . ~ I ~ o n l y$ | $B_{0}$ II only |
| :--- | :--- |
| C, III only | D. I, II and III |
| E. none of the above |  |

A27. Which of the following will occur at a displacenent node of the longitudinil rav: set up in an air colurm?

1. Maximum variation in pressure and maximam displacement of air perticlos
(B. Meximui varietion in pressure but no displacenent of air particles
C. Moderate variation in pressure and moderate displacement of air particles
D. No chenge jih pressure but maximum displacement of air perticles
E. No chencs in pressure and no change in displacement of the eir priticles.

The closed pipe ehow is 0.9 m long and contains a stationary cound wave rith nodes $N$ and antinodes $A$ at the position shown. The waxe langin of the sound is

322
d. 0.9 m
C. 0.45 m
E. 0.15 m
(B) 0.6 m
C. 0.45 m
D. 0.3 m
E. 0.15 m

Cont'd


The velocity of sound in air is $340 \mathrm{~m} / \mathrm{s}$. in electronic whistle, situated 34 m from a vertical wall, sounds sharply from $t=0 \mathrm{~S}$ co $t=0.4 \mathrm{~s}$ only. it sound recorder (which draws an empititude tine graph) is started at the same mordent as the phictlu. The grant obtained is:

130. A loudspocke is citing sound waves of frequency 500 Hz towards a solid $\quad$ ain. on moving a microphone between the louder aver and the man, it is furan then there are positions of moxinun loudness der nay speed intervals of 0.3 m . File can deduce from this th et ore ravirartis of the note is

1.31.
jet. $\overrightarrow{\sin }\left(\begin{array}{ll}0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0\end{array}\right)$
A. II rely
(c) I and ITO ma
.E. I, II and III

The abe diagram shows a disc siren; the mice: emitted by this disc rill depone on
I ins number of holes in the disc
II the distance of the holes from the Exile of the disc
II- h: minor of revolutions the disc us: 5 through per second

> Bo I and II only
> I. II and III only
 from loudspeaker X is jounce than that from loudspeaker Y. The sound waves frothed by $X$
i. have higher feegiore tiler the se by $Y$
B. have lo fore wavenugtin timon those by $Y$
C. have chortax warcingeh than those by $Y$
(1). have greater aptitude than those by Y.
E. travel fast it that those by $Y$
133. Thith respect to a sound nave,

I the pitch derends on frequency
II the quality cepericit on velocity
III the loudness depends cm amplitude
Which of the above statements is/are correct?
A. I oily b b. BI only
C. III only
(E. I End ITI ont:
D. I and II only $\quad 1=$
134. Anote sounded an a violin
in richer in harnonics than the same rote produced by a tuzing fork


A35. Whan the eir in a tube closed at one end and open at the other is made to vibrate, it has
A. an entinace at the closed and
B. an antinole exactly at the open end
C. meximus omplituce halfway along its length
D. the frequancy of any strongly vibrating tuning fork placed noar the open end
E, a node at the ciosed end
A36. The sound in air caused by the vibrating string must ...
$i$ have same frequency as the stationary wave
if have the same wavelength as the staticnary wave
1ii rlso be a stationary wave
ihich of the above statements is/are correct?
(1) 1
B. 2
B. 21
D. 1 and 2 only
437. Sound is produced by pouring water into a resoance tube alosed at one wa. is the tube fills, it is found that

I til: volocity of the sound produced remains constant
II the mioch of the sound produced becomes lover and love:
, III the pitch of the sound produced becomes higher and hicher
A. I only
B. II only
C. III only
D. I and II only
E. I and YiI only

A38. A sononetor wire mits a note of frequency 300 Hz then under a tenaion of 2 kgf . If the tension is increased to 3 kgf and the length is kepi constiant, the frequency of the note becomes
A. 75 Hz
B. 150 Hz
(C. $\quad 600 \mathrm{~Hz}$
D. 1200 Hz .

A39. An open tube i has a diameter twice than that of nother open tube $B$, but the furdacrilai length of $A$ is only helf of $B$. Noglucting the and coriection, frequency of the sound emitted by $A$ will be ...
A. 4 times then emitted by $B$. Bi. 2 times than emitted by $B$, C. same os L .

A 40. - hall of that emtted by $B$. D. a quarter of that emitted by $B$. Tumentif As in the figure, the colurm of air in the five glass tube is resonating with vibreting tuning fork of unknow frequency. If the leval is gradually reduced by a distance 1 mitre, resonance occurs again. From the above results only, which of the following can be determined?

1 frequance of the sound emitted by fork
if wavelcasth of the scund emitted by fork
iii velocity of sound in water
A. $i$ only
C. iil only
E. 8
(B. ii only
D. $i$ and ii only

## APPENDIX 2

| Analysis of content | Recall Comprehension Application Subtotal |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Reflection by a plane surface | 1 | 2 | 1 | 4 |
| Reflection by a curved surface | 1 | 2 | 0 | 3 |
| Refraction by a plane surface | 1 | 5 | 1 | 7 |
| Lens and optical instrument | 2 | 3 | 3 | 8 |
| Dispersion and color | 0 | 3 | 0 | 3 |
| Propagation of sound | 2 | 1 | 2 | 5 |
| Quality og sound | 3 | 1 | 0 | 4 |
| Strings and resonance tube | 2 | 1 | 3 | 6 |
| Subtotal | 12 | 18 | 10 | 40 |

Judges: Mr. C.C. Wong (B.Sc., Dip.Sys.An., Dip.Ed.)
Mr H.H. Wong (B.Sc., Dip.Ed.)
Mr. H.C. Au (B.Sc., Dip.Ed.)

## APPENDIX 3

CHINESE TRANSLATION OF THE PRETEST

中四物理測験古。
1．每清太楊，月球，地球依次同在—直線上持：
I。地球上某些地展必定位裕月球的本影医上
II．在地球上某些地愿可看到日全触的景像。
正，地球上某些地要位袹月球的半影匿上
問上述䄧些敘述正整。
A．只有 I
B．只有正
C只有亚
D．只有工及后。
K．I，II，正，仝部

像的亮度。
像的消晰度
A．增加
增加
道 减少
增加
C．增加
無教變
D．減少
城少
E．堦加
到身亡的形像是因萹……
A白铙收收所有落在它上面的光。

C．白䖻幾乎把全部该在它上面的光倩送出去。
D．白瓨的侁㩆是末知值。
无白施上的成像是虏像。

4



A． 7 竞＂
B． $15^{\circ}$
C． $30^{\circ}$
D． $40^{\circ}$
$E .75^{\circ}$
5．下到何省弇使实够座生一個大小根等的宾像或虚像，演实物恶不每踥面挼羯者。
I．平面镜
II．弪锶
IIII镜
A只有工
色：只有亚
C。只有工及正。
上。只有工及亚。
E．工，互及亚全部
 20 cm ，㔀其成像将會是
A．放大的像。
B．实像剧侅立。
C．緮小剧亚立。
下，位族無限遠虎
7.


光䋨。
A．只有工
B只有开 C 只有正
D 只有工叒正。
E．只有工㣻正。
下点上，如既産生平行的反射光䄉，别要。
I．把 M移難S

晋，固定S而把另和輆短焦墨之四镘取代M


A 只敬 I B 只有兵
D 只有工这正
E只有正及正。

I，光速 不光倠僬的方向。 亚，光的期準，
丹．只有工
B，只有正 C 只有正
D。只有 一 及亚 E，I，正及正。
賞。

III。光自A途入及，之折尉率大社1
上述何者正況遥。
今，只有工
B．只有正。
C．只有工及正
D只有百及亚
E．工政及正
11．耶晲点光源 0 之光䄉。
自一透的流体到涬液体

CG开法㧼成之灰用 $\theta$


A．只有口x

C．只有路
D．只有 $G \times$ 及 $Q Z$
E．QY及GZ
12.


义之形像位放
A．侮区之辟
B．区开入之間。
e．在 人上

及。光緌自空氯進入液体，入射角是 $45^{\circ}$ 。折射高是 $30^{\circ}$ 。

A． $15^{\circ}$
B． $30^{\circ}$


上最中之婫察者所看到的游惫
I．比实物满短 正，比実物滑焉。

丹 只有工。
B．只㕝亚
C，只有工及亚。
D 只有工及亚 而 只有亚及正。

内藏空绨，置答水中，間沿PG，
之光䋨会依都


一路㗽前進
A．（1）
B．（2）
C．
D．（4）F．（5）．
16．下列五種光掌儀器申，何者：選用四透镱，有其目踥？ A．裸式㬎微䯽。



E．你利略望遠鏡。
日放大，正立虚像。

B，放大，獬立实潒。

I．欲小 正立实像
无根本本可以成像
18



A．倒立，䋨小実螈。
巴，倒立，放大美像。
e，正立，谁大帘像。
D亚立，線小実像。
下。正立，放大虚像。
芣一同折射率之潅体包圈，則此光特会。
丹，斎聚就入点


D．平行出射

20.


一突哆的光透過分透鏡成一宴像工，像距镜 25 cm 。


f．成实像，在主蟿下 10 cm
B．盖宴像，在主輸下 15 cm 。

D 施虚箓。在主事由上 15 cm 。

21.




上述何者可座生蛼中的秙果？
力只有工。
B，只有正。
巳，只有亚。
D只有亚 定 亚或正。
察到的像較实梅痛近


己。前説正確，役説不正㴶。

巨雨説抣万亚不炎。
23．天衤有多種㘖色要理由是：
A：水点对自光中各危光的折射率不相等
B，水点对所有陽长中各色光区析射率相等
C．由太碭来貌经色光有相等的速度
D．由太陽来的各色光有办相等的速度

無法褋竬認出来？
A紅
B．白
C．綠 D 檠
E．品紅
顔色是


26．下到何者对空氧之策速有影明？
工声齐捁率
II．声之響度
III．空氣之温度
A只有工 是只有正 C 只有再
D．工，丘及亚。
无，非上浗之組合


B．有最大愿力变化及胱禾無位移。
C．中度歴力变化及中度顽子位般
D無痤力変化但鋉示有最大位移。
天，無壓力変化目基子無位移。
28． $\mathrm{ABA} A \mathrm{~A} \mathrm{~A}$ A
上圆之開管長 0.9 m ，形成—声波之馬主波，其中N优表核節之位買，A代表波腹之位置，求声波之被意。
A． 0.9 m ．
B． 0.6 m ．
C． 0.45 m
2． 0.3 m ．
E． 0.15 m ．
29.


䱚得声音振揊对時間的蘭你圆絨，黄由雷鼣器發声時





A． 0.3 m B． 0.6 m e．e． 0.66 m
D． 1.2 m ㅌ．不可㖕算

工盤中之引數




丹只存I
呑，只有工念亚。
E．I正及正
D只有开及正
皎个耑大，㥜义所座生之声浓
A．㧙Y座生者有襄高徏率
B比Y産生者有㫫長波長。
C，比乡産生者有轎短波长。
D比个屖生者有較大振煏。

33．对声波部责

II音品每声速有閣

上述何•者正維。
丹．只有 I
B 只有正
C只教亚。
D 只有工页互
天只有正及正。


 B，前媛説㘬正確，但统渚非合理解䕩。

D．前説不正確锾説正砤。
E．雨者㘬本亚摧，
丹．開管的一端是波腹所在，

C．管中部有最大振幍。
D．有强力的任何頻率的善义在管口振動。

工，必开弱屁主波频率相同。


A只有工
B只有开。
C．只有应。
D，只有工及正 E全部，
工管所發声波速度不度。
II．管所發声波頻率漸低。
亚，管所彭声波期率渐高，
丹只有工。B只有正。 C只有亚。
D，只有工及正 只只有工及所。


f． 75 Hz
B． 150 Hz 。
C .600 Hz
D． 1200 Hz
E． 4800 Hz ．



40.

值。皆水位上种 1 m 又有只㮩现象靕生，下列那些物理量可由此結果傕定之。
I商义之频率。
正此声没之波长 湿 水中之声虺。
丹，只有工 B．只有五。
C．只有而。
D．只有工及卫。 玉全部

## APPENDIX 4

| Date | Period | Content | Page |  |
| :---: | :---: | :---: | :---: | :---: |
| 4/9 | 0 | Pretest on light and sound. |  |  |
| 6/9 | 1 | Rays and beams of light, the pinhole camera. | P.239-240 | Ch. 21 |
| 8/9 | 2,3 | Shadows, eclipses, the nature of light, reflection of light, laws of reflection, experiment to verify the law of reflection. | P. $241-243$ |  |
| 12/9 | 4 | Parallax, to locate images by noparallax, looking into a plane mirror, how the eye sees an image in a plane mirror. | P. $244-245$ |  |
| 14/9 | 5,6 | Images formed in two mirrors inclined at $90^{\circ}$, kaleidoscope, experiments to study image formed in a plane mirror and images formed in two mirrors. | P. 246 |  |
| 19/9 | 7.8 | Parallel mirrors, the periscope, pepper's ghost, diffuse reflection, experiment to study rotation of reflected ray. | P. $247-248$ |  |
| 21/9 | 9 | Further explanation on how the eye can see an image, discussion of exercise. | P. 249 |  |
| 25/9 | 10,11 | Principal focus, mirrors of large aperture, the focal length of a spherical mirror, construction of ray diagrams, image formed by a concave mirror. | P. $250-253$ | Ch. 22 |
| 27/9 | 12,13 | Parallel beam from curved mirrors, the reflecting telescope, experiment to measure the focal length of a concave mirror. | P. 254 -255 |  |
| 29/9 | 14 | Images formed by a convex mirror, accurate construction of ray diagrams, worked example, prove of mirror formula $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$. | P.256-258 |  |


| Date | Period: | Content | Page |
| :---: | :---: | :---: | :---: |
| 3/10 | 15,16 | Magnification formula, mirror formula, sign convention, worked examples, discussion of exercise. | P. 259 -263 |
| 5/10 | 17,18 | The law of refration, to verify Sinell's law of refraction, refractive index, geometrical construction for refracted ray, some effects of refraction, the principle of reversibility of light, real and apparent depths, refractive index related to reai and apparent depth, experiment to measure refractive index by the real arid apparent depth method. | P.264-269 |
| 9/10 | 19 | Total internal reflection, critical angle, relation between critical angle and refractive index, the fish's eye view. | P.270-271 |
| 12/10 | 20,21 | Test on Ch. 21 and 22 |  |
| 17/10 | 22,23 | Discussion of test, experiment to measure the critical angle and refractive index of a prism. | P. 271 |
| 23/10 | 24 | Proof of apparent and real depth formula, multiple images formed by a thick glass mirror, total internal reflection in prisms, mirage. | P.272-273 |
| 25/10 | 25,26 | To study the deviation of light by a prism, discussion of exercise 23. | P. 274 -276 |
| 27/10 | 27,28 | Technical terms, lenses compared with prisms, optical centre of lens, focal length, a lens has two principal foci, construction of ray diagrams, formation of images by a converging lens, images formed by a diverging lens, solution of problems by graphical construction. | P.277-281 |


| Date | Period. | Content | Page |
| :---: | :---: | :---: | :---: |
| 31/10 | 29 | Experiment to measure the focal length | P. 282-284 |
| 2/11 | 30,31 | Magnification, lens formula projector, camera, eye. | P.285-286 |
| 6/11 | 32,33 | Defects of vision and their correction, compound microscope, angular magnitude and apparent size, astronomical telescope, sign conventions, worked examples. | P.287-290 |
| 8/11 | 34 | Discussion of exercise 24. | P.291-293 |
| 15, 11 | 35,36 | Newton's experiment with a prism, improvement on Nevton's original experiment, production of a pure spectrum, spectrometer, recombination of the colours of the spectrum, colour of objects in white light, rainbow. | P. $294-297$ |
| 14/11 | 37,38 | Test on Ch. 23 and 24. |  |
| 16/11 | 39 | Discussion of test. |  |
| 20/11 | 40,41 | Light filters, appearance of coloured objects in coloured light, primary and secondary colours, mixture of coloured lights, mixing coloured piements, infrared and ultraviolet light. | P.297-300 |
| 22/11 | 42,43 | Sound produced by vibration, sound waves require a material medium, sound can travel through solids, velocity of sound in water, velocity of sound in air. | P.329-330 |
| 27/11 | 44 | Factors which affect the velocity of sound in air, sound waves, Crova's disc, an experiment on the refection of sound, echoes. | P. $331-334$ |


| Date | Period | Content | Page |  |
| :---: | :---: | :---: | :---: | :---: |
| 29/11 | 45 | Echelon echo, accoustics of buildings, anechoic and sound prove rooms, to measure the velocity of sound by an echo method echo sounding, clinical and industrial application of ultrasound, radar. | P.335-339 |  |
| 30/11 | 46 | Pitch and frequency, music and noise, musical seales, musical intervals, problem of turning a keyboard instrument. | P. $340-342$ | Ch. 28 |
| 1/12 | 47,48 | To measure the frequency of a tuning fork, intensity and loudness of sound, quality or timbre of a musical note, beats, discussion of exercise. | P. $343-346$ |  |
| 4/12 | 49 | Stationary waves, sonometer. | P.347-348 | Ch. 29 |
| 7/12 | 50,51 | Overtones in a vibrating string, stringed instrument, methods of tuning a sonometer to a tuning fork, other factors which affect the frequency of a vibrating string, forced vibrations, resonance, resonance tube, relation between length of air column and wavelength, stationary wave in a resonance tube, resonance in open tubes, organ pipes, expeximents on sonometer and resonance tube. | P.349-355 |  |
| 11/12 | 52,53 | Pest-test on light and sound. |  |  |

Text: A. F. Abbott, Ordinary Level Physics (2 ed.), Heinemann, 1969.

APPENDIX 5

TEACHING MATERIAL IN OPTICS
F. 4 Physics Examples I

1. It thin converging lens of focal length 4 cm forms a real foe twice as lerec as the object. Calculate the distance of tho object from the lens and drew a ray diagram to scale showing how the image is formed.
2. A small object is viewed through a diverging lens (concave lens) held closed to the eye. An image $1.5 \mathrm{~cm} l \mathrm{cng}$ is formed 25 cm from the lens whose focal length is 40 cm . Find the position of the object and its size.
3. $\angle S C$ is a triangular prism, made of glass of refractive index 1.5 , in which the angle 4 is $30^{\circ}$ and the prole $B$ is $60^{\circ}$. A ray of light is incident on the face $A B$ with an entitle of incidence $30^{\circ}$ as the diecran shown. Cacilate the anole of emergence and the angle of deviation.

4) A glass cutie of liengtri 15 cm cm . each side has a small lubible made it If observe this table on on s face, the apparent depth is 6 cm . If observe it on the opposite face, the apparent depth is 4 cm . Find the distance letweov the inutile and the fist face gand the refractive, index of glass also
5). Copy the following table on the ensuing sheet, fie l in suitable words

F. 4 Physics Answer I
5) Lat object diana be $u$, making wee of the coal is $v=+2 u . f=4 \mathrm{~cm}$ Suractitite m leno formula

$\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$, $\frac{1}{u}+\frac{1}{2 u}=\frac{1}{4} \Rightarrow u=6 \mathrm{~cm}$ \& $v=12 \mathrm{~cm}$
Answer: ofject a mage are on opposite side of the lems, and the ofject is 6 cm from the lems
e) Let rifyect distance be 4 , making woe of the Real is Positive convention, them $v=-25 \mathrm{~cm}$ (virtual). $f=-40 \mathrm{~cm}$
From leno formula $\quad \frac{1}{u}+\frac{1}{-25}=\frac{1}{-40} \quad \therefore u=66.7 \mathrm{~cm}$
Let the height of object be $x$, as $\frac{\text { sine of eager }}{\text { sing of eject }}=\left|\frac{2}{4}\right|$, $\frac{1.5}{x}=\left|\frac{-25}{6.7}\right| \Rightarrow x=4 \infty$
 a height of 4 cm
6) The diagram shows hows the light roy pase through the prom. Making wee of the law of refraction

$$
\frac{\sin 30^{\circ}}{\sin x}=\frac{1.5}{1} \Rightarrow x=19.5^{\circ}
$$

$$
\begin{aligned}
& y=A-x=3 J^{\circ}-19.5^{\circ}=10.5^{\circ} \\
& \frac{\operatorname{an} 1 C .5^{\circ}}{\text { sm } r}=\frac{1}{1.5} \Rightarrow r=159^{\circ} \\
& \text { Angle of duration } \alpha=(30-x)+(r-y)=15.9^{\prime}
\end{aligned}
$$


). Set the hubble be a disturcei $x$ awry from face $A B$. Making us

Let the refractive index of gross ter $n$. Then
$\frac{x}{6}=\frac{n}{1} \quad \therefore \quad$ (1)
when the Rosersen cos ot the ensile tinnough force $D C$. then


$$
\frac{15-x}{4}=\frac{11}{1}
$$

Siring (1) $2(1) \quad \frac{x}{6}=\frac{15-x}{4} \Rightarrow x=9 ; \frac{4}{6}=n \Rightarrow n=1.5$
i)


## FORM 4

 PHYSICS TEST1. A thin oonverging lens of focal length 5 cm forms a virtual image twice as large os the object. Calculate the distance of the object from the lens and draw a ray diagram to scalo showing how the fimage is formed.
2. A small object is viewed through a diverging lens (ooncave lens) held closed to the eye. An image 2 cm long is formed 30 cm from the lens whose focal length is 40 cm . Find the position of the object and its size。
3. $A B C$ is a triancular prism made of glass of refractive index $2 \times 2$ whion the angle $\Lambda$ is $50^{\circ}$. A ray of light is inoident on the face as shown. Colorilate the angle of emergence and the angle of deviation of light.

4. There is a portiole insido a rectangular transparent blocko The apparent depth of the particle is 8 cm if viewed on the side AB. The apparent dopth is 6 cm if viewed on the side $C D$ o Find the refractive index of the block and the distance $X$ shown in the diagram。

5. a) State the reason of long sight and the method of correction.
b) Write down the structural differences and similarities between the aje and the camera.
F.4. Envicie Example II.
1). Iuve plane mirors making $45^{\circ}$ wth ench other are Shown in the diagram A point soure of light 6 placed betweem the turo murions. Following the scabe shown in the duagram, construct roy dagatums To show how light is furst regesected by mestor 18
 thin muntor 2 to form an unage. Find the position of the unage alus (Juro reyp are repuried.)
2) A concave messor of sadius of curvatme 40 cm formo asharply focused image of a small offect on a screen placeri at a distance of focm from the missor. Palculste (a) the position of the ofject ( $\sigma$ ) the magnification.
3) An bbjectio placed on and perpendecular to the aixs of a convex minsor of focal langth 8 cm . Whe ofy. is at a distance of $\mathrm{O}_{5}$ con away from the missior. Find. by accurate diauring the plocicoi of the imaqe and ito rature.
[ SOLUTION.

4) Let ofject distame be $U$, Guvin $v=80 \mathrm{~cm} . R=40 \mathrm{~cm}$ $f=20 \mathrm{~cm}$
Uaing the moter formula, Peal is Pocentive convention.

$$
\begin{aligned}
& \frac{1}{u}+\frac{1}{v}=\frac{1}{\xi} \Rightarrow \frac{1}{u}+\frac{1}{6} \cdot \frac{1}{2 E} \\
& u=26.7 \mathrm{~cm}
\end{aligned}
$$

maginficiaton $\left.m=\frac{|v|}{|n|} \right\rvert\,=\frac{80}{4.1}$

$$
=3
$$

Anewer: The oifect in placed 26.7 m in front of the concave mavior, maguification is 3.


Avsures: The inige formeds 3.20 m , behind the munver A critual. asect diminitied unvoge: (aherinencial answer may tioffor 2. $x x^{2} d$ ?
F. 4 optics test 1

1. A small object is placed on the pinnies axis of a convex miner of fecal lengfir 10 cm and the ofgect 1.5 cm from the morion. Ind dy caicivitation, the pesithin and nature of the unaye.
2) A concave spherical mirror of radius of curvature 20 cm forms ar n erect inge 40 an form the mustor. Jud the position and size of the ofject and show with a scaled diagram how the unage is formed.
3). man is standing in a room of area $6 \times 6$ m, height 3 m . The doagiom shown is a cross section of the ram. A large Pane mirier $P Q$ of height 1.2 m is hanged on the muddles of was CD. If the observer wants to sacs. the whore image of wail $A B$ in the muir $P Q$, find the purthat position of the observer from the muir (ie. find $x e^{2} y$ in the chagham)

4). An optical pin of length. 1C an is planed, in front of a compere muter of goral length 20 am . Find the position of the winger. of the optical pion is placed such that it hies on the principal axis with its head of dudes. $\overline{50} \mathrm{~cm}$ distance from the mirror i is $t_{0} i l$ is 10 cm further away from the misti, Find the length of the image. (Note: not the height of the wings!)
3) As shower in the diagram, $P Q, Q B$ are two plane minions placed perpendicular to each other with $Q B$ lying $30^{\circ}$ with the horizon. Pole $A B$ of levigth 2 in is placed pependeciever to the horizon. Draw r this chagiam, on your answer shat with exact scale: Construct a ray diagram o to show how the light from $A B$ word erected from $Q B$, then $P Q$ to form un unage. Fid
 the proition of the unage also.

## APPENDIX 6

THE QUESTIONNAIRE

Questionnaire No.

Name $\qquad$ Class $\qquad$

Date $\qquad$

Instruction: The following is a list of questions which is aimed to find out your background and opinion on certain ideas.; This is not a test. There are no right or wrong answers since people have different background and opinions. Your answers will be kept confidential and will strictly be used in research only. It will not have any slight effect or influence on you, so please try to be as accurate as possible.

Section A. Please answer the following questions:

1. What is your age
2. Where do you live? (which district)
3. Which dialect do you speak at home?
4. Where were you born?
5. When did you come to Hong Kong?
6. What is your father's occupation?
7. What kind of career would you like to pursue in the future?
8. Do you remember your secondary school entrance examination result? Please fill in the grades if you remember:
(a) Chinese $\qquad$
(b) English $\qquad$
(c) Mathematics $\qquad$
(d) Overall $\qquad$
9. Was the present school you are studying among the first three choice of your secondary school entrance examination?

Yes $\qquad$
No $\qquad$
10. How does your total family income compare with others?
(a) poor
(b) below average
(c) average
(d). above average
(e) rich
11. Indicate which of the following items you have in your house:
a) refrigerator
b) telephone
c) car
d) bathtub
e) piano
f) washing machine
g) colour television
h) radio-phonograph combination
i) air conditioner
12. Does your family have servants?
a) yes
b) no
13. Have you ever had a private tutor?
a) yes
b) no
14. Do you have your own bedroom at home?
a) yes
b) no
15. Do members of your family occasionally leave Hong Kong for vacation (excluding trip to Macau or the Kwangtung province)?
a) yes
b) no
16. Did your mother go to high school?
a) yes
b) no
17. Did your mother go to college?
a) yes
b) no
18. Did your father go to high school?
a) yes
b) no
19. Did your father go to college?
a) yes
b) no
20. How many books are there in your home?
a) under 100
b) ' $100-500$
c) above 500

Section B. Answer the questions by marking the one best response for each question.
21. Do your parents speak English with you?
a). rarely
b) occastomally
c) sometimes
d) often
e) almost always
22. Do your parents teach you English at home?
a) rarely
b) occasionally
c) sometimes
d) often
e) almost always
23. When did you start learning English?
a) nursery school.
b) kindergarden
c) grade 1
d) grade 2
e) grade 3 or above
24. Did you study in an English primary school? (i.e., receive instruction in English)
a) yes, since primary one
b) yes, since prinary three
c) yes, since primary five
d) yes, since primary six
e) no
25. What was your standard of English in primary school?
a) poor
b) below average
c) average
d) above average
e) good
26. What was your standard of English in the past three years in Secondary school?
a) poor
b) below average
c) average
d) above average
e) good
27. Do you ask and answer questions in English in class (outside English language lessons)?
a) rarely
b) occasionally
c) sometime $s$
d) often
e) almost always
28. Do you speak in English to your friends in class?
a) rarely
b) occastons $11 y$
c) $80 \pi 0$ rinisa
d) oftan
e) almost always
29. Do you speak in English to your friends outside class?
a) rarely
b) occastionally
c) $\operatorname{sometimes}$
d) oiten
e) almost always
30. Usually, in which language do you write letters to your friends?
a) English
b) Chinese
c) a mixture of half Chinese and half English
d) mainly Chinese, some English
e) mainly English, some Chinese
31. When you are watching an English movie, do you try to follow the spoken dialogue rather than read the Chinese captions (translation?
a) rarely
b) occastonal1y
c) sometimes
d) often
e) almost always
32. Do you listen to the radio programme broadcast on the English channel?
a) rarely
b) occossonally
c) sometimes
d) gfton
e) almost always
33. Do you watch English television programmes?
a) rarely
b) occastonsily
c) sometimes
d) often
e) almost always

Section C. Answer the questions by marking the one best response for each question.
34. Do your parents speak English with their friends?
a) never
b) sometimes
c) often
d) always
35. Do your parents use English in their jobs?
a) never
b) sometimes
c) often
d) always
36. Do your parents read English books, newspapers, or magazines?
a) never
b) sometimes
c) often
d) always
37. Do your parents write English letters?
a) never
b) sometimes
c) often
d) always
38. Do your parents watch English television programmes?
a) never
b) sometimes
c) often
d) always
39. Do your parents listen to the radio programmes broadcast on the English channe1?
a) never
b) sometimes
c) often
d) always
40. When you meet difficulties while doing your homework in English, can your parents help you with the language?
a) never
b) sometimes
c) often
d) always

Section D. The following is a list of eight reasons frequently given by 188 people for studying English. There are no right or wrong answers since many people have different opinions. Please read each reason carefully and indicate the extent to which it is descriptive of your believe about studying English. Use the following scale as a description of your believe:

Neutral

| Strongly |  | Siightly | or | Slightly |  | Strongly |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| disagree: | Disagree: | Disagree: | Neither: | Agree | Agree: | Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

41. It will help me to understand better the English people and their way of life. $\underline{1} \quad \underline{2} \quad \underline{3} \quad \underline{4} \quad \underline{5} \quad \underline{7}$
42. It will enable me to gain good friends more easíly among Englishspeaking people. $\underline{1} \quad \underline{2} \quad \underline{3} \quad \underline{4} \quad \underline{6} \quad \underline{7}$
43. It should enable me to begin to think and behave as the English do. $\underline{1} \quad \underline{2} \quad 3 \quad 4 \quad 5 \quad \underline{6}$
44. It will alllow me to meet and converse with more and varied people. $1 \quad 2 \quad 3 \quad 4 \quad \underline{5} \quad \underline{7}$
45. I think it will some day be useful in getting a good job. $\underline{1} \underline{2}$ 4 5 $6 \underline{7}$
46. One needs a good knowledge of at least one foreign language to merit social recognition. $\underline{1}$ 2 $\quad 3 \quad 4 \quad \underline{5} 6.7$
47. I feel that no one is really educated unless he is fluent in the English language. $1 \underline{2} \quad \underline{3} \quad \underline{4} \quad \underline{5} \quad \underline{7}$


Section E. The purpose of this questionnaire is to measure the meaning of certain topics and concepts to various people by having them judge the meanings against a series of descriptive scales. The right answer is what these things mean to you. Sometimes you may feel as though you have had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do a separate and independent judgement.

Work at fairly high speed through the items. Do not worry over individual items. It is your first impressions, the immediate feelings about the items, that we want. What do you feel about USING ENGLISH AS A MEDIUM OF INSTRUCTION IN SECONDARY SCHOOLS?

## Neutral

or
Very Quite Slightly Neither Slightly Quite Very

| 49. Good | - | - | - | - | - | - | - | Bad |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 50. Beneficial | - | - | - | - | - | - | - | Harmful |
| 51. Wise | - | - | - | - | - | - | - | Foolish |
| 52. Agree | - | - | - | - | - | - | - | Disagree |
| 53. Flexible | - | - | - | - | - | - | - | Nonflexible |
| 54. Fair | - | - | - | - | - | - | - | Unfair |
| 55. Important | - | - | - | - | - | - | - | Unnecessary |
| 56. Adequate | - | - | - | - | - | - | - | Inadequate |

Section F. Answer the questions by marking the one best response for each $\circ$ question.
58. I would study a foreign language in school even if it were not required.
a) definitely
b) probably
c) possibly
d) probably not
e) definitely not
59. I would enjoy going to see foreign films in the original language.
a) some
b) not much
c) quite a bit
d) not at all
e) a great deal
60. Our lack of knowledge of foreign languages accounts for many of our political difficulties abroad.
a) strongly disagree
b) disagree
c) doubtful
d) agree
e) strongly agree
61. I want to read the literature of a foreign language in the original.
a) strongly agree
b) doubtful
c) agree
d) strongly disagree
e) disagree
62. I wish I could speak another language perfectly.
a) a great deal
b) quite a bit
c) some
d) not much
e) not at a11
63. If I planned to stay in another country, I would make a great effort to learn the language even though I could get along in Chinese.
a) definitely not
b) probably not
c) possibly
d) probably
e) definitely
64. Even though Hong Kong is relatively far from countries speaking other languages, it is important for the Chinese to learn foreign languages.
a) "strongly agree
b) agree
c) doubtful
d) disagree
e) strongly disagree

Section G. The following statements are ones with which some people agree, and other people disagree. There are no right or wrong answers since different people have different opinions. Please indicate your agreement or disagreement by writing on the line preceding each statement the number from the following scale which best describes your feelings:
+1 slight support, agreement
+2 moderate support, agreement
+3 strong support, agreement
-1 slight opposition, disagreement
-2 moderate opposition, disagreement
-3 strong opposition, disagreement
65. $\qquad$ The English-speaking Westerners who have moved to Hong Kong have made a great contribution to the richness of our society.
66. The more I get to know English-speaking Westerners, the more I want to be able to speak their language.
67. English-speaking Westerners are very democratic in their politics and philosophy.
68. Eng1ish-speaking Westerners have produced outstanding artists and writers.
69.
___ By bringing Western ways to our society, English-speaking Westerners have contributed greatly to our way of life.
70.
___ English-speaking Westerners' faith in their religious beliefs is a positive force in this modern world.
71. $\qquad$ English-speaking Westerners have every reason to be proud of their race and traditions.
72.
_ If Hong Kong should lose the influence of English-speaking Westerners, it would indeed be a loss.
73.
_ English-speaking peoples are much more polite than many Chinese in Hong Kong.
74. $\qquad$ We can learn better ways of cooking, serving food, and entertaining from the English-speaking Westerners.
75. $\qquad$ English-speaking Westerners are dependable.
76. $\qquad$ Chinese children can learn much of value by associating with Englishspeaking Western playmates.
77.

Eng1ish-speaking Westerners set a good example for us by their family life.
78. $\qquad$ English-speaking Westerners are generous and hospitable to strangers. Chinese people in Hong Kong should make a greater effort to meet more English-speaking Westerners.
80. $\qquad$ It would be wrong to try to force English-speaking Westerners to become completely Chinese in their habits.
81. $\qquad$ If I had my way, I would rather live in an English-speaking Western country than in Hong Kong.
82. $\qquad$ Hong Kong would be a much better city if more English-speaking Westerners would move here.
83. $\qquad$ The English-speaking Westerners show great understanding in the way they adjust to the Chinese way of life.
84. $\qquad$ In general, Hong Kong industry tends to benefit from the employment of English-speaking Westerners.
85. English-speaking Westerners are straightforward and honest.
86. $\qquad$ English-speaking Westerners are ready to trust others.
87. $\qquad$ Eng1ish-speaking Westerners are ready to sympathize with people who are in trouble.
88. $\qquad$ English-speaking Westerners are people of principle who look for positive meaningful lives.
89. $\qquad$ English-speaking Westerners are academically intellectual and we can gain much from their knowledge and experience. ;
90. $\qquad$ The moral behavior of English-speaking Westerners is enlightened and should be copied by other countries.
91. $\qquad$ English-speaking Westerners are really concerned about the Chinese people in Hong Kong and are eager to learn from them and listen to their ideas.
92. $\qquad$ Eng1ish-speaking Westerners are sincerely committed to Hong Kong and its problems and work selflessly for its improvement.
93. $\qquad$ English-speaking Westerners truly consider Hong, Kong to be their home and are really concerned about its future.
94. $\qquad$ English-speaking Westerners are careful not to appear as "instant experts" but consider the situation carefully before expressing opinions and giving advice.
95. $\qquad$ Eng1ish-speaking Westerners treat the Chinese in Hong Kong as their equals.

THÁT'S THE END, THANK YOU VERY MUCH!

Section A. Read each of the statements below and for each one place a check mark on the alternative which seems to best describe you.

1. Compared to other students in my English class, I think I:
a) do less studying than most of them
b) study about as much as nost of them
c) study more than most of them
2. If English were not taught in school, I would:
a) not bother learning Eng1ish at all
b) try to obtain lessons in English somewhere else
c) pick up English in everyday situations (i.e., read English books and newspapers, try to speak it whenever possible, etc....)
d) none of these (explain)
3. I actively think about what I have learned in my English classes:
a) hardly ever
b) once in a while
c) very frequently
4. On the average, I spend about the following amount of time doing home study in English (include all English homework)everyday:
a) less than 15 minutes
b) 15 minutes to one hour
c) more than one hour
5. Considering how I study my Eng1ish, I can honestly say that I:
a) will pass on the basis of sheer luck or intelligence because I do very little work
b) really try to learn English
c) do just enough work to get along
d) none of these (explain)

After $I$ finish school, I shall probably:
a) try to use my English as much as possible
b) make no attempt to remember the English I have learned
c) continue to improve my English (e.g. daily practice, night school, etc.)
d) none of these (explain)

Compared to my other school courses, I:
a) do less work in English than any other course
b) work harder on English than any other course
c) do about as much work in English as I do in any other course

Section B. Answer the following questions in the format shown below:
slight- not sure/ slight-
very definitely yes_ yes ly yes neutral ly no no __verydefinitely no
8. My parents encourage me to study English. very definitely yes $\qquad$ - $\qquad$ very definitely no
9. My parents think that there are more important things to study in school than English. very definitely yes $\qquad$ very definitely no
10. My parents have stressed the importance that Eng1ish will have for me when I leave school. very definitely yes ___ _______ very definitely no
11. My parents believe that studying English is a waste of time. very definitely yes ___________ very definitely no
1.. Whenever I have homework in English, my parents make sure I do it. very definitely yes $\qquad$ very definitely no
13. My parents believe that I should really try to learn English. very definitely yes $\qquad$ very definitely no

Section C. Please reply to the following questions by placing a mark on the best response:
14. Place a check mark on one of the spaces below to indicate how much you like English compared to all your other courses.

```
English is your
least preferred
course
```

$\qquad$

``` :
``` \(\qquad\)
``` : ___:
``` \(\qquad\)
\(\qquad\) most preferred course ___:
``` \(\qquad\)
``` : course
```

15. When you have an assignment to do in Eng1ish, do you:
a) do it immediately when you start your homework
b) become completely bored
c) put it off until all your other homework is finished
d) none of these (explain)
16. During English classes, you:
a) have a tendency to daydream about other things
b) become completely bored
c) have to force yourself to keep listening to the teacher
d) become wholly absorbed in the subject matter
17. If you have the opportunity and knew enough English, you would read English newspapers and magazines:
a) as often as you could
b) fairly regularly
c) probably not very often
d) never
18. After you have been studying English for a short time, you find that you:
a) have a tendency to think about other things
b) are interested enough to get the assignment done
c) become very interested in what you are studying
19. If you had the opportunity to change the way English is taught in yourschool, you would:
a) increase the amount of training required for each student
b) keep the amount of training as it is
c) decrease the amount of training required for each student.
20. You believe English should be:
a) taught to all secondary school students
b) taught only to those students who wish to study it
c) omitted from the school curriculum
21. You find studying English:
a) very interesting
b) " no more interesting than most subjects
c) not interesting at a11

Section D. Please reply to the following questions by placing a mark on the best response:
22. Whether I like English or not, I still work hard to make a good grade.
a) rarely
b) occasionally
c) sometimes
d) offon
e) almost always
23. I lose interest in my studies after the first few days or weeks.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
24. I memorize grammatical rules, etc., without really understanding them.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
25. When I get behind in my school work for some unavoidable reason, I make up back assignments without prompting from the teacher.
a) rarely
b) occasionally
c) sometimes
d) often
e) almost always
26. Daydreaming about dates, future plans, etc., distracts my attention from my lesson while $I$ am studying.
a) almost always
b) occa sionally
c) sometimes
d) ofton
e) rarely
27. Even though an assignment is dull and boring, I stick to it until it is completed.
a) rarely
b) occastionally
c) somatures
d) cfton
e) almost always
28. I keep all the notes for English together, carefully arranging them in some logical order.
a) rarely
b). occasionally
c) somsting s
d) ofton
e) almost always
29. When I am having difficulty with my English, I try to talk over the trouble with the teacher.
a) rarely
b) occasionally
c) sometime $s$
d) oiten
e) almost always
30. I keep my place of study business-like and cleared of unnecessary or distracting items such as pictures, letters, etc.'
a) rarely
b) occasionally
c) sometimes
d) often
e) almost always
31. It takes a long time for me to get warmed up to the task of studying.
a) almost always
b) occasionaliy
c) sometimes
d) often
e) rarely
32. When I sit down to study, I find myself too tired, bored, or sleepy to study efficiently.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
33. Prolonged reading or study gives me a headache!. .
a) almost always
b) occssisinally
c) sometimes
d) often
e) rarely
34. After reading several pages of English, I am unable to recall what I have just read.
a) almost always
b) occasionally
c) sometime $s$
d) often
e) rarely
35. I waste too much time "chewing the fat," reading magazines, 1istening to the radio, going to the movies, etc., for the good of my studies.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
36. My studying is done in a random, unplanned manner, and is impelled mostly by the demands of approaching classes.
a) almost always
b). occasionally
c) sometimes
d) often
e) rarely
37. I utilize the vacant hours between classes for studying so as to reduce the evening's work.
a) rarely
b) occasionally
c) sometimes
d) oiton
e) almost aiways
38. I am on time with written assignments.
a) rarely
b) occasionally
c) sometines
d) often
e) almost always
39. I like to have the radio playing while I am doing my homework.
a) almost always
b) occastionally
c) sometimes
d) ofton
e) rarely
40. When reading a long assignment, I stop periodically and mentally review the main facts and jdeas that have been presented.
a) rarely
b) occasionally
c) sometimes
d) oiten
e) almost always

## Section D (Continued)

41. I seem to accomplish very little in relation to the amount of time I spend studying.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
42. I prefer to sit in the back of the classroom.
a) almost always
b) occasionally
c) somotims $s$
d) often
e) rarely
43. With me, studying is a hit-or-miss proposition, depen'ding on the mood I'm in.
a) rarely
b) occastons11y
c) sometimes
d) $\rho f t a n$
e) almost always
44. Before each study period I set up a goal as to how much material I will cover.
a) rarely
b) occasionally
c) sometimes
d) $o \hat{i} t e n$
e) almost aiways
45. I keep my assignments up to date by doing my work regularly from day to day.
a) rarely
b) occastonally
c) sometimes
d) $0 \leq 5$
e) almost always

Section E. Please reply to the following questions by placing a mark on the best response:
46. On the average, how much time do you spend in reading books apart from those having connection with your school work every day?
a) less than 15 minutes
b) 15 minutes to 30 minutes
c) more than 30 minutes
47. Which kinds of books would you prefer to read during your leisure time?
a) Chinese
b) English
c) no preference
48. Which kind of newspapers would you prefer to read?
a) Chinese
b) English
c) no preference
49. Whi.ch kinds of magazines would you prefer to read?
a) Chinese
b) English
c) no preference
50. If you have both the Chinese and English version of 'Reader's Digest", which one would you prefer to read first?
a) Chinese
b) English
c) no preference
51. Usually, in which language do you read faster?
a) Chinese
b) English
c) about the same

Section $F$. The purpose of this questionnaire is to measure the meanings of certain topics and concepts to various people by having them judge them against a series of descriptive scales. The right answer is what these things mean to you. Sometimes you may feel as though you have had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do not bother trying to remember how you check similar items earlier. Make each item a separate and independent judgement.

Work at fairly high speed through the items. Do not worry over individual items. It is your first impressions, the immediate feelings about the items, that we want.

What do you feel about LIFE IN HONG KONG?
neutral
or
very quite slightly neither slightly quite very


Section G. Instruction: The following statements are opinions which have often been expressed by students in your age group. They cover a wide range of topics and it has been found that some people agree with each statement and others disagree. There are no right or wrong answers. You are asked to mark each statement in the left hand margin according to your agreement or disagreement as follows:

```
+3 strongly agree -3 strongly disagree
+2 agree
+1 slightly agree -1 slightly disagree
```

62. Obedience and respect for authority are the most important virtues children should learn.
63. What youth needs most is strict discipline, much determination, and the will to work and fight for family and country.
64. Nowadays when so many different kinds of people move around and mix together so much, a person has to protect himself. especially carefully against catching an infection or disease from them.
65. 

What this place needs most, more than laws and political programs, is a few courageous, tireless, devoted leaders in whom the people can put their faith.
66. $\qquad$ No weakness or difficulty can hold us back if we have enough will power.
67. ......Human nature being what it is, there will always be war and conflict.
68.

A person who has bad manners, habits, and breeding can hardly expect to go along with decent people.
69.

People can be divided into two distinct classes: the weak and the strong.
70.

There is hardly anything lower than a person who does not feel a great love, gratitude, and respect for his parents.
71. $\qquad$ The true Chinese way of life is disappearing so fast that force may be necessary to preserve it.
$\qquad$ Nowadays more and more people are inquiring curiously into matters that should remain personal and private.
73. $\qquad$ If people would talk less and work more, everybody would be better off.
74.

Most people don't realize how much our lives are controlled by 'plots thought out and produced in secret places.

Section H. The following statements are ones with which many people agree, and many people disagree. There are no right or wrong answers since many people have different opinions. Please indicate your agreement or disagreement by writing on the line preceding each statement the number from the following scale which best describes your feelings:
+1 slight support, agreement
+2 moderate support, agreement
+3 strong support, agreement
-1 slight opposition, disagreement
-2 moderate opposition, disagreement
-3 strong opposition, disagreement
75. $\qquad$ In Hong Kong today, public officials are not really very interested in the problems of the average man.
76. $\qquad$ Hong Kong is by far the best place in which to live.
77. $\qquad$ The state of the world being what it is, it is very difficult for the student to plan his career.
78. $\qquad$ In spite of what some people say, the lot of the average man is getting worse, not better.
79. $\qquad$ These days, a person does not really know whom he can count on.

It is hardly fair to bring children into the world with the way things look for the future.
81. $\qquad$ No matter how hard I try, I do not seem to get ahead in school. The opportunities offered young people today are far greater than they have ever been.
83. $\qquad$ Having lived this long in Hong Kong, I would be happier living in some other place now.
84. $\qquad$ In Hong Kong, it's whom you know, not what you know, that makes for success.
85. $\qquad$ The big trouble with Hong Kong is that it relies, for the most part, on very agressive competition.
86. $\qquad$ Sometimes I cannot see much sense in putting so much time into education and learning.

Section I. Check the statement that best applies to you.
87. I speak English:
a) not at ail $\qquad$
b) a little
c) fairly well $\qquad$
d) fluently $\qquad$
88. I read English:
a) not at all $\qquad$
b) a little
c) fairly well $\qquad$
d) fluently $\qquad$
89. I write English:
a) not at all $\qquad$
b) a little
c) fairly well $\qquad$
d) fluently
90. My mother speaks Eng1ish:
a) not at all $\qquad$
b) a little
c) fairly well
d) fluently
$\qquad$
$\qquad$
91. My mother reads English:
a) not at all $\qquad$
b) a little
c) fairly well
d) fluently -
$\qquad$
92. My mother writes Eng1ish:
a) not at all $\qquad$
b) a 1ittle
c) fairly well
d) fluently
$\qquad$
93. My father speaks English:
a) not at all $\qquad$
b) a little
c) fairly well
d) fluently

My father reads English:
a) not at all $\qquad$
b) a little
c) fairly well $\qquad$
d) fluently
95. My father writes English:
a) not at all $\qquad$
b) a little
c) fairly we11 $\qquad$
d) fluently

Set III

Section A. Circle the letters in front of the statement which best answers each question.

1. How do you rate yourself in school ability compared with your close friends?
a) I ant the best
b) I am above average
c) I am average
d) I am below average
e) I am the poorest
2. How do you rate yourself in school ability compared with those in your class at school?
a) I am among the best
b) I. am above average
c) I am average
d) I am below average
3. Where do you think you would rank in your class in high school?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
4. Do you think you have the ability to complete college?
a) yes, definitely
b) yes, probably
c) not sure either way
d) probably not
e) no
5. Where do you think you would rank in your class in college?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
6. In order to become a doctor, lawyer, or university professor, work beyond four years of college is necessary. How likely do you think it is that you could complete such advanced work?
a) very likely
b) somewhat likely
c) not sure either way
d) unlikely
e) most unlikely
7. Forget for a moment how others grade your work. In your own opinion how good do you think your work is?
a.) my work is excellent
b) my work is good
c) my work is average
d) my work is below average
e) my work is much below average
8. What kind of grades do you think you are capab1e of getting?
a) mostly A's
b) mostly B's
c) mostly C's
d) mostly D's
e) mostly E's

Please answer the following questions as you think your PARENTS would answer them. If you are not living with your parents answer for the family with whom you are living. Circle the letter in front of the statement that best answers each question.
9. How do you think your PARENTS would rate your school ability compared with other students your age?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
10. Where do you think your PARENTS would say you would rank in your high school graduating class?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
11. Do you think that your PARENTS would say you have the ability to complete college?
a) yes, definitely
b) yes, probably
c) not sure either way
d) probably not
e) definitely not
12. In order to become a doctor, lawyer, or university professor, work beyond four years of college is necessary. How likely do you think your PARENTS would say it is that you could complete such advance work?
a) very likely
b) somewhat likely
c) not sure either way
d) somewhat unlikely
e) very unlikely
13. What kind of grades do you think your PARENTS would say you are capable of getting in general
a) mostly $\mathrm{A}^{\prime} \mathrm{s}$
b) mostly B's
c) mostly $C^{\prime} s$
d) mostly $\mathrm{D}^{\prime} \mathrm{s}$
e) mostly E's

Think about your closest. friend at school. Now answer the following questions as you think this FRIEND would answer them.
14. How do you think the FRIEND would rate your schodl ability compared with other students your age?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
15. Where do you think this FRIEND would say you would rank in your high school graduating class?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
16. Do you think that this FRIEND would say you have the ability to complete college?
a) yes, definitely
b) yes, probably
c) not sure either way
d) probably not
e) definitely not
17. In order to become a doctor, lawyer, or university professor, work beyond four years of college is necessary. How likely do you think this FRIEND would say it is that you could complete such advance work?
a) very likely
b) somewhat likely
c) not sure either way
d) somewhat unlikely
e) very unlikely
18. What kind of grades do you think this FRIEND would say you are capable of getting in general?
a) mostly A's
b) mostly B's
c) mostly C's
d) mostly D's
e) mostly E's

Think about your favorite teacher-the one you like best; the one you feel is most concerned about your schoolwork. Now answer the following questions as you think this TEACHER would answer them.
19. How do you think this TEACHER would rate your school ability compared with other students your age?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
20. Where do you think the TEACHER would say you would rank in your high school graduating class?
a) among the best
b) above average
c) average
d) below average
e) among the poorest
21. Do you think that the TEACHER would say you have the ability to complete college?
a) yes, definitely
b) yes, probatly
c) not sure either way
d) probably not
e) definitely not
22. In order to become a doctor, lawyer, or university professor, work beyond four years of college is necessary. How likely do you think this TEACHER would say it is that you could complete such advance work?
a) very likely
b) somewhat likely
c) not sure either way
d) somewhat unlikely
e) very unlikely
23. What kind of grades do you think this TEACHER would say you are capable of getting in general?
a) mostly A's
b) mostly B's
c) mostly C's
d) mostly D's
e) mostly E's

Section B. The following statements are ones with which many people agree, and many people disagree. There are no right or wrong answers since many people have different opinions. Please indicate your agreement or disagreement by writing on the line preceding each statement the number from the following scale which best describes your feelings.
+1 slight support, agreement
+2 moderate support, agreement
+3 strong support, agreement
-1 slight opposition, disagreement
-2 moderate opposition, disagreement
-3 strong opposition, disagreement
24. $\qquad$ Compared to English-speaking Westerners, Chinese are more sincere and honest.
25. $\qquad$ Family life is more important to Chinese than it is to Englishspeaking Westerners.
26. $\qquad$ Chinese children are better mannered than English-speaking children are.
27. $\qquad$ Chinese appreciate and understand the arts better than do most people in English-speaking countries.
28. $\qquad$ Compared to the Chinese, the English-speaking Westerners are very unimaginative people.
29. $\qquad$ The way of life of English-speaking Westerners seems crude when compared to ours.
30. $\qquad$ The English-speaking Westerners would benefit greatly if they adopted many aspects of the Chinese culture.
31. $\qquad$ People are much happier in English-speaking countries than they are here.
32. $\qquad$ English-speaking Westerners should study Chinese language and culture.
33. $\qquad$ The Chinese are morally better than English-speaking Westerners.
34. $\qquad$ Chinese people are more intelligent than English-speaking Westerners.
35. $\qquad$ Compared to the Chinese, English-speaking Westerners are disrespectful and impolite people.

Section C. Read each of the statements below and for each one place a check mark to the left of the alternative which seems to best describe you.
36. Compared to the other students in my physics class, I think I: :
a) do less studying than most of them
b) study about as much as most of them
c) study more than most of them
37. If physics were not taught in schocl, I would:
a) not bother learning physics at all
b) try to obtain lessons in physics somewhere else
c) pick up physics in everyday situations (i.e. read physics books and articles about physics in newspapers or magazines, etc.)
d) none of these (explain)
38. I actively think about what I have learned in my physics classes:
a) hardly ever
b) once in awhile
c) very frequently
39. On the average, I spend about the following amount of time doing home study in physics (include all physics homework) everyday:
a) less than 15 minutes
b) 15 min . to one hour
c) more than an hour
40. Considering how I study physics, I can honestly say that $I$ :
a) will pass on the basis of sheer luck or intelligence because I do very little work
b) really try to learn physics
c) do just enough work to get along
d) none of these (explain)
41. After I finish school, I shall probably:
a) try to use my physics as much as possible
b) make no attempt to remember the physics I have learned
c) continue to improve my physics (e.g. daily reading, extra-mural course, etc.)
d) none of these (explain)
42. Compared to my other school courses, I:
a) do less work in physics than any other course
b) work harder in physics than any other course
c) do about as much work in physics as I do in any other course

Section D. Please reply to the following questions:
43. Place a check mark in the appropriate space of the seven spaces below to indicate how much you like physics compared to all your other courses that you are now taking:

Physics is your Phsics is your
least preferred course $\qquad$ most prefered course
44. When you have an assignment to do in physics do you:
a) none of these (explain)
b) become completely bored
c) put it off until all your other homework is finished
d) do it immediately when you start your homework
45. During physics classes, do you:
a) become completely bored
b) have to force yourself to keep listening to the teacher
c) have a tendency to daydream about other things
d) become wholly absorbed in the subject matter
46. If you had the opportunity and knew enough physics, you would read more books and magazines about physics:
a) never
b) raxely
c) fairly regularly
d) as often as you could
47. After you have been studying physics for a short time, you find that you:
a) have a tendency to think about other things
b) are interested enough to get the assignment done
c) become very interested in what you are studying
48. If you had the opportunity to change the way physics is taught in your school, you would:
a) decrease the amount of training required for each student
b) keep the amount of training as it is
c) increase the amount of training required for each student
49. You believe physics should be:
a) omitted from the school curriculum
b) taught only to those students who wish to study it
c) taught to all secondary school students
50. You find studying physics:
a) not interesting at a11
b) no more interesting than most subjects
c) very interesting
51. On the average, how much time do you spend in reading physics books apart from the physics text every week?
a) less than 30 minutes
b) 30-60 minutes
c) 1-2 hours
d) more than two hours
52. Which kinds of books would you prefer to read during your leisure time?
a) always science
b) often science
c) sometimes science
d) never science
53. Do you like to read science articles from newspapers or magazines?
a) never
b) sometimes
c) often
d) always

Section $E$. Circle the letter in front of the statement which best answers each question.
54. Whether I like physics or not, I still work hard to make a good. grade.
a) rarely
b) occsstonally
c) $50 m o t i m e s$
d) often
e) alinost always
55. I lose interest in my studies after the first few days or weeks.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
56. I memorize definitions of technical terms, formulas, etc., "without really understanding them.
a) almost always
b) occastonally
c) sometimes
d) ofter
e) rarely
57. When $I$ get behind in my school work for some unavoidable reason, I make up back assignments without prompting from the teacher.
a) rarely
b) occa sionally
c) sometimes
d) often
e) almost always
58. Daydreaming about dates, future plans, etc., distracts my attention from my lesson while $I$ am studying.
a) almost always
b) occasionally
c) sometine $s$
d) ofton
e) rarely
59. Even though an assignment is dull and boring, I stick to it until it is completed.
a) rarely
b) occasoinally
c) sometime 5
d) ofion
e) almost always
60. I keep all the notes for physics together, carefully arranging them in some logical order.
a) rarely
b) occasionally
c) somotimos

Section E. (Continued)
d) ioften
e) almost always
61. When $I$ am having difficulty with my physics, I try to talk over the trouble with the teacher.
a) rarely
b) occssionally
c) sometimes
d) often
e) almost always
62. I keep my place of study business-like and cleared of unnecessary or distracting items such as pictures, letters, etc.
a) rarely
b) occasonally
c) somstimes
d) often
e) almost always
63. It takes a long time for me to get warmed up to the task of studying.
a) almost always
b) occasionally
c) sometimes
d) afiton
e) rarely
64. When $I$ sit down to study, $I$ find myself too tired, bored, or sleepy to study efficiently.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
65. Prolonged reading or study gives me a headache.
a) almost always
b) occastonally
c) sometimes
d) often
e) rarely
66. After reading several pages of physics, I am unable to recall what I have just read.
a) almost always
b) occasonslly
c) sometimes
d) often
e) rarely
67. I waste too much time "chewing the fat," reading magazines, listening to the radio, going to the movies, etc., for the good of my studies.
a) almost always
b) oocastonally
c) $50 \% 8 \mathrm{tim} s$
d) often
e) rarely
68. My studying is done in a random, unplanned manner, and is impelled mostly by the demands of approaching classes.
a) almost always
b) occasionally
c) sometimes
d) ofton
e) rarely
69. I utilize the vacant hours between classes for studying so as to reduce the evening's work.
a) rarely
b) occastonally
c) sometimes.
d) often
e) almost always
70. I am on time with written assignments
a) rarely
b) occestionally
c) sometimes
d) gfton
e) almost always
71. I like to have the radio playing while I am doing my homework.
a) almost always
b) occasionally
c) sometimes
d) often
e) rarely
72. When reading a long assignment, I stop periodicaily and mentally review the main facts and ideas that have been presented.
a) rarely
b) occasionally
c) sometimes
d) often
e) almost always
73. I seem to accomplish very little in relation to the amount of time I spend studying.
a) almost always
b) occescionally
c) soroe times
d) ofton
e) rarely
74. I prefer to sit in the back of the classroom.
a) almost always
b) ocetsionally
c) somatinios
d) often
e) rarely
75. With me, studying is a hit-or-miss proposition, depending on the mood I'min.
a) rarely
b) occasionally
c) somotimes
d) $g$ ftan
e) almost always
76. I study three or more hours per day outside of class.
a) rare1y
b) occascionally
c) sometrimes
d) ofton
e) almost always
77. Before each study period I set up a goal as to how much material I will cover.
a) rarely
b) occasionally
c) sometimas
d) often
e) almost always
78. I keep my assignments up to date by doing my work regularly from day to day.
a) rarely
b) occasionally
c) sometimes
d) ofton
e) almost always

Section F. Please read each reason carefully and indicate the extent 219 to which it is descriptive of your believe: Use the following scale as a descriptive of your believe.
neutral

| strongly | slightly | or | slightly |  | strongly |
| :---: | :---: | :---: | :---: | :---: | :---: |
| agree. | agree | either | dagree | agree | sagree |

79. I learn more when other teaching methods are used. strongly agree ___ _________ strongly disagree
80. The course was quite useful. strongly agree $\qquad$ -- $\qquad$
$\qquad$ strongly disagree
81. The textbook was good.
strongly agree $\qquad$ ---- $\qquad$ strongly disagree
82. The teacher exhibited professional dignity and bearing' in the class. strongly agree $\qquad$ --_ -_-_ $\qquad$ strongly disagree
83. The teacher seemed to be interested in students as persons. strongly agree $\qquad$
$\square$ -_ $\qquad$ strongly disagree
84. Generally, the course was quite boring. strongly agree ___ ___ ___ ___ strongly disagree
85. The teacher did not synthesize, integrate or summarize effectively. strongly agree $\qquad$
$\qquad$
$\square$ 'strongly disagree
86. The content of the course was too elementary. strongly agree ___ ___ ___ strongly disagree
87. The teacher encouraged the development of new viewpoints and appreciation.
strongly agree $\qquad$
$\qquad$ - $\qquad$ strongly disagree
88. Ideas and concepts were developed too rapidly. strongly agree $\qquad$
$\qquad$
$\qquad$ strongly disagree
89. Homework assignments were helpful in understanding the course. strongly agree $\qquad$
$\qquad$ ___ _ _ _ $\qquad$ strongly disagree
90. Generally, the course was well organized.
strongly agrèe ___ _ _ ___ strongly disagree
91. The teacher had a thorough knowledge of his subject matter. strongly agree $\qquad$
$\qquad$
$\qquad$
$\qquad$ strongly disagree
92. The examinations were too difficult. strong1y agree $\qquad$ - $\qquad$ strongly disagree
93. The demands of the students were not considered by the teacher. strongly agree $\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ strongly disagree
94. I can approach the teacher with questions. strongly agree ___ _ _ _ _ _ _ strongly disagree
95. The teacher spoke audibly and clearly. strongly agree $\qquad$ ___ -_ $\qquad$ strongly disagree
96. Blackboard work is legible, clear and organized. strongly agree $\qquad$ -_ $\qquad$ strongly disagree
97. The teacher has graded fairly. strongly agree $\qquad$ _-_ _ $\qquad$ strongly disagree
98. Labs supplemented lectures and assignments effectively. strongly agree $\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ strongly disagree
99. The labs stimulated my learning and interest. strongly agree $\qquad$
$\qquad$
$\qquad$ strongly disagree
100. The teacher made procedures to be used in the lab quite clear. strongly agree $\qquad$
$\qquad$
$\qquad$ strongly disagree

## Part 7

101) Standand Chinese (戗語) should be practised. +
102) It is impossible to keep to the Chinese way of life with all the westemization around.
103) Traditional Chinese values are incompatible with modern Iivingo-
104) We should stick to proper translations of English terms instead of just folloring fashionable translations.
105) The mixod Cantonese and English language of ours may be the beginning of a Hong Kong Language.
106) There is no need to insist on using Chinese (so as to keep our dignity as Chinese) while interacting with foreignerso

## SELF-REPORT FORM FOR INSTRUCTORS

To be completed and retained by the instructor

## $\because G$

Course or Section

This self-report form is for your own use. If you fill it out at the time your students are filling out the Student Instructional Report, you will have the opportunity to compare your own perceptions with those of your students when you receive the SIR Report.
Respond to each item according to how you would describe this course, your teaching, or the studentsenrolled. The items parallel those in the student form, with those asking for student background information left out.

## SECTION I Items 1-20. Directions: Circle the number that represents the response closest to your opinion.

NA $(0)=$ Not Applicable or don't know. The statement does not. apply to this course or your teaching, or you simply are not able to give a knowledgeable response.
SA (1) = Strongly Agree. You strongly agree with the statement as it applies to this course or your teaching.
A (2) $=$ Agree. You agree more than you disagree with the statement as it applies to this course or your teaching.
D (3) $=$ Disagree. You disagree more than you agree with the statement as it applies to this course or your teaching.
SD (4) $=\frac{\text { Strongly Disagree. You strongly disagree with the statement as it applies }}{\text { to this course or }}$

1. I feel my objectives for the course have been made clear to students.. $\begin{array}{rrrrrr}N A & S A & A & D & \text { SD } \\ 1 & 2 & 4 & 4\end{array}$
2. There has been considerable agreement between the announced objectives of the course and what is being taught.
$\begin{array}{lllll}0 & 1 & 2 & 3 & 4\end{array}$

3. I have been readily available for consultation with students $\ldots \ldots . . . \begin{array}{llllllll} & 0 & 1 & 2 & 3 & 4\end{array}$
4. I feel I knew when students didn't understand the material............ 0
5. Lectures were repetitive of what was in the textbook(s) ................ 0
6. I encourage students to think for themselves in this course........... 0

7. I made a point of adding helpful comments on student's papers or exams $\begin{aligned} & 0 \\ & 1\end{aligned} 2 \begin{array}{lllll} & 3 & 4\end{array}$
8. I have been raising challenging questions or problems for discussion.. \(\begin{aligned} \& 0 <br>

\& 1\end{aligned} \quad\)| 1 |
| :--- |


12. I think that I have been well-prepared for each class ................... 0
13. I have informed students of how they would be evaluated in the course. $0 \quad 1 \quad 2 \quad 3 \quad 4$
14. I have summarized or emphasized major points of lectures or discussions $0 \quad 1 \quad 2 \quad 3 \quad 4$

16. The scope of the course has been too limited; not enough material has been covered ......................................................................... 0
$\begin{array}{llll}1 & 2 & 3 & 4\end{array}$

18. Students seem to be putting a good deal of effort into this course ... 0
NA SA A D ..... SD
19. I feel that I have been open to other viewpoints ..... $\begin{array}{lllll}0 & 1 & 2 & 3 & 4\end{array}$
20. I feel that I am accomplishing my objectives for the course at thispoint$\begin{array}{llll}0 & 1 & 2 & 3\end{array}$

SECTION II Items 21-25. Directions: Circle one response number for each question.
21. For the students enrolled, the level of difficulty of this course is:

1 very elementary
2 Somewhat elementary
3 About right
4 Somewhat difficult
5 Very difficult
22. In my opinion the work load for this course in relation to other courses of equal credit is probably:
1 Much lighter
2 Lighter
3 About the same
4 Heavier
5 Much heavier
23. For the students enrolled, the pace at which the material in this course is being covered is:
1 Very slow
2 Somewhat slow
3 Just about right
4 Somewhat fast :
5 Very fast
24. I have been using examples and illustrations to help clarify the material of this course:
1 Frequently
2 Occasionally
3 Seldom
4 Never
25. Was class size satisfactory for the method of conducting the class?
1 Yes, most of the time ;
2 No, class was too large
3 No, class was too small
4 It didn't make any difference on way or the other
$\begin{aligned} & \text { SECTION III Items 32-39. . (Item numbers correspond to SIR answer sheet) } \\ & \text { Directions: Circle one response number for each question. }\end{aligned}$

32. Overall, I would rate the textbook(s) .......................................... 0 1 2345
33. Overall, I would rate the supplementary readings ............................ 0

35. I would rate the general quality of the lectures .............................. 0
36. I would rate the overall value of class discussions ...................... 0
37. Overall, I would rate the laboratories ............................................ 0
38. I would rate the overall value of this course to the students as ..... 0
39. How effective do you think you have been as a teacher compared to
other instructors you know or have known ................................... 0 1 23145

1) Do you have a backelor's degree? In which area?
a) physics
b) mathematics
c) education
d) other
e) no degree
2) Do you have a master's degree? In which area?
a) physics
b) mathematics
c) education
d) other
e) no degree
3) Do you have a doctor's degree? In which area?
a) physics
b) mathematics
c) education
d) other
e) no degree
4) Do you have a diploma in education?
a) yes
b) no
5) Do you have any other post-graduate training? Please specify.
a) yes:
b) no
6) Do you have any publications? Please specify.
a) yes: $\qquad$
b) no
7) Years of teaching experience up to September 1978.
a) 2 or less
b) 2 to 5
c) 5 to 10
d) more than 10
8) How many different schools have you taught in?
a) 1
b) 2
c) 3
d) 4 or more
9) Are you the chairman of a department in a school?
a) yes
b) no
10) What major subjects have you taught in the past?(Just choose one)
a) physics
b) mathematics
c) general science
c) others (please specify)
11) At what grade level(s) have you done most of your teaching in the past? 224
a) grade 9
b) grade $10 \& 11$
c) grade $12 \& 13$
d) about the same in each level

APPENDIX 7

CHINESE TRANSLATION OF THE QUESTIONNAIRE

問䳐編号 $\qquad$
姓名 $\qquad$
日 期
班別 $\qquad$
説明：下面是－系列的問題，用意在暸解你的北境及時一些事物的看法，這並不是一個測験，因各人的背境原看法不同；敌此並没有錯或對的答案之分。
際了窓用在砰究方面外。我們會將你的答穼保密，使你的告䨱不倉靶你有经膏的影响，故此請你誠賓的填鶱。

第一部份
Tramiste by moll
噇回答下列問題：
1）年 苳令 $\qquad$
2）居住地區
3）你在家襄説甚魔方言？
4）出生地點（如非本港出生者，請掸述國嫁，省份和縣名）
5）何時到港？
6）父親職薏 $\qquad$
7）你預算將扶従事何榬職萃？
8）你記得开中試的成績鸣？要是記得，請填寫下列的空格：
（a）中文 $\qquad$
（b）英 文 $\qquad$
（c）数閔 $\qquad$
（d）總成磧
9）你现在所就謮的篡校是否你开中試的首三個志願之一？是 $\qquad$舌
10）與别人相比之下，你的家庭總收入怎＂嵄？（照你自己的看法）
（a）貧筑
b）中下
（c）中等
（d）中上
心富有
（营 置）
（1）在下列各物中，請你特家裏㩧有的閣出：
（a）零 樞
b）電話
（C）祄顧本
（d）浴缶工
（e）显岡琴
（f）洗衣机
（9）影色電視
（h）音响器材
（4）冷蒮机
12）你专需有佣人没有？
（a）有
（b）没有
13）你曾有過私家補習老所嗎？
（a）有
（b）没有
1出你有自己個人的睡房騳？
（a）有
（b）没有
15）你的家人會不間中嗱港到外地湾假？（澳間和栱東省除外）
（a）有
（b）没有
16）你母親顕過中興没有？
（a）有
（b）没有
17）你白新謮過寒上學院没有？
（a）有：
（b）没有

$$
\left(\begin{array}{c}
\text { 等 }
\end{array}\right.
$$

18）你父親讀聥中鼠没有？
（a）有
（b）汲有
19）体父親僙過事上留院没有？
（a）有
（b）没有

（a）一百本以下
（b）一百至五百本
（c）五百本以上
$\frac{\text { 第三都份 }}{\text { 請在下列各題中選擇最適合你的荅案 }}$
21）你的父親䟠你説英铻否？
（a）很少
（b）偶然
（c）有 時
（d）很多時
（e）红常
22）你的父母有否教你㶅習失文？
（a）很少
（b）偶然
© ）有 时
（d）很多時
（e）䌁常
23）你何待開始學英文？
（a）幼兒圧或之前
b）幼稙園
（c）－年 級
（d）二年緅
（e）三年級或以上
(第三頁)

24）你曾否讀過英文小譽？
（a）曾，由一年級起
（b）曾，由三年級起
（c）曾，由五每級起
（d）曾，由六年別起
（e）汲有
25）伆僙小䁷時的失文程度怎様？
（a）很 送
（b）中下
（c）中 等
（d）中 $上$
（e）很
26）你在中學＂過去䇲年的英文程度怎様？
（a）很 差
（b）中下
（c）中等
（d）中 上
（e）很好
27）除了上英文課外，泝有用英文㖟問或回否問題否？ （Q）很少
（b）偶然
（C）有時
（d）很多時
（e）差不多全部
28）在上課的時候，你是否银同闗説英語？
（a）很 少
（b）偶然
（c）有時
（d）很多時
（e）不 多 全 部
29）下課後，你是否跟同臮説费語？
（a）很少
（b）偶然
（c）有 哷
（d）很多 時
（e）差不多全部
（第皿頁）

30）當你窎信給朋䝿出，你通常會用何種語文？
（a）中 文
（b）主要是中文，間中用些英文
（c）半中半英
（d）主要是英文，間中用些中文
（e）英 文
3り當你看西片時，你會否看中文享幕？
（a）很少
（b）偶然
（C）有時
（d）很多時
（e）経常
22）你有否收聽英文電台？
（a）很 ${ }^{3}$
（b）㥥然
（c）有時
（d）很多時
（e）綏常
33）你有杳收看英文電視台？
（a）很少
（b）偶然
（C）有時
（d）很多時
（e）絃常

第三部份
34）你的父母用英話跟明友交談不？
（a）従不
（b）有洔
（C）很多時
（d）常常
（禁要年）

35）你的父母在工作時需否應用费語？
（a）不需要
（b）有時
（c）很多時
（d）常 常
36）你的父母関譄英文書，報，雜誌嗎？
（a）從不
（b）有时
（c）根多时
（d）常常
37）你的父母窇英文信嗎？
（a）従不
（b）有時
（c）很多時
（d）常 常
38）你的父母收看英文電視節目思？
（a）従不
（b）有時
（C）很多時
（d）常 常
3甲）你的父母收聽英文電台嗎？
（a）従不
（b）有時
（c）很多時
（d）常 常
40）當你用英文做功深時，若遇到困難，你的父母能在語言方面幇助你嗎？
（a）不能
（b）有時
（c）很多時
（d）常 常
（觜六息）

第四部纷
下面是八個人們通常興崀英文的理由，請細讀每個理由：，然後照下面的尺度表示你的看法：

$$
\frac{1}{\substack{\text { 十分 } \\
\text { 不同 }}} \frac{2}{\text { 不同 }} \begin{array}{lllll}
\text { 意 } & \frac{3}{\text { 同其 }} & \frac{4}{\text { 意無意 }} & \frac{5}{\text { 見 稍為 }} & \frac{6}{\text { 同意 }}
\end{array}
$$

意
41）飪琶英文葍蔧㫑我更明白説英語的人及他們的生活方式。

$$
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 5 \quad 6
$$

42）它裉我能更容易在一些㸳英語的人＇中結交到一些好朋友．
$\qquad$
43）它能懐我有英國人的想法及表现。
$\qquad$
44）它㜔我能椚更多不同的人有交往及傾談。
$\qquad$
45）我認為掔習英文能幫助我彩来找到一份好的工作。
$\qquad$
46）一個人要在社曾上啔得一些名声，他最少應懂得一種外國語言。
$\qquad$
47）我認为除非一個人能流利地虺用英文，他不能真正質启受過教育。
$\qquad$ $1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$ 48）我需要緊習英文才能中舆里業。
$\qquad$
$\frac{\text { 第方部份 }}{\text { 這問卷的用意是測量不同的人靶一些題目或雚見 }}$念的看法。测量方面是請你紗該题目或䚉念放置在下列一個描述性尺度的適當位置上，正碳的＂答案因人而果，最重要的是你调人，對這些題且或觀念的感受。有時你或許以為你已兄過同一個尺度，但惯際普非這様，故此請你作答時不要前後参閲尺度上的項目，而只就該題作一獨立的決定。
請迅速的逪擇答宓，不要為個的的愐目猫锭，我們所需要知道的是你的第一個印象—即時的反㦄！




54）公平 1 2 3 － 4 － 7 不公平


第六部份
諳在下列各題莌選擇最適合你的答案
58）綝然學校没有夫兄定気们會選肂外國語文。
（a）必定會
（b）大概會
（c）有可能
（d）大概不書
（e）必定不㓱
59）我喜歡筧看没有中文字幕的外間電影。
（a）絶不 喜㢣
（b）不 大喜稣
（9）有時毫㢣
（d）頗喜歡
（e）十分喜歡
60）我們很多外交上的困難是由於缺乏外文知識所造成的。
（a）非常同意
（b）同意
（c）不能決定
（d）不同意
（e）非常不同意
61）我要閲䛾凡号文學的原著。
（a）非常同意
（b）同意。
（C）不能決定
（d）不向意
（e）非常不同意
62）我渴望能説：一流利的外文。
（9）+ 分渴望
（b）颇渴望
（c）有時新望
（d）不大渴望
（e）絶不幆脾

63）要是我計㹔移居外地，縦然中文已很呴用，我仍會薏云去學習該地的語文
（a）一定不：霉
（b）大概不會
（c）有 可能會
（d）大概會
（e）一定會
6方比鞟上安説，雖然香港距離説其他語文的國家很遠。但㖪堛外文们是很重要的。
（a）非常同意
（b）同意
（C）不能决定
（d）不同意。
8）絕不国唛
$\frac{\text { 第七部份 }}{\text { 以下思一些解，有很多人同意亦有不少人 }}$不同意，因為各人的数點不同，故此没有楆隼的答案。从下有六個不同程度的春法，請你將最能表達自己着法的号影填在每题之前的空格上。
+1 ：稍微同意。
－1：不甚同意
＋2：同意
-2 ：不同意
＋3：十分同意
－3：十分不同意
65） $\qquad$移居香港而又説英站的外國人封本港社


66） $\qquad$
望能説他們的語言。
67） $\qquad$説英語的外國人在政治和答段方面都㱏很民主的。

68） $\qquad$在説英語的外国人中有很多傑出的擎術家和作家。
（9）詋央認的外成人特西力的生活方式帛進我們的社金 跱改進我們的生活方式有很大的貢㹀。
$70)$ $\qquad$说英語的外國人對宗教信仰的信心成了現代社會的推動力。

11） $\qquad$説英語的外國人有充份理由為他們自它的種族和停統而駘傲。
72） $\qquad$要是香港失去了説英語的外國人欧影响，這㭩會是一個很大的授失。
73） $\qquad$在香港，説英語的外國人比較中國人更有裋䫘。
74） $\qquad$
的亨铨，服待和款待的方法；
75） $\qquad$説英語的外國人是可靠的。
$\qquad$甲國孩子在藇説英語的外國㧡我嬉战时可以興到很多有傮值的東西。

77） $\qquad$竞英語的外國人的家庭生活是我訛》一個很好的䄘樣。
78） $\qquad$談英諨的外國人基阳生人很慷慨萂熱城。
$\qquad$香港的中國人應加倍努力共認識更多説英語的外國人。
80）—強逼説英語的外國人完全中国化是不對的。
81）—要是任我選擇，我寧可離開香港住在一图説英語的地方。
82） $\qquad$


83） $\qquad$説芙語的外国人在適應中國人的生鹄古式上表現了很大的諒解。
84） $\qquad$一般來説。香港的工業每每因僱用了説英語的外国人而得到益處。
85） $\qquad$説英語的外國人是摔直誠實的。

86） $\qquad$説英語的外國人容易信任別人。

87）＂关語的外國人對困苦中的人富同情心。
88） $\qquad$説奌語的外國人是有原則的人，他們菖


89） $\qquad$談英語的外國人是知識份子，我門可以在他們的知識和䋊験上得到很大的益虔。

90） $\qquad$説贵語的外國人有高尚的道德水平，應該為別國人所做效。
q1） $\qquad$説英語的外国人真正蘭心香港的中國人，

－意見。
92） $\qquad$説谷語的外或人誠基憵地敬身在香㴀及《也
努力。
93）説英語夘外国人真誠地特喬港當為自己的客，他梆非常開心鸾港的前途。
94） $\qquad$説英語的外国人很小心的避免表現出自己是個「萬事通，他伊仔細考查事㥉始末之後办表達自己的看法及提議。
95） $\qquad$説英語的外国人業香港的中國人平等看待。
(篤十二臬)

問卷二

1）以英文科來説，興其他同敏比較，我認為我：

（b）跟大部伤同舆—䁬再功
（c）较大部份后學体功
2）如采校内没有教授英文，我
（a）我不薢學侸英文＂
嗑可能说英活等等。）

（d）不是以上任行一顼（娧明）
 （6）学不
（b）㷌一为 之
（C）帾冓如此
的時間是。
（a）少於 + 五分䄈
（b）$十$ 丘分转至—小洔
（c）－小哈 以上
5）以我的䴗習情況來看，坦白地説，我

（b）只做少許的工天，得過且過便管
（c）磪窎努力然英文
（d）不是凶上任炣一項（説馅）
6）等業後，我多数



（d）不是以上任坷一项（認呵） $\qquad$


（b）花在奌文的工来跟其他任何一科相用
（c）较后用功緊習英文

第二部份





閣的鲜。

$$
10^{\circ} 4561
$$

定要或做
英気。

$$
123456
$$



双又是你鼠不黄文是体最䯩


（a）気到十分厭頃

（c）首先数造家磻
（d）不是以上任何一项（話明）

（a）感到广务廊熄
（b）青的思䯆想的傁向

（d）完金枌入
 （a）水不
（b）多领不会多常浣
ic）制为定嚅
（d）害可能的労哯

（a）每每热反其供事情
16）發生鼠走云空成它


（a）減少採社


20）你認為英文


以磼授き所有中緊生

（a）絶不有趣

（c）非常有趣
管四都份


（a）誓 1
（b）䲩等
（c）有時
（d）象労


（a）晏少
（b）偶䇢
（c）有時
（d）時穿
（e）是多常常如此

（a）基少
（b）偶然
c）有時
（d）時常
（e）我掌常如比


（a）甚少
（b）偶然
（c）有呵
（d）時常
（c）能手常常如地
26）党我温䎌時国悬回約鿖，特束的計彭等等就不能隼中精祥在央文勧本上。
（a）甚少
（b）倮然
（c）有啨
（b）時常
（E）㱔乎常常如此

（a）甚少
（b）偶然。
（c）有喑
（d）時常


（a）甚少
（b）偶然
（c）有時
（d）時常

29）愛我遇上英文鄚題時我合找老皈商谈
（a）甚少
（b）偶然
（c）有喑
（4）暗常
（氏態手常常如此


（a）其＂
（b）鼬然
cic）乍昭
（d）時常
（e）惐常常如出

（a）甚少
（b）偶照
（c）．有等
（d）告常
． 5 ）等于常常如比
晆，爫殁不能的好湿習
（a）基少
（b）偶然
（c）有萻
（d）時第


（i）甚少
（b）傌然
（c）有洔
（d）時常
（F）笑受常常如此

（a）甚少
（b）偶然
（c）有時
（d）時常
（た）我于常常吅此。
等等，以致影响管查。
（a）苴少
（b）偑然
（i）有時
（d）时常
（E）嘠手常常如此
乐時方去做。
（a）其多。
（b）信然
c）盾 $\mathrm{C}=$
（d）$=0$


19）甚4，
（b）偶然
（c）有時
（d）時带
（e）弤要常常如此
38）我隼時竞英文的功謁
（9）甚少
（b）䲩然
（c）有的亲
（d）時常
19）等常常如此
39）做家䛞時，我喜敂把收書机開了
（a）甚少
（b）偶然
（c）有時
（d）時常
（e）稄常常如断

提及過的要點
（9）甚少
（b）保然
（c）有時
（d）時常
（e）幾乎常常如地

（a）展少
（b）偶然
（C）有時
（d）時常
（e）幾手常常如此
42）我喜鄀生在䛞室後面
（a）甚少
（b）偎然
（c）有時
（d）時常
（（ ）兹严常常如此

（a）甚少
（b）偶然
（C）有時
（d）時常
（e）常常如此

（a）甚少
（b）偶然
c）有時
（d）時带
（e）想手常常如此
45 我母天都有視待地工作以確保自己能何時完成功䛞
（a）基少
（b）偶然
（c）有時
（d）時常
（e）军戠常常如此
䈅五部份
請指出最適合的香案。

（a）十五分致以下
（b）十五分告量至等小等
（c）半小時以上

（a）市文
（b）縝特 P门偏女子
防英文
48）你产敬娔甚魔報紙？
（a）中気
（b）無特別偏好
（C）筑文

（a）中文
（b）無特別偏好
c）英文。
50）如果你兼有中英文本的䜖者文摘」你霄先請那一李？
1a）中文
（b）镸特勋偏好
（c）英 $\overline{\text { 而 }}$
51）通常你讀那一種文字會皎扁快速？
（a）中文
（b）相同婵度（指中英文）
c）英文

第六鄄份




印鱼及即時的感賢。
你塻詅香港的生活有何感受？

52）妵
53）㸱㸱
54）欹諧
55）仁慈
56）清滤
57）踭 $A_{8}$
58）萃適
59）育意我
60）．趋年
61）梴翌
$\frac{1}{2} \frac{3}{2} \frac{3}{3}$
－ 1 童

第七䬦份


体下列計分法在各题左欄閑評分：

+6 同量
＋5 稍微同意

＋2 不同蕄
＋3祅秋炊不同意

62） $\qquad$
（2） $\qquad$

和戉們的鱼志
（4） $\qquad$


（5） $\qquad$


16） $\qquad$

$\qquad$

$68)$ $\qquad$
的人梡虎得東。
（9） $\qquad$人可以结整地公鳥雨六䅋；弱有和强者
TO） $\qquad$
為要劳了。
（1） $\qquad$

72） $\qquad$

7） $\qquad$如果以人都少談坛两做事，各人的生法都会酸好了。
7）

## $\cdots$

所控制。

## $\frac{\text { 说八部分 }}{\text { 以下是一共 }}$




$$
\begin{aligned}
& +5-\cdots \text { 同念, 得微文洔 }
\end{aligned}
$$

75） $\qquad$

： 6 $\qquad$

Ti） $\qquad$

（i） $\qquad$

（9） $\qquad$

－50）

4） $\qquad$

32） $\qquad$

93） $\qquad$

84） $\qquad$

85） $\qquad$

86） $\qquad$

告起部分
ST我説英文
（a）全不
89）我償莫交
（的）リン
（c）全不
（c）頗好
（b）少；
（d）流利
（c）皮矞女子
（d）流利

E．

89）我舂英文
（a）全不
（b）少少
（c）頗 43
（ct）流利）

（a）全不
（i）
（c）友市


（a）全 $T$ ．
（b）少少
（c）酸好
（d）㤝
43）式父㜶談莫文
（a）空不．
（i）少
（c）楠好
（0）流 +1
94）島父親产票文
（a）全不
（b）${ }^{4} 3$
（c）废需女子
（d）流林
（15）部父新空突文
（a）全 $\pi$
（b）少
（c）没直女子
（d）效 $\mathrm{F}^{\prime}$ ．

間卷三

Iromilated ly Roceming W．K．Lo（B．A．）

相黄三



b）我兵中至 21
c）长兵中
d）我是中等々下
（我是最差明

a）成房爰应为
b戒兵中等 1 上
c）我是中等
d）弄是中等这T
e）我是最盖耻

（1）最妇一虾
b） 中等 1
（） 1 等
d）$\ddagger$ 等 2 T
（く）秋羑（成


b）度多数育
（c） 7 的定
d）多数次桀
e）双市

a）曼村该一级
b）中 均 $\geq 1$
（c）中等
d） 中 等
0）最善的一级




口族育可能
（不旨类定
d）办可解
○多教ふ可能




c）我比应经委中等




b）夕教是 6
（）多数是分级
d）多数是口级
（）多坆是巨级





a）蕾最仔
b）中等 2
c） 等
j）中等 $=7$

p


（i）原最
かも等之上
0）+
d）中等 27
0）展最盖

（音定定

c）7就青是
お気数ち章
8）业走万金




b）路有可 4
c）有㣍是是
d）解为可能

级的成绩？
a）多数是A级
！）多数是E级
c）多数是（级
d）多教是D级
－）多数是 E 织


可钭花尔的细亲能力？
ii）展最8
b）$\ddagger$ 等 -1
c）中
d） 等 $\leq 7$
（）需表


（i）存最访
1）$\ddagger$ 等 21
c）$\ddagger$ 走
d） d $^{2}=7$
c）原最吾

Q䆩者定点
1）等多敌窝
（）お特是定
1） 1 数 5
e）音定示電

奇可能党成度些言棌謀但喓？
路素可能
b）蕉交可能
多夯能首定



等级墭复？
a）多数是A级
或多数是B 矢
c）多数是（级
d）多数题D级

$p^{5}$





a）雾最
b） 5 等之上
c） 1 筧
お中等之
0）愿最羑

成表展等处？

b）中
c） 15

Q）魔最着

a）变定等
b）意多垂素
c）务能京定
d）多最义 3
e）音定子委



（i）楦光原镜
b）楼
c）不的量廷
（d）䂒交可能

$\therefore \quad p t$

级的成组
$\therefore$ 最是 4 绿
b）多数是 $=$ 线
〕）应数等

0）多是是






奔心さ或冓。





送き筑う。
方式以乎蚿粗野。




人青生。



第三亲公











 $\qquad$
 6）永名
1）佂一青之
c）经案如此



$$
\begin{aligned}
& \text { b } \\
& \text { c) 小㛺相 }
\end{aligned}
$$



核




心空量軍的的酉

串采系
石兵 $\qquad$








的是家需



1）威到十 二小相






d）安全 投入



$$
\text { a) } 3
$$

b）表少



门每乎想庆其化事情
b）有其復去它成它

法，比需
Q）减少堁程
b）复复車有深程
c）䭪复菻程
世你認青物理
（i） 7 㦄列入数靬图肉





c）非学有趣
利喜以外的蚛理点？

$$
\begin{aligned}
& \text { b } \\
& \text { ) - } 2=1 \text { 手 } \\
& \therefore=5
\end{aligned}
$$


a）的是利至


（d）永是相
区
a）$x$
b）查：亲
c）乌章
d）

出最萑是是

取 $<$ 成减
－分等
b）筑感
$\because$ 夺 诸
（1）竞
C）伐我常常的此
劫倉白

b）In $4 x$ ：
c）有
（d）時劳
4）某

式等等。
0）我常常都北
b）
c）有時
（1）待旁
c）悉；


（i）基少
b）偠兆
ら箱時
d）等常
d）戒南常学的北，



风成米常第化
b）偊需
व桀等
0年常
2）其

a）是丯
b）禺䟵
c）有味
d）時早
c）伐平常常运此

応期好。
ii） 1
（1） 5
－有特
d）时劣


a）甚
b）采
c）并琞
d）良章


本总

b）
c）交時
d）啫常



b）为然
）㵔 時
d）多昇
s）其 \％


a我我学分比
b）然
（）种果
d）時常
（）旲卦，

（i）我于常学必
b） 14
（）白的
（1）昭学
○其少


b）架

d）橗帛
凶量死，

的要法
a）表
b）
（1）有洔
d）敕常


理专余少。
4）成齐常常如此
b）情㘹
（贲甠
d）時章
c）其 9

4）薏
1）化
（有時
d）常
○幾乎常常如此


（a）表
b）禺然
c）変時
d）曈常


（黄学
b） 6
c）夜枟
d） $\mathrm{E}=$


醍定是是
b） $\begin{aligned} & \text { b } \\ & \text { b }\end{aligned}$
c） $\operatorname{man}^{6}$
d）年年


旨依㖕皃成才䭪。
包夺
人会名

d）
（我才章尝数









pio









枟合周音






程者同音
電李下同音




和与合童 $\qquad$









行老邻分平尤分。




第七部分
镍暽：以下的意具是一些宾你年纪担店

人同意，庲人不同意，符以设底
已同意或为同意虳鞋度 依下列


$$
\begin{aligned}
& \text { +7-整文同意 + 艮之不国意 } \\
& +6 \text { 有美 }+2 \text { 7月周意 }
\end{aligned}
$$


能温中國式蚊业济。



资站的先河；

蛔人的尊最。

## APPENDIX 8

## Mid-Year Examination 1978-79

FORM 4

## PHYSICS

Time allowed : 2 Hours

## SECTIONA: MULTIPLE CHOICE (32\%)

1. If the object distance is halved and the diameter of the hole in a pinhole camera is doubled, what effect does this produce on the size, brightness and sharpness of the image formed?

|  | Size | Brightness | Sharpness |
| :--- | :--- | :--- | :--- |
| A. | doubled | brighter | unchanged |
| B. | doubled | brighter | foubled |
| C. | fainter | lessened |  |
| D. | halved | brighter | unchanged |
| E. | halved | brighter | increased |

2. When the eye is looking at an image in the mirror, the image formed on the retina of the eye is virtual because the image which appears in retina is virtual.
A. True True (correct explanation)
C. True False
D. False True
E. False False
3. When an object is put in front of a concave mirror, a real, inverted, magnified image is formed. Find the position of the object.
A. infinity
B. beyond the centre of the curvature
C. on the center of curvature
D. between the focus and the center of curvature
E. between the focus and the pole
4. Which of the following can produce a virtual image of a real object?
I. Plane mirror
II. Concave mirror
III. Convex mirror
f. I only
B. II only
C. I and II only
D. I and III only
E. I, II and III
5. Convex mirrors are more suitable than plane mirrors for use as rear-view mirrors for cars mainly because convex mirrors can give/
A. a magnified image
B. a real image
C. a sharper image
D. an undistorted image
E. an image convering a wider angle of view

Form 4
6.
E Physics


Comenere
In the figure, the position of the pin has been so adjusted that the pin and its image may be observed with no parallax between them. what is the focal length of the mirror?
A. 10 cm
B. $\quad 2 \hat{\mathrm{~cm}}$
C. 24 cm
D. $40 . \mathrm{cm}$
E. It cannot be determined from the information given.
7. A straight stick appears to be bent when partly immersed in water. This is due to which of the following?
I. Interference
II. Reflection
III. Refraction
A. I only
B. II only
c. III only
D. I and II only
E. II and III only
8. A man looks vertically down at an object 2 m under water. If the refractive index of water is $4 / 3$, find the apparent depth.
A. $\quad \$ / 2 \mathrm{~m}$
B. 2 m
c. $2^{2}$ m
D. depends on how clear the water is
E. depends on the distance of the observer above water
9. The path of a ray of light through a glass prism can be calculated if we know
I. the refracting angle of the prism
II. angle of incidence in the side of prism
III. refractive index of the glass
$\therefore$ III only
.B. I and II only c. I and III only
D. II and III only
E. fll three
10. In the above diagrams, the critical angle of the glass is $42^{\circ}$. Which diagram shows the correct path for the light ray through the prism?
A. I
B. II
c. III
D. IV
E. V
11.


What are the mistake, if any, in the ray diagram shown above?
A. There is no mistake.
B. There should be one white emergent ray.
C. The red and violet emergent rays should be interchanged.
D. Dispersion of the white light should occur at the first face.
E. The diagram has both the mistakes mentioned in options $C$ and $D$.
12. : diver at $x$ metres under water looks up at the water surface and observes the sky appears to be a circle. What is the diameter of the circle if the critical angle of water is $\theta$ ?
li. $2 x \tan \theta$ metres B. $2 x \sin \theta$ metres $C . ~ x \tan \theta$ metres
D. $\frac{x}{\sin \theta}$ metres
E. $\frac{2 x}{\sin \theta}$ metres
13.


Which of the points I, II, III and IV can be seen by the, fig sh in the pond as shown in the diagram above?
A. I and II only
B. I and IV only
C. $I, I I$ and $I V$ only
D. I, III and IV only
E. All the points can be seen.
14. Which of the following statements concerning a simple astronomical telescope is/are correct?
I. the first image is always near the focal plane of the objective
II. the eye-lens is used as a simple magnifying glass to observe the first image
III. the final image appears to be enlarged
f. I only
B. II only
C. III only
D. II and III only
E. I, II and III
15.


The diagram shows two incoming parallel rays of light which pass through a lens 'L'. The ray XY after passing through the lens will pass through the point
A. I
B. II
D. IV
E. V
16. A long needle is viewed through a lens. The needle and its image appear as in Figure 1. When tho head is moved to the left, the needle (object) and its image appear as in:nFigurc 2.
Which of the following statements is/are correct?
I. The object is more distant than the image.

II. The image is more distant than the object.
III. The lens is convex.
IV. The lens is concave.
A. III only
B. I and III only
C. II and III only
D. I and IV only
E. II and IV only
17. A pair of rays converge on the point I as shown in the diagram. which of the following pieces of apparatus, placed along the line $N \mathbb{N}$ will dispiace the convergent point to the right?
I. a concave lens
II. a convex lens
III. a rectangular slab of glass
A. I only
B. II only
C. III only
D. I and III only

$78:$


In the diagram, the ray between the lenscs is parallel to the axis. only one incident ray and one emergent ray are correctly drawn. Which of the following pairs are the correctly drawn rays?

|  | $\cdot$ | incident ray |
| :--- | :---: | :---: |
| A. | $I$ | $\frac{\text { emergent ray }}{\text { IV }}$ |
| B. | $I$ | $V$ |
| C. | $I I$ | $I V$ |
| D. | $I I$ | $V$ |
| E. | $I I I$ | $V$ |

19. Which of the following is a property of a sound wave?
s. It does not require a material medium.
B. It is an electromagnetic wave.
C. It is a transverse vibration.
D. It travels most rapidly in a vacuum.
E. It is a longitudinal vibration.
20. Sound waves differ from electromagnetic waves in the following respects:
I. Sound waves cen't be refracted.
II. Sound waves have a greater velccity in a denser medium.
III. Sound waves can only travel in a gaseous medium.
f. I only
B. II only
C. III only
D. I and II oniy
E. None of the gbove
21. in sound wave of frequency $f$ travels in air with a velocity $c$. Under the same conditions, the velocity of the sound wave of frequency if will be
A. $\quad 1 / 2 c$
B. $c$
C. $2 c$
D. 4 c
E. undetermined
22. Two men $A$ and $B$ stand on a line vertical to and in front of a high wall. The distance between, $A$ and the wall is 330 m , between $B$ and the wall is 660 m . When i makes a whistle, $B$ hear the sound first and then the echo from the wall. Let the velocity of sound be $330 \mathrm{~m} / \mathrm{s}$, find the length of time between the sound and echo $B$ heard.
$\therefore \quad 0$
B. 1 sec
C. 2 sec
D. 3 sec
E. 4 sec
23. With respect to a sound wave,
I. the pitch depends on frequency.
II. the quality depends on velocity
III. the loudness depends on amplitude

Which of the above statements is/are correct?
h. I only
B. II only
C. III only
D. I and II only
E. I and III only
24. The quality of the same note produced from different musical instruments depends on
I.. the combination of overtones.
B. the length of the sound wave.
C. the energy of the sound wave.
D. . the amplitude of the sound wave.
E. the density of the medium transmitting the sound.
25. A commonly used method of tuning a sonometer wire into resonance with a tuning fork employs a paper rider.
Which of the following statements is/are true?
I. the wire vibrates because energy taken from the tuning fork is transferred to the wire and the paper rider.
II. the position of the rider is unimportant. 2
III. the mass of the rider is unimportant.
A. . I only
B. I and II only
C. I and III only
D. II and III only
E. I, II and III
26. Which of the following is/are transverse waves?
I. Light waves
II. Sound waves
III. Water waves
h. I only
B. II only
c. I and II only
D. I and III only
E. II and III only
27. Of the following radiations, the one which has nearly the same natures as $X$-rays is
$\therefore$ infrared
B. ultraviolet
C. visible light
D. radio wave
E. gamma-ray
28. F. M. broadcasting with a frequency 92 MHz is transmitted by radio Hong Kong every day. The wave length of this broadcasting is approximately.
si 0.3 m
B. $186 \times 10^{14} \mathrm{~m}$
C. $3 \times 10^{8} \mathrm{~m}$
D. 3.3 m
E. 1.7 m
29. If the distance between a point source of light and a surface is tripled, the intensity of illumination on the surface will be
$\therefore$ triple
B. doubled
C. reduced to $1 / 2$
D. reduced to $\gamma_{3}$
E. reduced to $1 / 9$

## APPENDIX 9

## FHYSTCS TEST

1) We can see the image cf ourselves in the plane mirror but not on a plane sheet of white paper because
(A) white paper transmitted nearly all the light falling on it.
(B) white paper absorbed all the light falling on it.
$\checkmark$ (C) light is diffusely reflected from the white paper.
(D) the image formed in white paper is virtual.
(E) the refractive index of white paper is unkown.
2) The rays $A$ \& $B$ diverging from a point source $P$ are reflected from a plane mirror MM'. The reflected rays $C \& D$ will now diverge at an angle of
(A) $5^{\circ}$
(B) $10^{\circ}$
(C) $20^{\circ}$
(D) $30^{\circ}$

) Whenever the centers of the sum, moon and earth are in a straight line (in Fhat order):

I some part of the earth is in the moon's penumbra
II some part of the earth must be in the moon's umbra
III some part on the earth can see a total eclipse of the sun reali.
Which of the above statements is/are true?
(A) I only
(B) II only
(C) III only
(D) I \& II only
(E) All three
4) Which of the following mirrors can give an image (real or virtual) of the same dize as an object which is not in contact with the mirror?

I concave mirror
II convex mirror
III plane mirror recili
(A) I only
(B) III only
$V(D)$ I \& III only
(E) All three
5) In the figure, the position of the pin has been so adjusted that the pin and its image may be observed with no parallax between them. What is the focal length of the mirror?
(A) 12 cm
(B) 20 cm
(C) 24 cm
(D) 40 cm
(E) It cannot be determined from the information given.

6) Rays from a point source at $U$ are reflected by a concave mirror $M$ and converge to a point $V$ as shown in the diagram. If we wish to obtain a parallel beam of light after reflection, we could

| I move the mirror closer to $J$ |  |
| :--- | :--- |
| II | move the mirror away from $U$ |


(A) I only
(B) II only
(C) III only
(D) I \& II only
(E) II \& III only
7) Total internal reflection can cocur at a surface of separation between a dense medium $X$ and a rare medium $Y$ only when
I. the refraotive index for light from $X$ to $Y$ is greater
than 1
if the angle of incidence is greater than the critical
angle
III the ray travels from $X$ towards $X$
7) Which of the above statements Lefare correct?
(A) I only
$\checkmark$ (D) II \& III only
(B) II only
(D) All three
(c) I \& II only
8) The angle of incidence of a ray of light on a liquid is $45^{\circ}$ and its angle of refraction is $30^{\circ}$. What is the critical angle of the liquid? apphation.
(A) $75^{\circ}$
(B) $60^{\circ}$
(c) $45^{\circ}$
(D) $30^{\circ}$
(E) $15^{\circ}$
9) The diagram shows a thin-wailed prism filled with air. The air prism is immersed in water. A ray of. light is incident along the line $A B$. Along which line will the light emerge?
(A) 1
(B) 2
(c) 3
(D) 4

(E) 5 cinppretivenom
10) The path of a ray of light through a glass prism can be found if we know:
I. the refractive index of the glass
II the refracting angle of the prism
III the angle of Incidence at one side of the prism
(A) III only
(B) I \& II only
(D) II \& III only
(E) All three
(c) I \& III only
11) A diver at $h$ metres under water looks up at the water surface and observes the sky appears to be a circle. What is the diameter of the circle if the critical angle of water is C? (in metre)
(A) $h \tan C$
$\gamma(B) \quad 2 h \tan C$
(C) $2 \mathrm{~h} \sin \mathrm{C}$
(D) $\frac{h}{\sin C}$
(E) $\frac{2 h}{\sin C}$
afflicutar.
12) In the diagrams shown, the critical angle of glass is $42^{\circ}$. Which diagram shows the correct path for the light ray through the prism?
(A)
(D)

(B)

$J$ (E)

(C)

upfricution
13) When a lens is placed at $M$, a real, inverted and magnified image of the illuminated pin is seen on the screen. When the lens is moved to position $N$, a sharp image of the pin is seen again. This image will be

(B) real, inverted and diminished.
(A) real, inverted and magnified.
(D) real, erect and magnified.
(E) virtual, erect and magnified.
compsetuensioss
14)


Two parallel rays of light pass through a box containing a piece of glass and emerge as shown.
I)

II)

iv)
14) Which of the above pieces of glass could produce this results cemprikneam
(A). I only
(B) III only
(D) I or IV
(E) All four
(c) II or III
15) When the eye is looking at an image in the mirror, the image formed on the retina of the eye is virtual BECAUSE the image which appears in the eye is virtual.


The diagram shows two incoming
parallel rays of light which pass
through a lens I. The ray PQ
after passing through the lens
will pass through the point.
 pairs are the correctly drawn rays?

|  | Incident Ray | Emergent Ray |
| :---: | :---: | :---: |
| (A) | $I$ | IV |
| (B) | $I$ | $V$ |
| (C) | $I I$ | IV |
| (D) | II | $V$ |
| (E) | III | $\ddots$ |

18) A red disc is placed on a green grass ground and is then illuminated with coloured light given below, which could make the disc indistinguishable from its background?
(A) magenta
(B) blue
(C) green
(D) white
(E) red
19) Red and blue filters are placed directly in the path of white light. what is the colour of the light coming through?
(A) black (no light pass through)
(B) green
(C) yellow
(E) magenta
(D) white ;
20) 

 shown. The wavelength of the sound is (in $\mathfrak{m}$ )
(A) 0.15
(B) 0.3
(C) 0.45
(D) 0.6
(E) 0.9
21) Sound waves differ from electromagnetic waves in the following respects:

I Sound waves have a larger velocity in a denser medium
II Sound waves can only travel in a gaseous medium
III Sound waves cant be refracted.
22) A sound wave of frequency $f$ travels in air with a velocity $C$ © Under the same conditions, the velocity of the sound wave of frequency $2 f$ will be
(A) 4 c
(B) $2 c$
(C) $c$
cornfuninnain
(D) $1 / 2 \mathrm{c}$
(E) cannot be determined
C.
23) Two men $X$ \& $Y$ stand on a line vertical to and in front of a high wall. The distance betwean $X$ and the wall is. 330 m , between $Y$ and the wall is 660 m . When $X$ makes a whistle, $Y$ hear the sound first and then the echo from the wall. Let the velocity of sound be $330 \mathrm{~m} / \mathrm{s}$, find the length of time between the sound and echo $Y$ heard (in sec.)
apphication $C$
(A) 4
(B) 3
(C) 2
(D) 1
(E) 0

The diagram shows a disc siren, the pitch emitted by this. disc will depend on

I the number of revolutions the disc turns through per second
II the distance of the whales from the axle of the disc reali
III the number of holes in the disc. c
(A) II only
(B) I \& II only
(c) I \&III only
(D) II \& III only
(E) $\Lambda I 1$ three
25) Two loudspeakers A \& B broadcast the same pure note. The sound from loudspeaker $A$ is louder than that from loudspeaker B. The sound waves produced by $A$
(A) have greater amplitude than those byty. reall
(B) have longer wavelength than those byly.
(C) have shorter vavelength than those byby.
(D) have higher frequency then those byby.
(E) travel faster than those by by.
26) The quality of the same note produced from different musical instruments depends on
(A) the length of the sound wave.
recali
(B) the energy of the sound wave.
(C) the amplitude of the sound wave.
(D) the combination of overtones.
(E) the density of the medium transmitting the sound.
27) When the air in a tube closed at one end and open at the other is made to vibrate, it has
recali
(A) a node at the close end.
(B) an antinode at the closed end.
B.
(C) an antinode exactly at the open end.
(D) maximum amplitude halfway along its length.
(E) the frequency of any strongly vibrating tuning fork placed near the open end.
28) A sonometer wire emits a note of frequency 300 Hz when under a teusion of 2 kgf . If the tension is increased to 8 kgf and the length is kept constant, the frequency of the note becomes (in Hz ).
applincation
C.
(A) 4800
(B) 1200
(c) 600
(D) 150
(E) 75
29) A commonly used method of tuning a sonometer wire into resonance with a tuning fork employs a paper rider. Which of the following statements is/are true?

## I the mass of the rider is unimportant

II the position of the rider is unimportant
III the wire vibrates because energy taken from the tuning fork is transferred to the wire and the paper rider.
(A) I only
(B) II only
(C) III only
(D) I \& II only
(E) I \& III only

30) Sound is produced by pouring water into a resonance tube closed at one end. As the tube fills, it is found that

I the pitch of the sound produced becomes lower and lower II the pitch of the sound produced becomes higher and higher III the velocity of the sound produced remains constant.
(A) I only
(B) II only
(D) II \& III only
(E) All three
(C) I \& II only

END OF PAPER

 woe An (b, se, Den)

APPENDIX 10

CHINESE TRANSLATION OF POST-TEST 2


$\qquad$ HONG KONG CERTIFICATE OF EDUCATION EXAMINATION $\qquad$
让题號数
Question No． $\qquad$
那一间固题示光溸的正碚路㖕
A．


盆中的针与其像
通置造一透镜看長全十，图一
影主针勿其像的位置，学顽新白左迸，坽（宗午）和像如周二所示。下列何者正挽


A．又有亚，B只有工及亚
C．只有工及项D 久有工昭
E．又有丘 借

A．$\quad 3 x \tan \theta m$
C．$\quad x \tan \theta_{m}$
B． $2 x \sin \theta m$
D．$\frac{x}{\sin \theta} m$

E．$\frac{2 x}{\sin \theta} m$
$\frac{\sin \theta}{\left.\left.\pi\right|_{\pi} ^{\theta}\right|_{\text {arer }} ^{\theta}}$

13．T列何医域工正正义要可被看到边丮的里？
A传工巩 B．只有工及正
c． 8 有工政\＆

E所有區域䖪均奇看到。

確
开第一倜像是時䒚都•近焦面
II目镜是用作筸単放大镜以观啇

I．最级时像是放大的像。
A．又有工，B只有I
C明有无
D有项要正
E．ISI及I．


## APPENDIX 11

## Teaching Schedule of F. 4 Physics (1979)

| Date | Period | Content | Page |
| :---: | :---: | :---: | :---: |
| $7 / 2$ | 1 | What is force, gravitational force | P. 13 |
| 9/2 | 2,3 | Centripetal force, Weights of standard masses, Why the weight of a body varies, relation between gravitational force and weight, action and reaction forces, weightlessness, weightlessness in space vehicles, artificial weight in a space station, friction, static friction, sliding friction, coefficient of friction, the nature of friction, friction and brakes, lubrication, air lubrication, further developments. | $\begin{gathered} \mathrm{P} .14 \\ \mathrm{P.} 20 \\ (\mathrm{Ch} .2) \\ \hline \end{gathered}$ |
| 13/2 | 4 | Discussion of exercise 2, average speed, actual speed, scalar and vector quantities, distance and displacement. | P. 21 |
| 15/2 | 5,6 | Experiment to determine the coefficient of limiting static friction between two solid surfaces, velocity, uniform velocity, acceleration, uniform acceleration. | $\begin{gathered} \mathrm{L} .56-57 \\ \mathrm{P} .23 \\ (\mathrm{Ch} .3) \end{gathered}$ |
| 19/2 | 7,8 | Equations of uniformly accelerated motion, velocity-time graph, uniformly accelerated motion represented graphically, velocity from distancetime graph, acceleration from velocity-time graph, worked examples, Galileo Gallilei, the simple pendulum experiment to study the simple pendulum, the measurement of $g$. | $\begin{aligned} & P .24 \\ & P .30 \end{aligned}$ |
| 21/2 | 9 | Distance moved by a freely falling body related to time of fall, to measure $g$ by use of a centisecond timer, discussion of exercise 3. | $\begin{gathered} P .31 \\ P .34 \end{gathered}$ |
| 23/2 | 10,11 | Newton's first law of motion, momentum, Newton's second law of motion, weight of a body/' expressed in newtons, to calibrate a spring balance in newtons, use of a calibrated spring balance, can a spring balance be used to measure mass as well as weight, weight of a body in a lift. | $\begin{gathered} P \cdot 35 \\ P \cdot 37 \\ P \cdot 40 \\ P_{4} 43 \\ \left(\mathrm{Ch}_{\bullet} 4\right) \\ \hline \end{gathered}$ |



| Date | Period | Content | Fage |
| :---: | :---: | :---: | :---: |
| 20/3 | 24 | Worked examples, discussion of exercise 6. | $\begin{aligned} & P_{0} 73 \\ & P_{0} 75 \end{aligned}$ |
| 22/3 | 25:26 | Work, energy, mechanical energy, interchange of energy between potential energy and kinetic energy, internal energy, transfer of energy from one kind to another, heat energy, the sun as a source of energy, the uranium bomb, the conservation of energy and mass, thermonuclear energy. | $\begin{gathered} P_{0} .76 \\ !.83 \\ \left.\mathrm{P}_{0} .8 \mathrm{Ch} \cdot 7\right) \\ \hline \end{gathered}$ |
| 23/3 | 27 | Power and its unit, to measure personal power, kinetic energy. | $\begin{aligned} & p_{0} 84 \\ & p_{0} 85 \end{aligned}$ |
| 26/3 | 28,29 | Internal combustion engines, worked examples, discussion of exercise?. | $\begin{aligned} & P: 86 \\ & P_{0} 89 \end{aligned}$ |
| 28/3 | 30 | The lever, mechanical advantage, mechanical advantage of a lever, pulleys, the single fixed pulley, the single moving pulley, direction of tension in a string. | $\begin{gathered} P \cdot 90 \\ P_{0} 92 \\ (\mathrm{Ch} .8) \\ \hline \end{gathered}$ |
| 30/3 | 31,32 | The block and tackle, velocity ratio, work done by. a machine, efficiency, relation between M.A., V.R., and efficiency, the inclined plane, the screw, experiments to determine the M.A., V.R. and efficiency of a block and tackle system, then an inclined plane. | $\begin{aligned} & \mathrm{P} 093 \\ & \mathrm{P}!96 \\ & \mathrm{~L}_{0} 77 \\ & \mathrm{~L}_{0} 80 \end{aligned}$ |
| 2/4 | 33 | Wheel and axle principle, gears, the hydraulic press. | $\begin{aligned} & P_{0} 97 \\ & P_{0} 100 \end{aligned}$ |
| 3/4 | 34 | Discussion of exercise 8. | $\begin{aligned} & P .101 \\ & P .102 \end{aligned}$ |
| 20/4 | 35,36 | Test (Ch. $2-8$ ). |  |

## APPENDIX 12

TEST IN MECHANICS
(ANGLO-CHINESE SCHOOL ONLY)

## STATICS AND DYNAMICS

易
The coefficient of static friction between two solid surfaces in contact depends only on
A．the surface area in contact．
B．the limiting friction between the two surfaces．
C．the normal reaction between the two surfaces．
（D．the texture of the surfaces in contact．
E．None of the above
If A 5 kg metal is eliding on a horizontal metal surface Let the coefficient of sliding friction be $\frac{1}{10}$ ，find the required horizontal force．
A． 0 kg wt

C． 2 kg kt
D． $5 . \mathrm{kg}$ 畂
E． 50 kg Wt
compteherourn

Finch of the following pieces of apparatus measure（s）weight on iv，and doles）compare masses？

A．I only
B．II only
C．III any
D．I and II only
E．II and III only

A会 An object，moving up a smash inciliod plane making an anglo $\theta$ with
horizontal，dccroasis its epcot from $x$ to $I$ w／．What is the distance travelled in this yニニ゙ーou：
s．$\frac{x^{2}}{2} \frac{x^{2}}{2}$ micros
B．$\frac{x^{2}-y^{2}}{2 g \cos \theta}$ notres
appinction
c．$\frac{x^{2}-\frac{r^{2}}{2 E} \sin Q}{\sin 6}$
D．$\frac{2(X-Y)}{6 \sin \theta} \operatorname{metres}$
玉．$\frac{(X . . 甘)}{\partial g \sin S}$ mitres

for A metric ephereon a horizontal plane is given a push so that it quickly runs off the edge of the plane．If air resistance is negligible，what is its vertical displacement downwards in $1 / 2$ second after it has left the plane？（Acceleration due to gravity $=10 \mathrm{~m} \mathrm{~s}$－
A． 5 m
B． $2 / 2=0$
．$\quad 17 \mathrm{~m}$
D． 0 m

E．uncertain，for it does not start with zero velocity
＊．The time of a simple pendulum making small oscillations depends upon
A．the length of the string and the acceleration due to gravity．
B．the mass of the bob and the angle of swing．
$\sec 32$
C．the mass of the bob and the length of string．
D．the mass of the bob and the acceleration due to gravity．
E．the length of the string and the angle of swing．
\＃\％Two objects，$X$ of mass 5 g and $y$ of mass 10 g are，projected vertically upwards at the same time with the same velocity of projection．Assuming －the air resistance is negligible．
A．Y will come to rest first．
B．X will reach a point higher than $Y$ ．
C．both objects have the same potential energy at the highest point．
D．both objects rise with the same retardation．
E．both objects have the same kinetic energy just before getting to the ground．
（）．The period of oscillation of a simple pendulum is 1 second at the surface of the earth．If the acceleration due to gravity at the mon＇s surface is $1 / 5$ of that on the earth，what is the period of oscillation when the
pendulum is on the moon？
A． $1 / 5$ second
B． $1 / \sqrt{5}$ second
C．$\sqrt{5}$ seconds

Q．If the resultant of all forces acting on a body is zero，the body may be
is accelerating．
Bo decelerating．
C．falling under gravity．
D．moving with uniform velocity．
E．，moving along a circular track with uniform speed．
40 A body of mass 10 kg is moving with a velocity of $5 \mathrm{~m} / \mathrm{s}$ force required to stop the body completely in 2 seconds？What is the
A． 1 N
B． $4 N$
c． 25 N
D． 50 N
E． 100 N
ff．A black of mass 10 kg is put on the floor of a case．If the whole system
is now falling freely from rest under gravity，what is the magnitude of the normal reaction betti：$n$ the block and the floor？
A． 0 kgf
B． 10 kgf
C． 970 kgf
D． 980 kg f
E． 990 kgf

The weight of a 10 ks object is handing on a spring balance in an elevator．then the elevator ir
（A）moving up with constant velocity $5 \mathrm{~m} / \mathrm{s}$
（B）moving up witt constant acceleration $2 \mathrm{~m} / \mathrm{s}^{2}$ ．
The reading from the earing balance will be：


A lamp of mass 100 g hangs at the end of a light wire．A light string knotted at the made of the wire exerts a horizontal pull until the upper portion of the fire inclines at an angle of $30^{\circ}$ to the vertical． What is the tension of the horizontal string？
A． 0 gf
B． 50 gf
D． $100 \tan 30^{\circ} \mathrm{gf}$
E． $100 \tan 60^{\circ} \mathrm{g} \mathfrak{f}$


A load $\begin{aligned} & \text { Wests on } \\ & \text { on } \\ & \text { inclined plane．The coefficient of kinetic friction }\end{aligned}$ is $M$ ．What is the minimum pull $F$ required to keep the body 7 moving at steady speed up the plane？
A．$+\mu w \cos \theta$

$$
\begin{aligned}
& \text { B. } W(\sin \theta+\cos \theta) \\
& D \cdot W \sin \theta+\mu \forall \sin \theta
\end{aligned}
$$

C．$W \sin \theta+\mu N \cos \theta$
E．$\cdot$ 婴 $\cos \theta+\mathrm{M}^{2} \sin \theta$
A body of mass 10 g rests on a rough inclined plane at an angle of $30^{\circ}$ to the horizontal．If the body does not move，what is the frictional force between the body and the inclined plane？
B． $0.866_{\mathrm{gf}}$
C． 5 gf

A． 0.0 .5 gf
$\mathrm{Da}_{\mathrm{a}} \cdot 8.66 \mathrm{gf}$
E． 10 gf

application
In the diagram，what is the effort required to lift the load？
A． 96 kgI
B． 144 kg 5
C． 160 kgf
D． 9.5 kgf
E． 16 kgf


A hinged thapina: is homs $i$. the $p$ edition shown by the rope. Under these conditions tie saracen ut fore on the hinge mill
A. be vertical.
B. bs herizatiol.
C. be directed firgogh the lie. of the trapdoor.
n. be framing to th tow.

Which of the foll
II
II rus in
III
Town
III Pow:
recall
A. I only
D. I end II only
B. Ti coly
B. -.. II an III
c. III only


In the above diagram, the moment of the force $F$ about the point $A$ is
A. $F \times A B$.
B. $\quad=\times A C$
C. $F \times A D$
D. $F \times B C$
E. $P \because B D$

20


When a meter stich: is $s=a-n$ shown, it will he in equilibrium. If the pivot point is moved to the 6 cm point, find the position of $E$ so that the gystin bnecrac ronisib-tum ageing. (assume the weight of the miter stich is zero.)
A. 28 cm
B. 34 cm
C. 41 cm
D. 66 cm
E. 76 cm

application

A uniform metre rule of weight 0.500 N is maintained in equilibrium as shown above that is the value of the weight $X$ ?
A. 0.250 N B. 1.500 N C. 4.000 N D. 4.125 N E 4.750 N



The figure represents a uniform lamina in the two shaded portions cut out. The centre of the mass of the remaining portion is
A. in the first quadrant.
C. in the third quadrant.
B. in the second quadrant.
E. outside the ${ }^{\text {norge circle. }}$
D.: in the fourth quadrant.

Th a A body of mass $m$ holograms is dropped a point $h$ metres above the ground． When it reaches a point $x$ metres above the ground，its kinetic energy in joules is（Acceleration due to gravity $=$ E）
A．mex
B． $1 / 2 \mathrm{mx}^{2}$
C．meh
application
D． $\operatorname{rgg}(h-x)$
E．$y_{4} \cdot m\left(n^{2}-x^{2}\right)$

Using the following symbols：

```
\(F=\) force'exerted
\(B=\) distance moved
\(t=t i m e\) taken for the force to move through distances
\(v=\) velocity of motion
```

The power produced by a machine is given by
A．Es
B．$F / t$
CiV
D．$F / E$
F．$F t / V$

W The work required to bring a moving object to est is directly
proportional to its
A．velocity B．momentum
D．potential energy $E$ ．kinetic energy

corpretinuoin 64
＇the load is 600 N ，the efficiency of the pulley system shown is 50\％．This means that
A： 300 N is required to lift the load
B． 300 N is just able to prevent the load from falling
G． 400 N is just able to lift the load
A．＂． 400 N is able to prevent the load from falling
E． 600 N is just noble to lift the 20 ad ．


A load $L$ is pulled up as inclined plane by a force $F$ ．The velocity． ratio of this inclined plane is
A．$\frac{Y Z}{X I}$
B．$\frac{X Z}{X I}$
c．$\frac{X Z}{X Z}$
D．$\frac{X I}{Y Z}$
E．$\frac{X Y}{X Z}$

> recall

For a given machine，which of the following depend（s）on the road？$\because$
I Velocity Ratio
II Mechanical advantage
III Efficiency
A．I only
B．II orly
C．I．and II only
D．I and III only
F．．II and III only ！


A wooden block of $\bar{y}$ g weight rest on a hinged wooden plane．One end of the plane is raised slowly until the block just begins to slide．If this occures at angle $\theta$ ，which of the following is true？
A．The kinetic coefficient of friction is ain $\theta$
B．The kinetic coefficient of friction is tan $\theta$
C．The static coefficient of friction is $W$ sin $\theta$
D．The static coefficient of friction is $W \cos \theta$
E．The static coefficient of friction is $\tan \theta$

The acceleration exists when the magnitude and direction of the motion of the body is/are described below.

Magnitude of velocity

constant
variable
B. ii only
(E. ii and iii only

## Direction of Velocity

constant
constant
variable $\quad \therefore \quad . \quad$.
c. iii only

35: A stone is thrown vertically upwards, at its highest position it has
I zero velocity
II no acceleration
III maximum kinetic energy
mich of the above statements is/are correct?
A. I coly
B. II only
D." I and II only
E. I and ITI only
C. III only
32. Consider the following, which are correct?

1. Force is that which changes a body's state of rest or uniform motion in a straight line.
2. An object weighs heavier at the equator than at the North Pole.
3. Heights and mass are both constant when an object ifs raised from sea-level to space.
4. Artificial weight on a space station depends a lot on the speed of rotation of the station.
A. 1 and 2
B. 1 only
C. 1 and 4
D. 3 only
E. 1, 2 and 4
5. A simple pendulum with a period 1 second on the earth has a period of $y / 2$ second on a certain planet. If the acceleration due to gravity is $9.8 \mathrm{~m} / \mathrm{sec}^{2}$, what is the acceleration due to gravity on the planet?
A. $19.6 \mathrm{~m} / \mathrm{sec}^{2}$
B. $4.9 \mathrm{~m} / \mathrm{sec}^{2}$
C. $39.2 \mathrm{~m} / \mathrm{sec}^{2}$
D. $2: 45 \mathrm{~m} / \mathrm{sec}^{2}$
E. cannot be determined because both the mass and length of the pendulum i's not given
6. When pe say that the mechanical advantage of a machine is 15, we mean that
A. the work done by the machine is 15 tines the work put into it.
B. the resistance overcome by the machine is 15 tires the force applied
to it.
C. the load mores through 15 times the distance moved by the effort.
D. the porer put into the machine is 15 times that got out of it.

So the frictional force is 15 times that of the effort.
35. Two skaters $A$ and $B$ on a small level pond have speeds of $0.9 \mathrm{~m} / \mathrm{s}$ and $0.6 \mathrm{~m} / \mathrm{s}$ respectively. They collide head on in a gentle manner and link arms. Both skaters have the same mass. Their common velocity after collision is
A. $0.3 \mathrm{~m} / \mathrm{in}$ the original direction of $A$.

Bo $0.3 \mathrm{~m} / \mathrm{s}$ in the original direction of $B$.
C. $0.15 \mathrm{~m} / \mathrm{s}$ in the original direction of A .
D. $0.15 \mathrm{~m} / \mathrm{s}$ in the original direction of $B$.
7. none of the above
36. An inclined plane 10 m long has one end on the ground and the other end on a platform 6 m high. A man of mass 150 kg wishes to push a 90 kg object up this plane. The force of friction is 10 kg .
The minimum force he must exert is, in kg, approximately
A. 10
B. 54
(C. 64
D. 90
E. 100
37. In order to hold the object on the plane without letting it slide, the minimum force required is, in $k g f$, approximately
application
A. 0
B. 10
C. 44
D. 54
E. 64
48. The potential energy gained by the object when $i t$ is at the top of the plane is, in kg i - m
A. 100
B. 324
C. 540
D. 640
E. 900
39. The eificiency of a machineis defined as

> C. M.A.N.R. Kcaíl
A. 10sd/effort
B. effort/load
D. output/inprat
E. inpat/output
40. A bullet of mass $m \mathrm{~kg}$ and velocity $\mathrm{Vm} / \mathrm{s}$ is brought to rest in $t$ eeconds ly a sandbag. The deph penetrated (in metres) is
A. V met
B. Vt
C. $V t / 2 \mathrm{~m}$ abtication
D. $v t / 2$
B. $2 t \mathrm{~V} / \mathrm{m}$

4\%. An object whose mass is 100 gsi starts from rost un moves oith constant acceleration of $20 \mathrm{~cm} / \mathrm{sec}^{2}$. At the end of 8 sec ats moneatum is, in gricm/sec.
A. 500
B. 8000
C. 16000
afplicatism.


$$
\begin{aligned}
& \text { qut. fity } \\
& \text { H.H.Wong (RSSH:N, ped } \\
& \text { K.K.HC }
\end{aligned}
$$

APPENDIX 13

LESSON PLANS IN ATOMIC PHYSICS

0 N

EFFECT OF MEDIUM OF INSTRUCTION UPON STUDENT LEARNING IN MATHEMATICS, SCIENCE

AND HISTORY. AT FORMS II, III AND IV LEVELS

Second Stage:

Four Lessons on ATOMIC STRUCTURE AND RADIOACTIVITY at Form IV Level

School of Education

April 16, 1979

## Atomic Structure and Radioactivity



Lesson One: Atomic Structure (40 minutes)
I. The Atomic Theory
II. Atomic Models
III. Nucleus, Mass Number, Atomic Number

Lesson Two: Isotopes and Radioactivity (25 minutes)
I. Isotopes and Its Chemical Properties
II. Radioactivity and Its Discovery

Assessment One: (15 minutes)
15 multiple-choice questions for Lessons One and Two

Lesson Three:Radiation and Half-Life ( 40 minutes)
I. alpha, beta and gamma radiations
II. Half-Life and Decay Time
III. Carbon Dating

Lesson Four: Tracer and Atomic Energy in Peaceful Uses (20 minutes)
I. Tracer in Peaceful Uses
II. Atomic Energy in Peaceful Uses

Assessment Two: (20 minutes)
20 multiple-choice questions for Lessons Three and Four

## Time

Allocation
I. The Atomic Theory

5 The belief that complex substances are composed of simple, elementary components existed in ancient Greece. We know that almost every substance can be brcken into smaller parts. About 2500 years ago, a Greek philosopher, Democritus taught that by breaking substances into smaller and smaller parts, one would finally reduce matter to its smallest particles, which could not be broken down any further. These smallest, indivisible particles were called ATOMS.

According to Democritus, atoms, like grains of sand, when packed together could be moulded into any form, so that everything in nature could be built with atoms.

## II. Atomic Models

a. J.J. Thomson Model

Ators had been pictured as small, hard indestructible particles until 1897. When the electron--- a negatively charged particle much smaller than the atom, was discovered. In the next year, J.J. Thomson, the English scientist, who discovered the electron, proposed a so called 'plum pudding' model.

In his model, atoms are pictured as small spheres of positively charged matter in which electrons are embedded. (Figure 1). The atom should look somewhat

HANG THE. FIGURE OF THOMSON MODEL.

Thomson proposed a plum-pudding model of the atom. He pictured atoms as small spheres of + charged matter in which electrons are embedded. like a snowball with some pebbles or a lump of raisinstudded pudding.


## 2500 years ago,

 Democritus taught that by breaking matter into smaller and smaller parts, it mat be reduced into its smallest particles--the atoms.
## Teacher's Guide

## b. Ruthorford-Bohr Model

The Thomson model was soon discarded as it failed to comply with new experimental findings. Thirteen yenrs later, another English scientist, Ernest Rutheriord proposed the 'Nucleon Model', (Ficure 2) here tise atom consists of a nucleus at the centor suxrounded by electrons which negetively charged. by Niels Bohr, a Danish scientist.

Bohr picturd the atom as a miniature solar system. Inside the atom, electrons, like those planets revolving round the sun, are whirling round a tiny positively charged particle callee the NUCLEUS. (Figure 3)

## c. Our present view

Planets move round the sun in definite orbits but electrons are not. They are whirling round the nucleus with a very high speed, changing their orbits all the time. Because of their rapid motion, it is impossible to find their positions at any instant. The electron can still be found 'somewhere' round the nucleus, but its position can be described only in terms of 'probabilities'.
III. Nucleus, Mass Number and Atomic Number

## III-1 The Nucleus

The nucleus, being much smaller than the atom, has a diameter $\frac{1}{10000}$ part of the diameter of the atom; thus atoms consist larcely of empty space. To have some idea of the relative sizes of the nucleus and the atom: if the nucleus were enlarged to the size of a small glass marble, the whole atom would be as big as a fiant balloon measuring more than 300 feet across.

Since clectrons are much lighter than atoms, (less than one-thousandth part), so that nearly all the mass of the atom is concentrated in the tiny but heavy nucleus.

```
The nucleus, + charged, is much smaller than the atom.
The nucleus holds nearly
all the mass of the atom.
```


## III-2 Particles of Nucleus-- Protons an $d$ Neutrons

5 Scientists found that the nucleus is composed of two kinds of particles-- protons and neutrons. The proton is a positively charged particle, possessing a positive charge equal in magnitude to that of the electron. In a neutral atom, the number of protons is equal to the number of electrons. Its mass is about 2000 times that of an electron.

The neution does not carry any charge, its mass is the same as the proton. For some atoms, the number of neutrons is equal to the number of protons. But in some heavy atoms, those having large number of protons and neutrons, the number of neutrons is larger than the rumber of protons.

```
Nucleus-- protons and
```

    neutrons.
    Proton, + , equal to that
of an electron.
$m_{\text {proton }} \dot{=} 2000 \mathrm{~m}_{\text {electron }}$.
for a neutral atom,
no. of $p=$ no. of $e$
Neutron, no charge,
$m_{\text {neutron }} \doteq m_{\text {proton }}$
in general,
no. of $n \geqslant$ no. of $p$

III-3. Mass Number and ATomic number
5 Protons and neutrons ar: the component particles of all atomic nuclei. fio nelp in identifyrg various nuclei, scientists deined two numbers, the atomic number and the mass number.

The number of protons inside the nucleus is called the Atomic Number and is denoted by the synbol 2 .

The total number of protons and neutrons is called
$z=$ atomic no. (no. of $p$ )
$A=$ mass no. (no. of $p+n$ ) the Mass Number and is denoted by the simbol $A$.

Less commonly, the number of neutrons is represented by $N$, which can be found by using the formula

$$
N=A-Z
$$

when $A$ and 2 are known.

Examples: $C$ atom - 6 protons \& 6 neutrons in nucleus $\square$
$\therefore Z=6, \quad A=6+6=12$
Na atom-- 11 protons and 12 neutrons
$\therefore \quad Z=11, \quad A=11+12=23$
III-4 Symbolic Representation of Nuclei

5 To represent helium, cherists use the abbreviated symbol : He. Nuclear physicists are more particular, they represent the nucleus of helium as $2^{H e}{ }^{4}$ where the top-right no. - mass number and the bottom-left no. = etomic number
From this symbol, we know at once that there are 4 particles in the nucleus, 2 protons and 2 neutrons.

In gereral, if $X$ is the symbol of the element, its nucleus is represented as $z^{X^{A}}$. The number of component particles are clearly given from the symbiol.
Example: $6^{\mathrm{C}^{12}}, 11^{\mathrm{Na}^{23}}, 92^{\mathrm{U}^{238}}$

```
The nuclei of an
element X is represented
by }\mp@subsup{z}{}{\mp@subsup{X}{}{A}
```

Lesson Two: Isotopes and Radioactivity (25 minutes)

## I. Isotopes and Its Chemical Properties

I-1 Chemical Proverties and Atomic :umber
All atoms of an element contain the same number of protons. The chemical properties of an element

Chemical properties depend on atomic no.
is determined ry the number of electrons in an atom, which is equal to the atomic number of the element.

According to the atomic theory, all atoms of an element should be identical. They should have the same size, mass and structure.

Scientists discovered that an element may consist

Atoms of the same element but of different masses exist-- they are called ISOTOPES, having the same $Z$ but different $A$. of several kinds of atoms with different masses. These atoms of the same element have the same number of fromer The various species of an element having different masses are called its ISOTOPES.

I-2 Examples of Isotopes
Ordinary hydrocen atoms has 1 proton in its nucleus. $\square$ There are also two ${ }^{\text {sthinds }}$ of hydroyen atoms which have one and two more neutrons respectively in their nuclei. These are called 'heavy kydrocen'. The
3 isotopes are represented hy $\frac{H^{1}}{35},\left({ }_{1} \mathrm{H}^{2}\right)\left({ }_{1} \mathrm{H}^{3}\right)$
Chlorine has 2 isotopes: $17^{\mathrm{C1}} \cdot 17^{\frac{1}{35}} \mathrm{Cl}$
Oxygen has 3 isotopes: $\quad 8^{0^{16}},\left(8^{0^{27}}\right),\left(80^{18}\right)$
Lead has 4 isotopes: $82^{\mathrm{Pb}^{204}}, 82^{\mathrm{Pb}^{206}}, 82^{\mathrm{Pb}^{207}}, 8^{\mathrm{Pb}^{208}}$
Carbon has 3 isotopes: $\quad 6^{6^{12}}, \quad 6^{\mathrm{C}^{13}},\left(6^{\mathrm{C}^{14}}\right)$
Isotopes underlined exist in majority abundance, while the ones in brackets have an abundance of less than $1 \%$.
II. Redioactivity and Its Discovery

## II-I Qiscovery of Radioactivity

## of discovering radivactivity

The story happened in a dull, misty day in 1896. A French scientist, Henri Becquerel, placed a. uranium selt on a photo plate in a dark drawer. The plate was found to be fogged after development.

Becquerel accidentally discovered that a photo plate was exposed by uranium.

> The uranium salt can emit radiations that affect the photo plate.
Large rumber of nucleons
in a small space are
restless or unstable.

$$
\begin{aligned}
& \text { Unstable atoms, which can } \\
& \text { attain a more stable state } \\
& \text { arter radiation, are } \\
& \text { radionctive. }
\end{aligned}
$$

```
Decay process results in a new element which can still be radioactive, until
a final stable state is
attained.
```


## I. alpha, beta and camma radiations

After radioactivity wan discovered, hundreds of experiments were performed to study their proper:ies.

There are 3 types of
radiations: $\alpha, \beta$ and $\gamma$ Scientists soon identified thrce different kinds of radiations: (i) alpha $\alpha$ radiation,
(ii) beta $\beta$ radiation and (iii) gamma $\gamma$ rays

## I-l aloha $\alpha$ rodiation

Alpha radiation is found to be groups of particles having 2 protons and 2 neutrons in each group. Since the helium nucleus is also composed of 2 protons and 2 neutrons, alpha particles are sometimes stated as He nuclei. Due to the 2 protons present, alpha particles are nositively charged. When an alpha particle is emitted, the process cen be represented symolically by:

$$
z^{X^{A}} \cdots z-2^{Y^{A}-4}+2^{H e^{4}(\alpha-\text { particle })}
$$

$\alpha$-radiation consists of groups of $(2 p+2 n)$, identified as He nuclei $2^{\text {He, }}$, carrying + charge.

When an alpha particle leaves a nucleus, its $Z$ is less by 2 and its $A$ is less by 4.

Where X is the element to emit the $\alpha$ particle, generally calied the mother nuclide, and $Y$ is the residual element called the daughter nuclide.

Note that the mother nuclide after emifting an alpha particle has its atomic number decreased by 2 and the mass number less by 4. (Emission of 2 p and $2 n$ )
Example: $86^{\mathrm{Ra}^{226}} \rightarrow 84^{\mathrm{Rn}^{222}}+2^{\mathrm{He}^{4}}$

I-2 beta $\beta$ radiation
5 Beta radiation consists of electrons. These electrons are not orbital electrons. This is simply due to the change of a neutro into a proton and an electron.

$$
n \rightarrow p+e(\beta \text { particle })
$$

The electron is emitted as the bota particle, the equation is given by

$$
z^{X^{A}--7} z_{2+1}^{Y^{A}}+-1^{e^{O}}(\beta \text {-particle })
$$

The residual daughter nuclide has an atomic number of $Z \nmid I$, due to 1 proton more. The mass number A has not changed as ihe total number of nucleons is unchanged.

Example: $\quad 6^{C^{14}} \rightarrow 7^{N^{14}}+e^{0}$

I-3 gamma 6 rays

The radiation does not carry any charge. It has a nature similar to that of light but its energy is millions of times larger. They possess wave properties -- can be reflected or refracted. (diffract or interfere with each other as well) The radiation travels with the speed of light.
II. Falf-Iife

II-1 Introduction
From lesson l, we know that unsteble atomic muclei are radioactive. These nuclei may decay, or break up by itself to form more stable nuclei wi the the emissinn of radiation.

The breakins up process occurs randomiy. ve connot tell which nucleus vill decay in a particular time. But it is true that more nuclei will kreak up if more unstable atoms are prrse:t.

## II-2 $\quad$ Helf-Life ( $\mathrm{T}_{\frac{1}{2}}$ )

Some radioactive samples need a long period to be converted to the stable ones and some need a few seconds. As an indication of the ACNIVITY or the power of still being actjve, we meesure THE TIME REQUIRED FOR HALF ON THE TORAL HUIABER OF RADIOACIIVE NUCLEI ONIGINAL PRESENT TO BE CHANGED.

This is the half-life of the radioactive element.
Example: Radon, a radioactive fas whose $T_{\frac{1}{2}}$ is 4 days, if we start with 256 atoms of radon,
in 4 days time, $\frac{256}{2}-128$ atoms will be changed, leaving 128 atoms of unstable radon atoms. in 4 more days, $\frac{128}{2}=64$ atoms are acain decayed, leaving 64 atoms still active;

In a total period of 16 days, 16 atoms of radon still remain active.
$\gamma$-radiation is in fact waves of high enersy, traveliing with the speed of light.
fuclei decay randomly. More radioactive nuclei can give more radiation.

The half-life is the time for half of the number of nuclei to decay.

HANG THE EXPONENTIAL DECAY CURVE PROVIDED,


Different elements have different half-lives, some may be very long and some yery short. Here are some examples:

Element
Uranium 238
Carbon 14
Radium 226
Polonium 214

## Yalf-Life

4.5 billion years

5600 years
1620 years
$10^{-4}$ second

From the graph, we see that the number of survivors becomes smaller as time passes, but it may never: become zero. This is another way of saying that we camnot assign any 'definite' life time in which all of the oricinal atoms for a sample will have decayed.

The decay law is a result of statistical anelysis, and it is applicable to a sample contrinine a lare number of radioective nuclei.

## III. Carbon Dating

8 Archeologists, people who stuad ancient relics, always have interest to determine the ace of bones or rocks due from encient tombs. If the ase of a piece of ancient bone can be found, historians cen obtain more information about the cultural development at that tine.

The common methicd of datinf makes use of Carbon-14, a radioactive isotope of Carbon-12, which exists naturally in vcry minute amounts. The half-life. of Carbon-14 is about 5600 years.

All living oréanisms, plants or a inals, takes in
Carbon-14 elong with carbon-12 from the surroundines. When the organism dies, there is no longer any intake of Carbon-14 isotores, end those that remain break down slowly. Ey measurement of the amount of Carbon-14 present in a specimen, the length of time elapsed since the organism's death can be found.

## The number of unstable atoms decreases as time passes.

Lesson Four: Tracer and Atomic Energy in Peaceful Uses
ime
nin.)

## Introduction

Many people nowadays still heve a belief that radiations can only do harm to living things. This could possibly be due to the vast destructive power from atomic bombs.

Though it is undeniable that radiations can be harmful to body tissues and cells, but it can also become helpful under careful control and usate. The most popular application is in the generation of electrical power.

There are other applications in radiotherapy-the tiocatment of cancer patients with radiation to kill cancerous cells, archeological dating as described in last lesson and to serve as tracers in medical end industrial researches.
I. Tracer in Peaceful Uses

## I-1 Principle

A score of ar ificial radioactive isotopes (radioisotopes) are available today for use in Endustay and medicine. An important aspect of their usefulness is that they can be traced; a detector of radiation will easily tell their presence anywhere, even in amounts too small to be visible or found by simple means.

## I-2 Medical Applications

Radioisotopes are of greatest value in the dirgnosis of human disorders. $T$ ey help in many cases where X-rays fall short. For example, radioactive sodium, in the form of a salt solution, is injected in the patient's arm. The isotope is picked up by the blood streem ans transported to the heart. The position of the isotope can then be located by a detector. This offers a valuable means in the recognition of diseases of the heart or the circulatory system.

## Teacher's Guide

| Radiation is harmful |
| :--- |
| due to the vast |
| amount of energy |
| released. |

Radiation is destructi ve, but it can be constructive if under suitable control.

| Applications in power |
| :--- |
| generation, radio- |
| therapy, dating and |
| tracers. |

The detection of radioisotopes allow the application of the tracing technique in many fields.

## I-3 Incustrial Aoplications

Tracing small amounts of matter is helpful in all kinds of research in industry. In oil refinerics, radioisotopes can be used to trace oil along the pipelines. By adding a few tracer -atoms to the oil, batches of different Erades of oil ca? be labelled like letters and followed. Hidden leaks are easily dicovered, they are betrayed by the presence of radioactivity outside the pipes.

## II. Atomic Energy in Peaceful Uses

In reactions concerning nuclides, energy may be absorbed or released. The enercy absorbed or released in a nuclear reaction is a million or more than the emount of enerey involved in an ordinary chemical reaction. Hence this property has marie the reactions inportant in intustrial and military apolisations.

Fission-- the lieavy metal uranium is a misture of 2 isotopes of which $92^{\mathrm{U}^{275}}$, Uranium-235, is the most importont. Sone atoms of U-235 decay naturally. emitting high-speed neutrons.

When one of these neutrons hits the nucleus of a neichborine U-235 atom, it may break into two nearly equal radioactive nuclei, $\mathrm{Ba}^{144}$ and $\mathrm{Kr}^{90}$, together with two or more neutrons.
$92^{U^{235}}+0^{n^{1}} \rightarrow 56^{\mathrm{Ba}^{144}}+36^{\mathrm{Kr}^{90}}+20^{\mathrm{n}^{1}}$

The breakine up process results in the liboration of a great amount of energy in the form of heat. fine neutrons emitied in the reaction may solit other U-235 nuclei, and so a chain reaction is set up, resulting in a continuous lineration of energy.

The energy released is usen to heat up circulating cold weton into stean, wich is used to renerate electricity efter passine some mechanical devices.

敨 曾 語 言 興
中二，中三，中四賋，理，史三科
零腮效果之研究

第二階段：
中四级「急子结構和放射性」的四謀教学設計

香港中文大豊教育典院
一九七九年四月十与口

倸程及時間分配

原子结權及放射現象

$$
\begin{aligned}
& \text { 第一章: } \frac{\text { 原子结㰏 (40分) }}{\text { 工原子理旍 }} \\
& \text { ㅍ. 原子模型 }
\end{aligned}
$$

血，原子核，筫量数，原子序數

$$
\text { 第二章: } \frac{\text { 同位袁及放射現象 (25分) }}{\text { 工同位素其他化楽特性 }}
$$

卫．放射現象及其褑現绖過
評爁測驗：第一回（15分）
15 題多工頁選摆題（閣於第一章及第二章之内容）

$$
\text { 第三章: } \frac{\text { 輻射及丰衰期 }}{\text { 工和 } \alpha \text { 輻钨 }}
$$

ㄱ．半衰期克事変時間
四䃭－14定年法
第四章：$\frac{\text { 示踪剤及原子能之和平用途 }}{\text { 工示踪荗的鷹用 }}$
回原子能之和平用途
喠爁测驗：第二回（20分）
20題多工更潠擇题（関於第三卒及第四章玉内容）





 （Ruderfod）提出了一俌新的原子模型。皘为傆子林模型」（x因二）根摒要模型。原子中间有一核心。要而那皆带负贾的重子，教仰在核心外 而，不久丹黄的科学家
原子枚模型
晹要。原子囊的究子。就好像行量


世委国引
$\square$


徣将虚喓福模型掛图排造。

首子该说着度子中央的核二，不得边特。




（分）




質子雨较是中子。




第二章：同位章，乎衰期（2分）
時問
（s）I．同位妾（todan）





标的，它们的大小等量禾造植应是它会一这的

I－2
同位新的何子

$, H^{\prime},\left(, H^{2}\right),\left(, H^{3}\right)$

䓍（eygen）有三种同位童： $0^{16},\left(80^{17}\right),\left({ }_{8} \mathrm{C}^{15}\right)$





$\rightarrow\left(D_{D}\right)$ $\qquad$
－1 1
这射地象（Radiantinity）的萑现
3


住好得威了无

से

攼度子都是有交付姓。





時間（分）

其丰衰期 $\mathrm{T}_{y_{2}} \mathrm{E}_{5} 4 \mathrm{n}$ 。
如果起初有 256 個気的原子。

剩下了 128 俔不程的辰子


娄者将治 性

時间闺倞之 素变
围揞起

8
话性原子数目


不同元竞的本哀期有很大白手差别。



時間


与





死了之该，它不能再吸入碚一14的原了，予䂆照

科学家量店某栐本中剩下来碳一准的份量则
可知道此椓本距今之等代。

時间弟四旁：否生宗新 和原子能的和平用逢（20分）

3！
3 在今天，很多人傽辎射感到害怕，認为楅钓对
的破壌能力天强有阅。

等可否認，輻射对身体的组线和细胞会座生
建設性的用途，如堆动発电机来産生电为使为最著名的倒京
治瘵—利用輻射能利死癌细槩来医治有癌症的病人。其次是用在医学或工業群究方面之「示跡原る法」，甚肴如上章研说的用在谢宝古代文物年代的＂定年法等。
8 I．示踪刘（Tracers）的用途
I－1 原理：
人造放射性司传素，在工業和医党方面有重大的用途，其要点是在放，能钓以揚测


工次医学之应用
放射性同位素对訜所人体疾病有重大价植：很多使入一克也束象的症壮也被解决。如放射性钠（Sedicm），以淮体形式被证射入病者的体内，胙首血！夜榆送至心饅。該等钠光素之位置可由掉测器揞示出来，这对診断心縅或白液洧擐系统之毛病提供有用的资数。

I－3 2 掌 之传（D
追嫁小量之物体对々業上之码于究有
性元弯能包作影示出在輸䌷管中石油渓动的情说，正如等有記号一棲。任何怞管的隠数裂痕也可由油管多的放射性現㿥面倬愙出来

輻射是有害的，因它带有巨大破壤力。

辐钓也有建設性间途如生産电为等

其他如放射性治療故文物訂年法和
运跡原子法等。

探测放射性允素使
示踫原高法应代在多方面。

探测被注射入病者体由的放射性同位素能暬勖訜迷疾膈。

棌㑡放在动或水中之放射性元素能倬察出買动情㫛或油管之裂痕。

時明
（分）
开．原子 能 的和平 用遥
教饰導引

9
在核子应应遗程中，大量的能量会被吸收成放出。在該等反应所捗及㳙能量比喜道化营反应所需的多逵石可信或以上。因此原故，核子之应在工澲和革事上的丝用日益重要。

核子る裂
在重金展方素一验的所有同位素之中，$g_{2} 4^{275}$称为铀 235 的最为重要。若于铀235 子在本身的自然衰变中放出高速中子 核

根鄰的今由235原子被这些高速中子䅇中而崩裂
或更多中子秦

$$
92 u^{235}+0^{n} \rightarrow{ }_{56} \mathrm{Ba}^{, 104}+{ }_{3 k} k_{r}^{90}+2_{e^{\prime}} 1^{\prime}
$$

铀225裏变可放出高違中子。

中子撆中其化金由235原る，便其引烈並放出更妥中？

铀235核子崩裂除齐生基位核子和中子外。亚的熱能方式放出大量能量。面中子也可使其他铀235核子引。裂，莩至一鐩銷反应 （chain reaction），令能量能徐建懜地放出。敢出大量的量被用表者昲在一桃流的冷大量的能量以熱能的方式在！裂中放出。
 （Chain reaction）

放出之能量放䛖为条电。机面童生电力。

[^27]
## Assessment One (15 minutes)

1. The besic idea of the Rutherford-Bohr Model is that
(1) the atom has some positively charfec matter.
(2) the atom is formed by a cloud of electrons.
(3) the nucleus has electrons inside.
(4) the atom has a structure similar to that of the solar system.
(5) the electrons arc moving in chanfing orhits,
2. Accordire to J.J. Thomson,
(1) atoms cannot be divided into smaller parts.
(2) an atom is a neutral sphere consinting of some positively charged matter with electrons embedded in it.
(3) inside an atom, there will be a nucleus with electrons all around.
(4) electrons are located inside the nucleus.
(5) alpha particles come out from the nucleus.
3. The number of protons in the nucleus of an atom is called
(1) the nass number
(2) the atomic number
(3) the isotope number
(4) the ionization number
(5) the nuclear weight
4. The smallest unit of the element that can exist by itself and
retain the same quality as the element is called a/an
(1) atom
(曈) molecule
(3) elemertary particle
(4) electron
(5) nucleus
5. Uranium was first discovered as a radioactive element by observing its action in
(i) affecting a covered photographic plate.
(2) producine counts on a detector.
(3) making tracks in a cloud chamber.
(4) exploding a bomb.
(5) speeding up a chemical reaction.
6.- 7 refer to Fipure 1, a representation of Bohr Atom.
6. $X$ and $Y$ are respectively
(1) proton and neutron.
(2) electron and proton.
(3) nucleus and electron.
(4) electron and nucleus.
(5) neutron and electron.
7. $X$ is composed of
(1) protons only
(2) neutrons only
(3) protons and neutrons
(4) neutrons and electrons
(5) protons, neutrons and electrons
8. An electron from a hydrogen atom
(1) is identical to an electron from another hydrogen atom.
(2) has a greater mass than an electror fror an oxygen atom.
(3) is larger than an electron from an helium atom.
(4) has a greater charge than an electron from an nitrogen atom.
(5) is lighter than an electron from an chlorine atom.
9. The wefkness of the J.J. Thomson Model is that
(1) the total charge of electrons is incorrect.
(2) the size of the atoms is incorrect.
(3) the shape of the atom is incorrect.
(4) each electron is surrounded by about the same amount of the other matter.
(5) the number of electrons is equal to the number of the other norticles.
10. Vsint the common convention, the element $21^{45}$ has
(1) 21 protons and 66 electrons
(2) 21 neutrons and 45 protons
(3) 21 neutrons arid 24 protons
(4) 21 protons and 45 neutrons
(5) 21 protons and 2! neutrons
11. The following table shows four nuclei $P, Q$, $R$ and $S$ with their mass numbers and atomio numbers:

|  | Nuc]eus | Mass Numher |  |
| :--- | :---: | :---: | :---: |
| I. Atomic Number |  |  |  |
| II. | 0 | 20 | 9 |
| III. | 0 | $R$ | 20 |
| IV. | $S$ | 22 | 10 |
|  |  |  | 10 |

Which of the ahove isfare the isotove (s) of an element having
a mass number 20 and an atomic number 10 ?
(1) I, III and IV only
(2) I and III only
(3) II and IV only
(4) I and IV only
(5) III and IV only
12. A heam passes between two parallel plates is deflected as shown. From the picture, we can tell that the beam is composed of
(1) electrons
(2) protons
(3) neutrons
(4) gamma particles
(5) alpha particles

13. $!$ hen a very fast moving proton $P$ approaches a stationary nucleus $S$, the path of $P$ is likely to be
(1) I
(2) II
(3) III
(4) IV
(5) V

14. An improvement of the putherford- Bohr hodel over the J.J. Thomson Model and a weakness of the Rutherford-hohr lodel are that
(1) the size of an atom is bigger but elactrons and nucleus are not distincuishable. wx
(2) electrons and nucleus are distinfuishable but electrons are movine around the nucleus in fixed orbits.
(3) the size of an atom is smaller but electrons are moving around the nucleus in fixed orbits.
(4) electrons and nucleus are distinfuishable but electrons are moving around the nucleus in changing orbits.
(5) electrons and nucleus are distinfuishable but electrons are movine around the nucleus in fixed orbits.
15. A beam of particles passes through a magnetic fiela. If the magnetic field is decreased to a low intensity, no apparent deflection or chances of the beam can be observed. If the magnetic field is increased to a very hish intensity, the heam is widened to a small degree but still goes in the same direction. The above information indicates that the heam is composed of
(1) neutrons only
(2) alpha and beta particles
(3) neutrons and a preat number of elnctrons and protons
(4) neutrons and a small number of electrons and protons
(5) gamma particles
T. The symol $2^{\text {Hes }}$ was bs used for an doparticle because
(1). it hes 2 electrons and 4 nucleons
(2) it has 2 protors aid 4 neutrons
(3) it has 2 neutrons and 4 protons
(4) it has a protons and 2 neutrons
(5) it has 2 electrons and 2 protons
2. Biologistz are trying to find out nore about the metabolism op plants and animais through the use of
(1) high-entrge particie accelerators
(3) radio-isutopic trasers
(3) high power ticroscope
(4) X-rays
(5) $\alpha$-decay
3. Of the threa coumen types of radiations, namely alpha' beta and gama s fron radioactive sources, electriccharge is carried by,
(1) $\beta$ and $\gamma$ onij
(2) $\alpha$ and Yonly
(3) $\alpha$ and $\beta$ only
(4) $\beta$ only
(5) \& only
4. The main reason why a neutran uill penetrate a nucleus more readily than a proton ie tiat the neutron is
(1) Blightly ncto massive
(2) movin
(3) moving slo:05
(4) uncharged
(5) unaffectec by nuclear forces
5. All EXCEPT ONE of the following statements are true. Which one is the exception :
(1) Radioactivitü is a natural characteristic of some elements
(2) Radioactivity isotopes can be produced artifically in the laboratory
(3) Radioactive icotopes decay by the emission of particles from the nuclef
(4) All isotopee are radioactive
(5) There is a vide variey of decay rates for radioactive elements.
6. When the nucleus $99^{p_{a}^{231}}$ becomes $89 \mathrm{Ac}^{227}$, it has undergone
(1) an $\alpha$ mascey
(2) a- $\quad$ -
(3) a y-decay
(4) a collisien iditi neutrons
(5) a capture of 1 atutron and then a release of 1 proton.
7. Aradoactive atom emits a $\beta$-particle 甘hat happens to the mase
numbr of the evor
(1) It increases oy 1
(2) It remaing uncharged
(3) It decreases $b: i$
(4) It decreases by 2
(5) It decreases by 4
8. The half-life. of a cortain redioactive isotope is 3 seconds. Starting with $N$ active atoms.
I. there will be $N / 8$ active atoms remained after 9 seconds" II. there wili be $N / 1 G$ ective atams remained after 18 seconds
III. three-quarters of the active atoms will have decayed after 6 seconds,
IV. there will be N/32 active atoms remaining after 21 seconds.

Which of the above statements is/are correct ?
(1) I only
(e) II oniy
(3) III oniy
(4) I, IT and IV only
(5) I, IJ, III and IV
9. An unstable element $x$ decays into a stable element $Y$ with a half-life of 3 days. On 1 st March, a piece of $x$ has a mass of 10 g . What will be the masses of $x$ and 5 days later ?

10. When a chain reaction takea place in $U^{235}$, each nucleus breaks into
(1) One neutron and one proton
(2) one protors
(3) one neutron
(4) more than ? neutron
(5) more than i proton
11. The age of an old tree is found by burning the tree ashes and counting the number of radioactive $\mathrm{C}^{14}$ nuclei is detectea to be 3 miliions.
From the decay eraph of $\mathrm{C}-14$ given on the left, the age of the oid tree being, tested is found to be
(1) 5.600 years
(2) 11,200 years
(3) 16;800 years
(4) 22,400 years
(5) 2,800 years

12. Some radioactive isotopes have to be injected into a patients vein to investigate his blood circulation. In the list of radio-isotopes eiven, choose the one you think is the mest suitable
(1) $X$ of half-life 10 seconds
(2) Y of half-life 1 hour
(3) $Z$ of half-life 10 daya
(4) $P$ of half-life 1 year
(5) $Q$ of halp-lif\% 10 years
13. An atom tith mass number $A$ and atomic number 2 decays in three stages by the emission of an $\alpha^{\alpha}$-particle, a $\beta$-particle and a second $\beta$-particle. It then becomes an isotope of the same element with mase number
(1) unchanged
(2) equels $A$ - 1
(3) equals A - 2
(4) equals A - 3
(5) equals $\quad A-4$
14. Which of the following might be the products of the fission of a nucleus of $\mathrm{g}^{0} \mathrm{u}^{235}$ after the nucleus has absorbed a neutron ?
(1) $-1^{\dot{e}^{\mathrm{O}}}+2^{\mathrm{He}^{4}}+\mathrm{O}_{4}^{\mathrm{Pa}}{ }^{232}$
(2) $82^{\mathrm{Pb}^{209}}+5{ }_{2} 2^{\mathrm{He}}{ }^{4}+70^{\mathrm{n}^{1}}$
(where $-1^{0}$ represents an electron
and $0^{n^{1}}$ represents a neutron)
(3) $-1^{\mathrm{e}}+93^{\mathrm{Np}}{ }^{236}$
(4) $2^{\mathrm{He}}+90^{\mathrm{Th}} 232$

Imagine that a new ibotope of Iithium (Li) with atomic number 3 and mass number 5 has been discovered among the radiations emitted from radioactive piutonium ( Pu ). Which one of the following nuclear equations correctly describe its emission from a 94 Pu 239 nucleus ?
(1) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 3^{\mathrm{Li}^{5}}+91^{\mathrm{Pa}}{ }^{234}$
(2) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 3^{\mathrm{Li}}{ }^{5}+97^{\mathrm{BK}}{ }^{244}$
(3) $94^{\mathrm{Pu}^{239}} \rightarrow 3^{11^{5}}+{ }_{9} \mathrm{PQ}^{244}$
(4) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 5^{\mathrm{Li}^{3}}+89^{A c^{236}}$
(5) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 5^{41^{3}}+{ }_{91} \mathrm{~Pa}^{234}$

## Questions 16 - 17

A radium source that emits $\alpha, \beta$ and $\gamma$ radiations simultaneously is pat in an evacuated box. The radiation coming from the samll lead cavity then forms a narrow beam which passee between two charged wetal plates as chown in the diagram. When the photographic plate is developed,
 3 apots labelled $P, Q$ and $R$ are obtained.
16. Which are the radiations responsible for each of the spots?
Spot $P$ Snot $Q \quad$ Spöt R

| $(1)$ | $\alpha$ | $\beta$ | $\gamma$ |
| :--- | :---: | :---: | :---: |
| $(2)$ | $\alpha$ | $\gamma$ | $\beta$ |
| $(3)$ | $\beta$ | $\gamma$ | $\alpha$ |
| $(4)$ | $\gamma$ | $\alpha$ | $\beta$ |
| $(5)$ | $\beta$ | $\alpha$ | $\alpha$ |

17. If mora foaitive oharee is put on the positive pieto ans more negative charge on the negative phato, what will happer to she spots?

|  | Sput P | Spot. | Spot ${ }^{\text {R }}$ |
| :---: | :---: | :---: | :---: |
| (1) | shifts more to the right | Enilits to the left | shifte more to the right |
| 2) | shifts alightly to the right | regaint uncharged | Ehifts slightly to the left |
| (3) | ```shifts more to tho leミt``` | romeins unchanged | chifig anere to the right |
| (4) | shifts eiightiy co the right | ghifts to the right | shifts mora to the right |
| (5) | shifts more to the 1eft | shifte tig the rient | shifes siighty to tha Left |

Questions 18-i9
An analogy has beed drawn between the decay rate. in o radioditive doosy and the flow of water through the zystem. In a radicactive samie, the decay rate (i.o.- the rate oi irealing down of unstakie atoms) is proportional to the number of unstable atoms present. Similarly, the rats of water flow ic ajso proportional to the height of the water level above the outlet.


The diagrems above shons tanks of difserent crossobectional areas and are all drained by incritiea? capililery iubes.
18. The half-life period of the water in tank ix would be

Y half of the time apont by vatex molecuie inside és capillary fube
II. the tine taker for tix tatan level so fall to haje of ita original vailu III. hali of the time required to dixin all the water in the tank
(1) Only I is correst
(2) Only II Ie ertrect
(3) Only III is sorrect
(4) Only I and III arecoriest
(5) Only If and III are correst
19.

In this analogy, the height of the water level corresponde to the number of unstable atons; thila the rate of watei flow corresponds to the rate of decoy. Thía analogy is not a good analogy because
If, the half-life of the tanks are iifferent even if the initial heights of the water levels are the same
II. the haif-life.of the tank riose not only depend on the height of
the initial water level but also on the cross-sectional area II. the capillary tube where the water flows out is too small so that the half-life is too long.
Which of the above reasons ig/are correct?
(1) I only
(2) II only
(3) II and III ondy
(4) I and II only
(5) III only
20.

Which of the following processes do you think will be most effective if some radioactive isotopes are used as means of investigation?
I. The investigation of water flow in a river II。 The research on mineral absorption in a plant' IIL. The investigation of traficic congestion in a belluway. Which of the above statements 1s/are correct?
(1) I only
(1) II only
(3) I and IT only
(4) II and III only
(5) I, II and III only.

谢騟—：第一，第二課（15分浯）第八頁
！虚德福—波㶾（Rutherford－Bohr）原子模型最特別的地方是：
（1）愿子中有一些带正電的物筫
（2）原子是由一国業子组成
（3）原子的䕒造類似我㑡的太陽系
－（4）原子核内藏有全部䉓子
（5）電子是依只不固定的軌道行走
2 根橧湿姆進（Yhomam）原子模型墴原子的描绘
（1）度子是不可分割的個骼
（2）原子是一個中和的球體，由一些带正雾的物質组成，而電子列埋藏在其中。
（3）原子内有一籍被宽子答圈的原子核
（4）電子是埋藏在原子垓め
（5）$\alpha$ 一数于量往原子核中射出来的
3．原子核め筫子的數目被糐盖
（1）筫量数
（2）原予房數
（3）同位素數目
（4）游㒕數
（5）核子重量
4．最细小而仍能保留其充素之特式的䢂子稀思
（1）原子
（2）分子
（3）基本精子
（4）電子
（5）核子
5．科学家登現铀具有放射性，最初他伡發现铀能多
（1）使一塊色裹着不嚗光的威光中威光
（2）使輻射䛨算器出现譜數
（3）在雲符室中産生雾还
（4）發生核爆
（5）加速化学作用



園—

6．铟中所示，X和个分虽代表
（i）質子竦中子
（2）電子和質制
（3）原子核和電子
（4）電子和原子核
（5）中子和電子
7．圆中之 $\chi$ 是由何種精子組成？
（1）祗有質子
（泣有中于
（3）筫子和中子
（4）中子和雷子
（5）質子，中子和電子
8．氧原子中的電子
（1）尖易—氢原李中的電子卒質上是相同的
（2）其筫量應天於氧原子中的電子
（3）其䯕積㦄大於氛原子中的電子
（4）所带的電荷應比氮原子中的電子所带者多多
（5）其重量應較氯原子中的霉子然鋲
9．晹姆类原子模型之騾照是
（i）全部電子的傻電渮是不正碓的
（2）原子的大小是不正碓的
（3）原子的形状是不正磼的
（4）每一精雷子是由约数量相同的其他顿質環结普
（5）電子的數目是等放其他数子的数目。


（2） 21 泣中子和45粒筫子

（4）2！袢 筧子和45程中子
（5）2 1 数筫子和24 媇中于
11．下列為四㹳不同的原子核乐只和今及其第量數和。
原于序数。

出以上群些原子核之交素是×的同位素？
（1）旅有 工 具 和 亚
（2）低育 工和亚
（3）旅有正和正。
（4）咬有 工和亚
（5）秎古亚和亚。
言重红子應是
（1）雷 子
（2）算子
（3）中子
（4）$\gamma$ —精子
（5）$\propto$ 一精子
子核 $S$ 待，$P$ 㦄铅圆中那一路空哆動？
（1）I
（2）II
（3）III
（4）IV
（5）卫



（1）原子的体禎轎大但電子开原子核分不闰。
（ 2 ）䉓子并原子核分闲，但電子绕原子核在国定的軌道上移動。
（3）原子的体栍烄小，但電子续原子核在圈员的軌道上移動。
（4）電子并愿子核分闹，但霍子缕原子核在不国是的梚道上移動。
（5）電子并原子核分荓，但電子绕原子核疗定的射道上移動。
観察不到道東拉子离生偏向或其他的変化。差硚㙏的強度种至很高，意束拉子作有限度的揞大，亚仍
是由下列那些頑子组成？

（2）$\alpha$ 和 $\beta$ 稳子
（3）中子及數量很多的電子和質一子
（4）中子及数量很严的電子和符子
（5）$\gamma$ 粒子

測験二：第三，第四謤（20分镜）


（2）它有两撞第子知四数中于

（4）它有两糕第子和两粒中子
（5）它有两往笔于和两核管子
家便鷹国
（1）高能精子加速器
（2）䉓波放射性同位素示路峦
（3）高信讶復競
（4）$X$－射线
（5）$x$－章变






（5）祝有风一程
4中子玟算子更易穹入原子垓肉的原因是国会中子
（1）㫫莗一些
（2）移動畭快
（3）移動㩆幔
（4）没有茶霍荷
（5）不受核子引人影响

（1）放射性是某些充素的特質


（4）世上所有的同位素䉼是有稹载性
（5）放射怡充素有各括美異很六的放街率

（i）$\alpha$－裏譱
（2）$\beta$－䯩变
（3） 8 一槀要
（4）并角千碰搌

 （1）酸前境多1
（ $=$ ）保持不变
（3）䩙㙟減み
（4）較普減年
（5）襄前流篎 4
 N何活情尞子影




二述那理或段我撞特形是正难的
（1）就䟫 $工$
（2）积弃
（3）瓿有 III

（5）工，II亘动五



（1）

亚放出


（3）一控严子
（4）多族一娄 4
（c）多放一粠質



 （1） 5.600 等
（2） 11,200 年
（3） 16,800
（4） 22,400
（5）2，800年


合選用？

（2）单亳期青一人暗之一元素

（4）单乗期显





（i）不 变
（ $\because 3$ 等条 $A-1$
（3）等 交！$A-\pi$
（4）等歀A $A$



（1）$e_{-1}^{0}+{ }_{2} H^{4}+p_{1}^{23}$
（2．） $\mathrm{si}^{204}+5, H_{2}^{4}+7 \mathrm{~K}^{2}$
（3）${ }_{-1} e^{\prime \prime}+{ }_{93} N_{c}^{236}$
（4）,$H_{e}^{4 .}+{ }_{y c} T h^{32}$
（5）$\sum_{3 x} S_{r}^{40}+{ }_{45} X e^{140}+6 n^{1}$





（1）${ }_{44} P_{4}^{19} \longrightarrow{ }_{3}^{2}{ }^{2}+{ }_{91} P_{i}^{154}$
（2）${ }_{94} \dot{P}_{1}{ }^{34} \longrightarrow{ }_{3} i i^{5}+{ }_{97} E i^{2=4}$ ．
（3）${ }_{94} P_{4 i}^{234} \longrightarrow L_{i}^{5}+{ }_{91} P_{4}^{244}$
（4）${ }_{94} \mathrm{Pu}^{239} \longrightarrow{ }_{3} \mathrm{Li}^{5}+{ }_{89} \mathrm{AB}^{236}$
（5）${ }_{44} \mathrm{P}_{4}^{254} \longrightarrow 5^{\mathrm{Li}^{3}}+\mathrm{Pa}_{4}^{234}$








|  | $\frac{P}{\alpha}$ | $\frac{Q}{3}$ | $\frac{R}{\gamma}$ |
| :--- | :--- | :--- | :--- |
| $(1)$ | $\alpha$ | $\alpha$ | $\beta$ |
| $(3)$ | $\beta$ | $\gamma$ | $\beta$ |
| $(4)$ | $\alpha$ | $\alpha$ | $\beta$ |
| $(s)$ | $\beta$ | $\alpha$ | $\gamma$ |



焦拿有何変化？






出水豦。




钎族上还之解姩。


（3）旅参亚荅等的。
（4）就奇 工和亚是学的。






衰期便太長了。

（1）祸 有 1

（ら）监有 正 乕 正
（4）祒有工和正
（5）瓬有再

20）美伎用放射性同位素作研究的工具，你認尊下到积
一項或篍項最总有效？
工研究河永之流動
亚群究植物数磄物質之吸政
亚研究上下班時交通之㵝寒
（i）梳有 工
（2）枢有 II
（3）聇曹 工和 I
（4）溗育开和正
（5）工，II和正

APPENDIX 15

ENGLISH PROFICIENCY TESTS

## ENGLISH TEST I

## LISTENING COMPREHENSION

Time-40. minutes

In this eection of the test, you will have an opportunity to demonstrate your ability to understand spoken English. There are three parts to this section, with special directions for eack part.

## PART A

DIRECTIONS: There are two kinds of problems in Part $A$. One kind is answering a short question; the otrer is rmdenstanding a chort statement. These questions and statements will be sncire: juct ore time, They will not be written out for you, so you will have to listen rirefuliy in order to understand what the speaker says.
When you hear a question, we: the four poscible answers in your test book and decide which one would be the best answer to the question you have heard. Then, on your answer sheet, find the numbe: of the problem and fill in (blacken) the space that correapoads to tio Ietter of the answer you have chosen.

```
Look at Example I.
    You will hear: When did Tom come here?
    You will read: ( A ) By taxi.
        (B) Yes, he did.
        (C) To stuciy history:
        (D) Last night.
```

The best answer to the qucstion, "When did Ton come here?!" is ( $D$ ) " "Last night." Therefore, you should choose answer (D).
Then you hear a statement, read the four sentences in your test book and decide which one best gives the meanine of the statement you have heard. Then, on your answer sheet, find the number of the pr ublem and mark your answer..

Look at Example II.
You will hear: James relaxed with a sigh of

## Sample Answer

You will read: relief when he heard the news.

You will read: (A) The news was very disappointing.
(B) The news made James very sad.
(C) The news was better than expected.
(D) The news made James extremely nervous.

Sentence (C), "The nows was better than expected," is closest in meaning to the sentence "Tames re?axed with a sigh of relief when he heard the news." Therefore you should choose answer (C).

## UAETA

1. (A) $\mathrm{He}^{\prime}$ s studying.
(B) He spends mone time teacking.
(C) He studies Ionger than I do.
(D) I study more time than he does.
2. (A) Henry's a balver.
(B) Henry's a drummer.
(C) Henry's at the door.
(D) Henry's a batter.
3. (A) She is a banker.
(B) She is a merchant.
(C) She is a teacher.
(D) She is a chemist.
4. (A) The magazines are in the baskot.
(B) The magazines are on the floor.
(C) The magazines are on the table.
(D) This is about furniture.
5. (A.) I like monkeys but not lions.
(B) I like cats but net lions.
(C) I like lions but not cats.
(D) I like lions buit not monkeys.
6. (A) It's only eleven o'clock.
(B) It's time for lunch.
(C) Our lunch time is ten orclock.
(D) I'm hungry but it's too early for lunch.
7. (A) The blue cer is not warth buying.
(B) The green car is expensive.
(C) Both cars Ere expensive.
(D) The green ca: is cheaper than the blue car.
8. (A) She arrived st 11:0C.
(B) She ardived at 11:30.
(C) She arrivec at $12: 00$.
(D) She arrived at 12:30.
9.: (A) The two girls are standing there.
((3) They're not relatives.
(C) The two girls are =clatives.
(D). They are sisters.
9. (A) Dorothy was late for the train.
(B) Dorothy was trying to catch the train.
(C) The train had lef'i before Dorothy came.
(D) Dorothy made them late for the train.
10. (A) Bob always mekes girls nervous.
(B) The girls before BOD are always nervous.
(D) Girls always make Bob nervous.
(D) Both the girl and Bob are nervous.
11. (A) We're on diet.
(B) We eat more than we usually dc.
(C) We don't eat very ruch, for we take vitamin pills.
(D) It is important to care for the balance of our diet.
12. (A) Ten days ago, the feople were trying to leave the town.
(B) The flood made fifty families homeless.
(C) I was by tre river ten days ago.
(D) The river vas sitwated near the town.
13. (A) They went $0:$ honcymon right away.
(B) They did go on honeymon immediately after their wedding.
(C) They spert a west having honeymoon.
(D) They went on their honeymoon a week after their wedding.
14. (G) Jean was too bus: to go shopping.
(B) Jean's sistem has no time to buy dresses.
(C) Jean and hes sisier have a lot of time to spend.
(D) Jean wasn't a eoca buyer of dresses like her sister.
15. (A) The monkey nade fun of Laura.
(B) Laura's monkey couldn't dance.
(C) Her monkey made furny faces.
(D) The monkey danced and laughed.
16. (A) She decides to stop smoking, because cigarettes are harmful.
(B) She's afraid of gaining woight if she quits smoking.
(C) She doesn't like to gain weight.
(D) She's not aware of the consequences of smoking.
17. (A) Mr. Scott didn't come.
(B) Mr. Scott attended the meeting.
(C) Mr. Scott aimost attended all meetings.
(D) Mr. Scott was late for the meeting.
18. $\therefore$ (A) Nobody was.missine.
(B) Several peopie were missing.
(C) One person couldn't be found.
(D) Several people couldn't be found. .
19. (A) He left after io got ali the answers.
(B) He left an econ ia ho roind him all the questions.
(C) Nobady answens Eddje! e quicistions.
(6) He left aftc: he answercd all the questions.

## $\mathrm{P} / \mathrm{RT} \mathrm{B}$

DIRECIIONS: In Port B JCu will har fiftcen short conversntions between two speakers. At the end af ench convirsation, a third voice will ask a question about what was eaid. rise questic: will be spoken just one time. After you hear a conversation and the ouesti.c. $\mathrm{ab} \cdot \mathrm{a}^{2}$. it, read the four possible answers and decide which one wouid jo tha beft ...sver to the question you have heard. Then, on your answer sheet, .ind numer of the problem and mark your answer.

Look at Example I_
You will hoar:
(man) Hollo, Mary. This is Mr. Smith at the office. Is Bil feeling any bettor today?
(woman) Oh: yes, li: Srith. He's feeling much better now. But the dozor sgys helll have to stay in bed until Monday.
(third voice) where is rifil now?
You will read: (i) ft tia office.
You will read: (i) ht the office.
(C) Home in bed.

Sample Enswer
( $\hat{A}$ ) (B) (C) (D)
(D) Away on vacation.

From the conversation, we know that Bill is sick and will have to remain in bed until Monday. The best ansris, then, is (C), "Home in bed." Therefore, you should choose answer (C).

## P $A$ RT B

21. (A) At the depariment ftore
(B) At the church
(C) In the garden
(D) it the erocery
22. (A) He doesn't hare any money to buy the lamp
(B) He has a lot of money to buy the lamp
(C) If he lends her moncy, she will buy the lamp
(B) If she lends him meney, he can buy the lamp.
23. ( $A$ ) Repairman
(B) Taxi driver
(C) Salesman
(b) Car dealer.
24. (i) $10 \mathrm{~A} . \mathrm{M}$.
(B) $12 \mathrm{i} . \mathrm{M}$.
(c) 2 P.N.
(D) 4 P.M.
25. (A) He's going to find an apartment
(B) He's helping bis oroiher lool: for an apartment
(C) He already founc an apartment

- (D) He's looking for an apartment with a girl.

26. (A) The big partics are more impersonel than small ones.
(B) She like big parivies better
(C) She.likes small parties
(D) The party is nonsense.
27. (4) He is gatisfied with driving from his hone to work
(B) The distance is about 20 milas
(C) The road is good but there's a lot of traffic
(D) He lives very far from his work.

(B) It mas milis oc: in ho arly minter last year
(D) It was very icld
(D) It was vory rec curine ximas time.
28. (i) 504
(B) $\$ 2.00$
(C) $\$ 2.50$
(D) $\$ 3.00$
29. (A) \# 19,500
(B) $\$ 20,000$
(C) $\# 25,000$
(0) $\$ 40,002$
30. (A) The stc: 7- Bet
(B) The movio r: -5

(D) The photog was $50: \therefore$
31. (S) Childrm heri aloody int for thoir grandmother's home
(B) Children wi? lenve for thatr grandmother's home
(C) Children mily I ave fre their grandmother's after school
(D) Children will pley with their grandmother in the school.
32. (A) She's cara.ess
(B) She likes Georg? "ery much
(C) She's not coracrmed with George's health
(G) She doesn't care what Goorge said.
33. (A) He hears wri?
(B) He hears pin-ly
(C) He's deaf
(D) He's dead.
34. (A) Thers's mother cat
(B) He revir lonoons the dog
(C) She has misto? it for his dog
(D) The doz litres to walt: on the leash.

## PART C

36. (A) Declined
(B) Dspleted
(C) Limited
(D) Unlimited.
37. (A) Becsuse it is imarrt-nt for food resources
(B) Becalles th nant ancherion are to be exhausted
(C) Because ton ronchist insisted on it
(D) Because fishes nre fencr then Indian Tigers.
38. (A) Europe and lsie
(B) The whole wrod
(C) isia enc imonice
(D) imericn.
39. (4) The lend anit the air
(B) Importar'
(C) Indian migree end the :moricon Eagle
(D) The ifricom "upien:。
40. (a) The Indian TAse and the smerican Eagle are important
(B) None of the gecot sen firheries are to be cxhausted
(C) Fish supply has no effects on people
(D) Sea resourcoe cir imprtent to people.
41. (A) The resources ci the sen wore unlimited
(B) The thrents to injm?s and Birds

(D) We must love ficins.
42. ( $n$ ) Paris
(B) Copenhagen
(C) New.York.
(D) Iondon.
43. ( 1 ) 1
(b) ?
(C). 3
(D) Never.
44. (A). London and Paris
(B) U.S.M.
(C) Paris
(D) Paris and Copenhagen.
45. (A) The Natural Gas Company
(B) Fuel Shortage
(C) The Gas Industries
(D) $A$ warm winter.
46. (A) It was very cold
(B) It had snows
(C) It was a little cold
(D) It was unusually warm.
47. (A) Curiosity about canned sea food
(B) Sincerity and Persuacion
(C) Anger about canned sea food
(D) Ordering canned sea food.
48. (A) Toxic and poison
(B) A clẹar crystalline substance
(C) Chips of glass
(D) Sea food.
49. ( 1 ) Boil them in water
(B) Boil them in warm vinegar
(C) Throw them away
(D) Eat them.
50. (A) Complain to the Federal Food and Drug Administration
( B$) \quad \Lambda$ sk for refunding of your money from the canner
(C) Place them in vinegar for a few minutes
(D) Let the particles dissolve.

END.OF THE LISTENING COMPREHENSION

1. "Elizabeth borrowed the book a month ago." it by now."
"Thien she should $\qquad$
(A) to finish
(B) have finished.
(C) finish
(D) had finished
2. "Are those men in the blue uniforms policemen?"
"Oh, no; they're $\qquad$ ."
(A). bus drivers
(B) buses drivers
(C) bus driver
(D) buses driver
3. "I'm very tired." "We really should stop $\qquad$ and go to bed."
(A) to study
(B) from studying
(C) of studyine
(D) studying
4. "I like Mary's parents very much."
$\qquad$ ."
(A) So I de
(B) I so do
(C) So do I
(D) I do so
5. "That's a beautiful table cloth."
'ryes, but it's not $\qquad$ for this table."
(A) nearly enough long
(B) nearly so long
(c) nearly long, enough
(D) so nearly long
6. "How did you get your car out of the ditch?"
$"$ $\qquad$ it."
(A) Fush
(B) Having pushed:
(C) From pushing
(D) By pushing
7. "I got twenty-five problems wrong on that maths test last week." "Yell, take your time on this one and you'll probably make $\qquad$ mistakes."
(A) not much
(B) fewer
(C) lesser
(D) very little
8. "How many from your team entered the contest?"
" $\qquad$ but one."
(A) All
(B) Any
(C) Some
(D) Many
9. "I can't see the blackboard very well."
"Perhaps you need $\qquad$ ."
(A) to examine your eyes
(B) to have your eyes examined
(C) to have examined your eyes
(D) to be examined your eyes
10. "I like your new typewriter very much." rI bought it because it was $\qquad$ yours."
(A) $l i k e$
(B) similar of
(C) like as
(D) $a s$
11. "will the committee meet during vacation?"

No, I suggested that a meeting $\qquad$ at some other time."
(A) holds
(B) is holding
(C) be held
(D) hold
12. "How did Carl get the nichame of 'Quacker'?".
"Because he $\qquad$ ducks when he was a child."
(A) had been imitatine
(B) has initated
(C) was imitating
((1)) used to imitate.
13. "Yasn't Joen supposed to be here by now?" "Don't worry. She'll be here $\qquad$ twenty minutee."
(A) by at least
(B) around
(C) at $n \in a r l y$
(D) in about
14. "I wonder how old Mrs. Clark is." .
'She won't tell her agc, and $\qquad$ ."
(A) so won't her sister
(B) her sister won't. too
(C) neither will her sister
(D) either won't her sister
15. "Mr. Smith said we could rice to Miani vith him." "Are you going to taie advantage $\qquad$ his offer?"
(A) of
(B) with
(C) by
(D) to
16. "Hon't you have more meat?"
"No, thanks. I've had $\qquad$ enough: already."
(A) beyond
(3) more than
(C) greator than
(D) plenty
17. "Where would your Erandfather Iive if he retired?"
'He' $\alpha$ have a little place beside the water if he $\qquad$ it."
(A) could have afforded
(B) vould afford
(C) could afford
(D) would have afforded
18. "will the child recover?"
"Rigint now, there's no way $\qquad$ ."
(A) for knowing
(B) to have known
(C) of knowing
(D) to be knovin
19. "Do you want to see my driver's license or my passport?" "Ch, $\qquad$ -"
(A) either does well
(B) either one will do
(C) each one is good
(D) each will be fine
20. "Have you gone to sec the doctor?"
"No, but $\qquad$ -"
(A) I go
(B) I'm going to see
(C). I go to see
(D) I'm goine to! .
21. "Is Dave about ready?"
'Yes, he's $\qquad$ ."
(A) finished dressing nearly
(B) finishing nearly dressing
(C) nearly finished dressing
(D) nearly finishing dressing
22. "I like toast very much."
"That's good, because $\qquad$ is dry."
(A.) the most of the bread
(B) almost whole of the bread
(C) the nearly all bread
(D) Almost all the bread
23. "J. can't imagine how they could put on that play in high school." "They chose the best scenes", $\qquad$ out everything that was unsuitable."
(A) and were left
(B) 10 ft
(C) and leave
(D) leaving
24. "Mr. Wilson is expected back at noon."
"Would you have him $\qquad$ then, please?"
(A) calling re e
(C) to calling me
(D) called me
25. "Jack plays the piano beautifully."
res, he's $\qquad$ here."
(A) the most talented of any students
(B) the more talented student than any other
(C) more talented than any other student
(D) most talented of students
26. "Are you sure there's nothing wrong with this radio?" | "Well, all of the parts seen to be $\qquad$ ."
(A) in working order
(B) in order of working
(C) in work order
(D) in order of work
27. "The Calhouns have just moved into a larger apartment." "Did they have to buy $\qquad$ for it?"
(A) many new furniture
(B) much new furniture
(C) many new furnitures
(D) much new furniture
28. "What did you say about the lawnmower?"
"I objected to $\qquad$ ."
(A) its price so high
(B) it has such a high price
(C) its high price
(D) it is high priced
29. "Were you ever able to give the Johnson the message?" res, I finally succeeded $\qquad$ by phone."
(A) to reaching them
(B) of reaching them
(C) to reach them
(D) in reaching them
30. "What excuse did John offer for his rudeness at the committee meeting?" 'he didn't even mention it $\qquad$ explain it."
(H) let alone
(B) and even not
(C) or not
(D) as opposed to
31. "The Ryan watch television all the time."
" $\qquad$ do the Tuckers."
(2) So
(B) Either
(C) Neither
(D) Also
32. "I cant understand what Peirce says."
"I know. That's because he speaks $\qquad$ English."
(A) a little
(B) such small
(C) 80 little
(D) very mail
33. "I'm sorry. Were you speaking to me?"
'res, I' was. Would you please $\qquad$ in this room?"
(A) not to smoke
(3) not smoke
(C) no smoking
(D) no spoke
34. "Did you call Mr. jackson?"
"No, because he said he would rather not $\qquad$ disturbed this morning."
(A) to be
(5) being
(c) be
(D) been
35. "Do you know reward "ilion?!
"The nome sounds familiar, hui J don't remember $\qquad$ him."
(A) that I meet
( 3 ) meeting
(C) to meet
(D) of meeting
36. "Did your club dance turn out mEl??"
"Yes. We made a $\qquad$ profit."
(A) five-huridred-dollar
(B) fivi-hundred-dollars;
(C) five-hundreds-dollar
(D) five-hundreds-dollars
37. "What's the matter with that picture on the wall?"
"It needs $\qquad$ ."
(i) straightening
(B) to be straightening
(c) straightened
(D) straighten
38. "The market won't bo open tonight."
"If I $\qquad$ , I mouldn't have bothered to drive over here."
(A) know
(E) known
(C) would know
(D) haj known
39. "Do you have a dictionary?"
"No, but I wish I $\qquad$ ."
(A) have
(B) did
(C) do
(D) hove had
40. "Michael left for California this morning."
"Oh, I thought he $\qquad$ until next week."
(A) won't be going
(B) isn't going
(C) wasn't going
(D) hadn't been going

1. He was the only $\qquad$ of the plane erash.
(A) poseessor
(B) relic
(c) eurvivor
(D) finale
2. To repair or infrove the appearance of somethingis to fix it $\qquad$ -
(A) cut
(a) off
(5) up
(D) over
3. He $\qquad$ for stenaing on Mamy's foot.
(a) a moniched
(B) apolurizod
(C) ridiculed
(D) humiliated
4. Seceuts of 2 $\qquad$ sapeseront, jeen couldn't attend the perty.
(i) pamature
(B) prolisic
(C) prescribed
(D) pricr
5. The lear trs decirect to orronize $\qquad$ in order to cirouse the members of their pariy.
(i) a rasiy
(B) a sensation (C)
a convcy
(D) an exercise
6. His $\qquad$ ard cxperience matro hint an excellent person for this job.
(f) competence ( $B$ ) complacency ( $C$ ) compensation( $D$ ) compurction
7. A new hind ci machino made tine cld one $\qquad$ -
(A) outright
(B) obstructed
(C) outlendish
(2) obsolete
8. To nst someor: for helr is to tum $\qquad$ hin.
(0) to
(B) for
(C): on
(2) by
9. The balloon wes $\qquad$ "ith air.
(i) injected
(B) infused
(C) instilled
(D) infloted

We can't undersiand Uncle Georse, for he almays $\qquad$ whatever he says.
(A) maters
(P) molests.
(c) rumbles
(D) muzzles
11. To assist somore mith somethinf is to help him $\qquad$ $\therefore$
(ii) around
(B) on
(c) over
(D)/ out
12. Mr. Robinson vas very grateful and thanked us $\qquad$ , though we had really done very littic.
(:) eminently
(3) profucely
(C) arrogantly
(D) complacently
13. He used the stick os a $\qquad$ to kecp the window open.
(d) pron
(B) siot
(c) curb
(D) plug
14. The vase $\qquad$ on the edge of the table; then fell to the floor with a crash.
(d) wobbled
(B) wheodled
(C) wellcwed
(D) wadaled
15. You haven't really answered the question, for what you said is not. $\qquad$ -.
(A) eligible
pertinent
(C) provident
(D) expeditious

## PAKT B

16. not real
(ii) imacinary
(B) incredible
(C) insensible
(D) unanimous
17. the state of being unoccupied, emptiness
(A) seclusion
(B) exile
(C) vacancy
(D) recess
18. a part of something
(A) capsule
(B) covenant
(C) Eymptom
(D) segment
19. to make sad
(A) distort
(B) deplore
(C) depress
(D) disdain
20. accordine to uhe lav:
(A). conspicuous
(B) temperato
(c) sympathotic (Q) logitịmate
21. rapid movement back and fortit
(1i) vịbration
(Pi) accolerabiun(C)
comoticr:
(D) versetility
22. the conter or contra. pari
(A) cube
(B) cove
(d) core
(D) cult
23. werm and close fricachshin
( . ) Fiety
(E) CTrazy :
(C) intimacy
(D) enmity
24. to free somene fror binme an cuilt.
(3) absoiv:
(3) zensporato
(c) disengage
(D) unfetter
25. to confuse
(i) focus
(B) bewide:
(c) infect
(D) accost
26. to describe or depict.
(A) survey
(B) portray
(c) wehcla
(D) observe
27. useless, ineffectual
(i) brazen
(8) slugeish
(C)"dire
(D) futile
28. to bring back, to rescue
(A) recede
(B) retrieve
(c) retrench
(D) rescind
29. to pretend
(A) feign
(D) fuse
(C) foil
(D) fure
30. very ugly or frightening
(h) 'sullen
(I) dismel
(C) hideous
(D) Elcomy
31. difficult to contrcl.
(i) unbiased
(D) vincanny
(C) ungainly
(D) unruly
32. a beginmer
(i) nomad
(D) nominec
(2) novice
(D) netery
33. to force
Qi.) coerce
(B) abash
(c) efface
(D) suceumb
34. frankess of expression, sincurity
(a) convictjon
cancior
(C) innuarido
(D) intimation
35. to demand centain concitions
(i) excrets
i3) trwoke
(C) postulate (()) stipulate
36... to explain, to mave clear:
(4) elucidento
( n ) incincato
(C) infilitrate
(D) expostulate
36. a distressine or wancontuncie situation
(i) hezerd
(3) 5uise
(C) plight
(D) blotch
37. returning from time to time
(A) repentant
(5) rocurrent,
(c) recessive
(D) repuenant
38. an unexpected shocl:
(i) clang
(B) blast
(SD. jolt
(D) snap
39. insignificant, worthless
(ii) paltry
(B) minimum
(C) stunted
(D) compect

## READING COMPPEHENSION

In 1686 a minister admitted that many people in New Ingland wanted to see stage plays in spite of the strong opposition of the influential Puritan church. Interest in the drama grew elowly and unsteadily in America, but it persisted. By 1800, Thomas Bullfinch had designed an
(5) exquisite theater for Boston with rooms for dances, card games, and teas. Throughout the nineteenth century, playhouses were established in cities along the East Coast from New York to Charleston, South Carolina. Also, as people moved westward to settle new areas, temperary theaters were built in the young towns. In Columbus, Ohio, trees that were growing on
(10) a Monday would become timber for a theater by the following Thursday. In Natchez, Mississippi, a theater was built in a graveyard, and the audience could see bones beneath the stage. Shows were often presented in taverns and other public buildings.

Serious drama did not flourish very far from the East Coast; however. Many talented actors traveled around the country, but they could offer only light entertainment because travel was difficult and not much scenery or equipment could be carried over the rough western roads. But dramatic activity was so popular that a native form of light entertainment developed. In fact, even the humorous tale came to be presented theatrically, as the storyteller relied upon appearance, gesture, and manner of speaking for his dramatic effect.

1. According to the passage, a theater in Natchez was built in a
(A) church
(B) tavern
(C) forest
(D) graveyard
2. Thomas Bullfinch was most probably
(A) an actor (B) an architect(C) a minister (D) a builder
3. According to the passage, most of the development of the theater took
place
(A) before 1700
(B) between 1700 and 1800
(c) between 1800 and 1900
(D) after 1900
4. Which of the following factors contributed to the particular kind of native entertainment that developed?
(A) The scarcity of good actors who would travel
(B) The lack of popular interest in serious drama
(C) Difficult traveling conditions in the American vest
(D) Cpposition of the Puritan church to serious drama
5. The passage states that the theatrical productions of the American West developed in the form of
(A) light entertainment
(B) humorous tales
(C) casual songs
(D) serious drama
6. The author suggests that the Puritan church
(A) could not prevent the building of theaters
(B) tolerated only skilled actors
(C) used the drama for religious purposes
(D) could not discourage interest in the drama
7. The presence of rooms for dances, card games, and teas in the Boston theater shows that
(A) other entertainment was more important than the plays
(B) the church had a great deal of influence
(C) the theater building was elaborate
(D) Boston was an up-to-date citJ

The gorilla, called fiendienly fierce on the basis of reports from hunters and observers of captive animals, turns out to ke quite agreeable in his own domain, according to zoologist George B. Schailer. Every ape is avare of his status in the group, says Dr .
schaller, so "there is rarely any strife beyond the occasional bickering which is apt to occur even amove the most congenial companions." Averaging fewer than twenty animals, the gorilla social group always is dominated by a silver-backed older male, and members of the group. seem to like their benevclent dictator. On down the line, males
(10) dominate females and female dominate juveniles. The social exchange is close and affectionate, "much like that of a happy human family with a polygamous mating system," Dr. Schaller observes.

As a captive, the gorilla has been described as introverted and phlegmatic. Dr. Schaller observed a range of emotions from hesitation
(15) and uneasiness to curiosity, boldness, and annoyance: Like humens, gorillas bite their lips when uneertain and frown when annoyed. The young throw tantrums when thwarted and, like human infents, are intensely curious. Dr. Duane first year, found the animal attentive ed a baby corilla through that its exploratory behaviour equalled that and persevering and judged that its of human infants.
8. Dr. Schaller reports that within the eorilla's social group
(B) each member knows sho is more and who is less important
(B) there is strife when leadership is contested within the group
(C) each member has a chance to obtain the position of leador
(D) status is determined by the number of female and juvenile
9. An interesting observation concerning gorillas is that
(A) their behaviour is just like that of human babies
(B) their emotions are more intense and erratic than man's
(C) they exhibit a range of emotions very similar to man's
(D) they more often exibibit uncertainly, annoyance, and curiosity
10. In line 17, "thwarted" could be replaced correctly by
(A) hungry
(B) frustrated
(C) anery
(D) tirea
11. According to the passage, witrin the gorilla social group, decisions are made by
(A) a group of the oldest males
(B) a consensus amone the males
(C) one of the clder hales (D) the strongest among the males
12. It appears that keeping a Erown gorilla in captivity has the effect of
(A) behave like a human infant, froming and having tantrums
(B) curious, attentive, end persevering
(C) less lively and less interested in things around him
(D) imitate adult humans
13. According to the author, in their natural habitat/gorillas are
(A) fiendishly fierce
(B) careful to fight only with members of their own social group

- (B) more aggressive than are members of their own social group
(D) likely to indulge in minor quarreling but are amiable on the whole

14. Apparently Dr. Shaller's work was important because he
(A) he observed gorillas in situations that were natural to them
(B) discovered that gorillas are very much like human beings
(C) observed gorillas over a long period and found that they are just
(D) like human infants social group

In the Mormon company, bugles sounded each morning at five. Two hours were allowed for breakfast and prayers. During the day the company traveled in a close file, most of the men trudeing beside the wagons, carrying weapons that were loaded and clearly visible. At
(5) : night the wagons were dram into a tight circle-- or a semicircle if the company camped on a river bank. Usually the animals vere pastureed within the circle to kecp them from roming and falling prey to thieves. The men would retire for prayers by groups at eight-thirty, and they were expected to be settled by nine. Fifty of them had been
(10) appointed as guards, with twelve of these standing duty each helfnight. At cne time, while they were crossing the prairies, in Indian country, the company drove five wagons abreast.

- The Mormons sighted their first buffalo at the head of Grand Island on fipril 30. Hunters from the camp rode after them and
05 ) succeeded in bringing down eleven, which were added to the larder.

24. How were the Mormons awakened each morning?
(A) By their appointed guards
(B) By light from the rising sun
(C) By a kind of trumpet
(D) By the calls of birds
25. The Mormons placed their wagons in a circle or a semicircle at night because this arrangement
(A) was a quick and convenient way to make camp
(B) helped to shelter the party from wind and rain
(C). Was the most appropriate setting for their devotions
(D) gave them a kind of barricade or fort for protection
26. What seems to have been the Mormons' chief worry as they traveled?
(A) Hostile attacks
(B) God's displeasure
(c) Runnine out of food
(D) Losing their way
27. Which of the following adjectives would NOT describe the Mormons in the passage?
(A) Devout
(B) Disciplincd
(C) Wary
(D) Helpless
28. In line 11, "prairies" could be correctly replaced by'
(A) riverbeds
(B) flat, open lands
(C) deep valleys
(D) border territory
29. He can infer from the passage that, by carrying their weapons, the Mormon men hoped to
(A) prevent them from being stolen
(B) fight fatigue more easily
(C) discourage possible enemies
(D) travei faster
30. When they pastured their animals, what did the Mormons do with them?
(A) Gave them food and rest
(B) Provided them with shelter from
(8) Allowed them to wander freely the eluments about
(D) Slaughtured and cooked them
31. When the eleven buffalo were added to the larder, they were added to the
(A) company's herd of animals
(B) hunting records of the men who brought them in
(C) company's store of food
(D) cooking pot

Every human being, no matter what he is doing, gives off body heat. The usual problem is how to dispose of it. But the designers of the Johnstown carpus of the University of Pittsburgh eet themselves
(5) the oprosite problem - how to collect body heat. They have designed a collection system which utilizes not only body heat, but the heat given off by such objects as light bulbs and refrigerators as well. The system works so well that no conventional fuel is needed to make the campus's six buildings comfortable.'.

Some parts of most modern buildings - theaters and offices as well as classrooms -- are more than amply heated by people and lights and sometimes must be air-conditioned even in rinter. The technique of saving heat and redistributing it is called "heat recovery." a few modern buildings recover heat, but the University's system is the first to recover heat from some buildings and re-use it in othors.
(15) Along the way, Pitt has learned a great denl about some of its heat producers. The harder a student studies, the more heat his body gives off. Male students emit more heat than femsile students, and the larger a student, the more heat he produces. It is tempting to conclude that the hottest prospect for the Johnstown campus would be a hard-working, overveight male genius.
15. Until recently, body heat has caused problems because it.
(A) was difficult to collect
(B) came in a variety of forms
(C) was difficult to get rid of
(D) tended to be absorbed by physical objects
16. Which of the folloring is true of the heating system of the Johnstom campus?
(A) The heat is supplied by human bodies only.
(B) The heat is supplied by both human bodies and other heat-emitting objects.
(C) The heat is supplied by both human bodies and conventional fuel.
(D) The heat is supplied by human bodies, other heat-emitting objects, and conventional fuel.
17. fit the Johnstown campus, how many of the buildings; are heated entirely by the heat collection system?
(A) none
(B) Two
(C) Four
(D) Six
18. In line 7, "conventional" most nearly means
(A) ordinary
(B) powerful
(C) electrical
(D) extra
19. In line 10, "amply" most nearly means
(A) partly
(B) overiy
(C) warmly
(D) adequiately
20. The phrase "even in winter". (line 11) most nearly means
(A) if the winter is especieliy warm
(B) during all of the yoar except the rinter
(D) in the winter as well as in other seasons
(D) during the evenings in the winter
21. In line 12, "heat recovery" refers to a
(A) method of concealing the source of heat
(B) special form of air conditioning
(C) supplementary hot water system
(D) way of reclaiming and re-using heat
22. According to the passage, which of the following would produce the LEAST amount of heat?
(A) A fat female who studies hard
(B) A thin female who does not etudy
(C) A fat male who does not stuciy
(D) A thin mele who studies hard
23. In line 19, the "hottest prospect" means the
(A) most intelligent student
(B) most desirable student
(C) most diligent student
(D) most obese student

## WRITING fBILITY

Find out the part of the fisisoce ti PhET $A$

1. It is often easier to select the best tool for a particular job than to use $\frac{\text { them correctly. }}{\text { (1) }}$
2. When a person accepts a dinner invitation, $\frac{\text { you are }}{(B)}$ expected to arrive $\frac{\text { on time. }}{D}$
3. Today, divorce is nct longer ragarded as a disgrace, as a tragedy, $\frac{\text { or even as a failure. }}{D}$
4. $\frac{\text { Lbsurdly }}{(L)}$ is one of the most $\frac{\text { prominent }}{\mathrm{C}} \frac{\mathrm{D}}{\mathrm{D}}$ themes of twentiath-century European drama.
5. If the parents had went to the meeting, they could have discussed the problems with the principal $\frac{\text { himself. }}{\mathrm{C}}$.
6. It may be said $\frac{\text { that }}{B}$ in some countries each of the citizens help to decide government policy.
7. When our neighbor's grandson $\frac{\text { gaught }}{A}$ his finger in the car door, he did not cry even though $\frac{\text { it must }}{C} \frac{\text { have }}{\text { (D) }}$ him a Ereat deal.
8. The lawyer, Ben Burstine, he $\frac{\text { nrosonted }}{\omega}$ his cascl so successfully $\frac{B}{B}$ that tho jury $\frac{\text { came }}{C}$ to its decision $\frac{\text { within }}{D}$ a snort time.
9. $\frac{\text { A visit }}{A}$ to the chateau includes sampling the wine, discussing its merits, and then, $\frac{\text { if }}{\mathrm{C}}$ you are fortunate, to hove a chat with the marquis.
10. It may not have bear the $\frac{\text { worse }}{\text { (b) }}$ blizzard in history, but I do not want to $\frac{b e}{C}$ out in another one $\frac{\text { like it. }}{8}$.
11. Japan has experienced $\frac{\text { a }}{\mathrm{A}}$ remarkeblo cconoric $\frac{\text { growing }}{\mathbb{C}}$ in the $\frac{\text { past }}{D}$ decade.
12. He generaliy expresses himself more forceful than $\frac{\text { jny of the members of }}{A} \frac{B}{D}$ 位 the opposite party.
13. Is a result from hearing the radio announcement, $\frac{\text { Craig has written }}{\mathrm{E}} \frac{\text { to offer }}{\mathrm{C}}$ himself as a member of the panel for next weck.
14. It is surprising that Marquesne is such e fine writer, for he has not read $\frac{\mathrm{A}}{\mathrm{A}}$ only a few books other than his own.
15. There $\frac{\text { are }}{\Lambda}$ many organizations which sole purpose $\frac{\text { is }}{\mathrm{C}}$ to help mentally
retarded children.
16. Waiting for a plane to take off from an airport cen often take so jong as the trip $\frac{\text { itself. }}{\mathrm{D}}$.
17. Paul had just returned home and begen to read the paper when his sister called to say she had arrived $\frac{\text { at }}{\mathrm{D}}$ the station.
18. It has been estimated that the efforts of $\frac{a}{h} \frac{\text { mere }}{B}$ one per cent of $\frac{\text { its }}{C}$ total population $\frac{\text { moves }}{(D)}$ the worid forward.
19. The columnist feels sure that who wins the election uill have the gupport of both parties.
20. Because he was $\frac{\text { greatly }}{3} \frac{\text { troubled }}{C}$ by his conscience, Hamlet was incapable to $\frac{\text { kill }}{(D)}$ the king.
21. Neither Russia nor the United States haven been able to discover a mutually $\frac{\mathrm{C}}{\mathrm{B}}$. satisfactory plan for $\frac{\text { gradual }}{D}$ disarmament.
22. The specific gravity of a gas is the numerical ratio of $\frac{\text { its }}{B}$ density $\frac{\text { with }}{(C)}$ the density of a seandard of reference, $\frac{\text { usually }}{D}$ air.
23. Seldom in Western civilization has one man been successful in more intellectual pursuits as leonardo.
24. Far too many owners of color television sets have had a difficult time to find $\frac{\text { qualified }}{\text { (D) }}$ repairmen.
25. iside from the resolution to have more ecumenical conferences, the most


F!RTB
26. There is always a gap between what we say and $\qquad$ .
(h) whatever we do
(B) whet we do
(C) that which is done
(D) that done
27. A good administrator must know $\qquad$ -
(A) to be firm
(B)/ to have firmess
(C) the way of firmess
(D) how to be firm
28. In a period of inflation, the value of money drops as $\qquad$ -
(i) prices rise
(C) up go the prices
(B) prices go the other way.
(D) prices arise
29. Because there was little heat in the bedroom, Evan was cold $\qquad$ -
(A) much through the night
(B) most of the night
(C) many parts of the night
(D) the majority part of the night
30. The hikers needed to walk faster to $\qquad$ -
(d) errive by their destination in time
(B) reach their destination on time
(C) reach at their destination in time
(D) arrive their destination on time
$\qquad$ .
31. The purpose of the research had a different meaning for them than -
(i) ours
(B) for ours it had
(C) with us
(D) it did for us
32. It is one thing to accuse a person of a certain crime, but $\qquad$ -
(i) proving it is different
(E) how to give proof is no easy
(C) when to prove it is difficult (D) to prove it is quite another matter
33. The party continued through $\qquad$ -
(A) the whole of the night
(B) nearly whole of the night
(C) almost of the night
(D) most of the night
34. Synthetic fabrics are particularly valuable in making $\qquad$ -
(A) unheavy clothing for sumers (B) cloties yearing light in summer (C) light clothes of the summertime (D) lightweight summer clothing
35. According to Xenophon, Socrates believed that $\qquad$ -
(A) what a man does is also able for a voman to do
(B) a man's abilities can be the sane with a woman
(D) a woman can do the same thing as a man
(D) the same things between man and yomiri can be done equally
36. Nineteen people were already dead,
(A) seven of whon were tecnagers (B) sever being teenagers
(C) teenagers were seven (D) anong seven wore teenagers
37. iccustomed to climbing trees, $\qquad$ -
(i) I hal no difficulty reaching the top
(B) reaching the top was not hard to me
(C) the top was not difficuit for mo to reach
(D) to reach the tof was not a problem
38. The harder they worked, $\qquad$ .
(f) they secmed to do less
(B) the less they seemed to do
(C) they were doing less
(D) they did less
39. In order to be a cood scientist, $\qquad$ -
(A) mathematics is urgent
(B) one should have the mathemetics
(C) one must unders and mathemstics
(D) mathematics is important to be understood
40. Nary had spent $\qquad$ studying.
(x) the viole daj
(D) all during the day
(C) altogether a day
(D) entircly a day

APPENDIX 16

SCORES OF INDIVIDUAL STUDENTS

Each students scores were printed in two lines with their student number at the beginning of the first line and the end of the second line. The numbers between the student numbers were the scores. The following example would help to read the scores (taking the first student as example).

First line
101 Student number
5.5 Pretest (with correction formu- 12 Motivational intensity in physics 1a)

34 Mathematical reasoning
37 Abstract reasoning
40 Hechanical reasoning
36 Spatial reasoning
40 Chinese verbal reasoning
37 Chinese language usage
38 English language usage
38 English verbal reasoning
23 Listening comprehension
22 English structure
17 Vocabulary
15 Reading comprehension
17 Writing ability
22 Post-test (good items)
24 Retest
55 Term examination in English
21 Mechanics
21 Atomic physics (with error)

## Second line

29 Socioeconomic status

27 Desire to learn physics
63 Study habit in physics
82 Teaching performance
75 Self concept of academic ability
24 Student's knowledge of English
8 Yotivational intensity in English
38 Attitude to life in Hong Kong
55 Authoritarianism
30 Anomie
14 Rating of English skills
7 Parents' knowledge of English
30 Orientation toward English
27 Attitude to English as a medium
19 Attitude toward foreign language
100 Attitude to Eng. speaker
14 Parental encouragement
15 Desire to learn English
85 Study habit in English
8 Reading habit
16 Ethnocentrism
33 Cultural allegiance
22 Atomic physics (no error)
101 Student number

4uッコン
VGSCH HAS BEEN CRFATED．
OURCEF ENGSCH










 $\begin{array}{lllllllllllllllllllllllllllll}107-10 & 31 & 33 & 32 & 36 & 45 & 36 & 37 & 43 & 34 & 29 & 19 & 21 & 19 & 17 & 20 & 67 & 16 & 21\end{array}$




 $\begin{array}{lllllllllllllllllllllll}110-40 & 38 & 37 & 36 & 35 & 45 & 41 & 39 & 45 & 29 & 28 & 15 & 12 & 25 & 20 & 25 & 62 & 25 & 27\end{array}$










 $\begin{array}{lllllllllllllllllllllll}117 & 25 & 28 & 33 & 29 & 24 & 40 & 29 & 39 & 40 & 18 & 26 & 21 & 1.2 & 15 & 13 & 16 & 52 & 9 & 18\end{array}$


 $\begin{array}{llllllllllllllllllllll}119-18 & 35 & 36 & 39 & 36 & 41 & 35 & 24 & 35 & 21 & 16 & 18 & 15 & 19 & 12 & 18 & 44 & 16 & 18\end{array}$






$\begin{array}{lllllllllllllllllll}24 & 12 & 23 & 65125 & 74 & 27 & 12 & 31 & 53 & 26 & 15 & 8 & 28 & 24 & 16 & 86 & 13 & 15 & 82\end{array}$ ..... $\begin{array}{llll}5 & 22 & 31 & 22\end{array}$ ..... 165

 ..... 166
 $\begin{array}{llllllllllllllll}168-38 & 34 & 35 & 36 & 29 & 45 & 38 & 37 & 44 & 25 & 27 & 14 & 15 & 23 & 18 & 21 \\ 64 & 19 & 20\end{array}$$29 \quad 16 \quad 23 \quad 6461 \quad 75 \quad 27134657 \quad 2917 \quad 9 \quad 31 \quad 38 \quad 20119171369$9184226172
 $28 \quad 1424 \quad 66 \quad 76 \quad 70 \quad 24123353 \quad 301512331215101171785$ 5153523 ..... 173
17520293136343642464433261817212326772821$\begin{array}{lllllllllllllllllllll}177 & 15 & 29 & 38 & 27 & 26 & 39 & 32 & 35 & 45 & 32 & 28 & 25 & 20 & 17 & 16 & 15 & 58 & 14 & 19\end{array}$$\begin{array}{lllllllllllllllllllllll}183-03 & 32 & 32 & 28 & 23 & 39 & 32 & 45 & 40 & 30 & 28 & 19 & 21 & 31 & 14 & 24 & 56 & 20 & 25\end{array}$$5163726 \quad 184$$\begin{array}{llllllllllllllllllllll}186 & 05 & 31 & 35 & 30 & 32 & 34 & 35 & 46 & 46 & 29 & 31 & 17 & 21 & 18 & 19 & 23 & 61 & 24 & 23\end{array}$
 $\begin{array}{lllllllllllllllllllllllllllll}28 & 15 & 27 & 63 & 94 & 72 & 33 & 16 & 25 & 45 & 22 & 14 & 8 & 29 & 33 & 19 & 93 & 21 & 12 & 77\end{array}$$\begin{array}{lllllllllllllllllllllll}189 & 13 & 30 & 36 & 33 & 24 & 38 & 33 & 35 & 39 & 28 & 24 & 15 & 17 & 18 & 18 & 10 & 54 & 17 & 22\end{array}$$1906827 \quad 28 \quad 342144404448 \quad 29291718 \quad 3315 \quad 27601543$
1917358912543017395426221032331412815229218 6203723 ..... 190

:LE




## APPENDIX 17

DISCUSSION ABOUT ITEM DELETION IN• SOME SCAIES

As shown in Table 3.2, the following scales have some of the items deleted during data analysis\% Their content validties are re-examined here to ensure that the original purpose of the individual scales remins unaffected.

Item 7 of Desire to Leari shisics (See Appentix 6, Set III, No. 49) This item asks about the same kind of thines as in itemo. Deletime this item dees not affect the content at all.

Item $5,20,21$ of study Habits in physics (See Adendix 6 , Set $11 I_{1}$ No. 59, 73, 74)
Few concerns aydreaming during studying. It is nct toc releter te the 了urirae of the scole. Item 20 conceras the relaticr brtwees the

 is not ton relevant fin oriainally lamer. Item 21 concerns vinere the streente sit is the cleserocme Siace sets are asified py the tefters, there is no direct relaticn rith stuif hobit.

Itém : Prientetion Towart English (See A, endix 6, Set I, No, 48) Ttis iter: $\because$ as not tor relevat since Lifle of tre si:bjectsucre fror the Cisimese "itdle school wic's did not require cll their studerits te pas in Euelisi in order to graduate.

$20)$
Since students at frede 10 level are usually not proficient encugh in Enclish, only very fer of them will read Eiglish nerspaper or maézincs urless they are forced to do so. Hence item 4 is not tco relevent to the scile. Iteif 7 his a letine this iten dees not effect the content vaiditratern. $\quad$. Iter $100^{\circ}$ Nec lin पabit (See Auendir 6, Set II, No 46) \%
Siace this scele cims at linding the cciprisco between bon much Eagfish or Chinese the students chocsc, the first item is not reteted rith the ecale at all.

Item 4 of Ethnocentrism (See Appendix 6, Set III, No. 104) Since the scale concerns the attitude towards Chinese and Western culture, while item 4 deals with modern and traditional translations which is not too relevant, so it was deleted.

## APPEIVDIX 18

ITEM INTERCORRELATION MATRIX FOR SCAIES HAVING LOW RELIABIIITIES

The followiné is a list of itern correlstions of those scoles heving low relicbilities (internal consistency).
(A) Orientatior Toward English

| Item No. |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ST | . 22 | . 34 | . 21 | . 13 | . 16 | . 33 | . 21 |
| Correletion | TT | . 48 | . 57 | . 49 | . 33 | . 42 | . 64 | .46 |

(B) Desire tr LEira Mislish

| Itern No. |  | 1 | 2 | 3 | 4 | 5 | 6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ST | . 20 | .16 | .26 | . 30 | . 23 | .3) |
| Correlation | Tn: | . 63 | . 56 | . 50 | . 50 | . 48 | . 55 |

(c) Attitude Townd Poreich Lumbage

| Item N. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cormelation | ST | .06 | .10 | .19 | .13 | .10 | .19 | .26 |
|  | 0 | $.5 ?$ | $.4 n$ | .50 | $.4 ?$ | .35 | .50 | .43 |

(D) Ethnocentrisp


## APPENDIX 19

INTERCORRELATION MATRIX FOR SIGNIFICANT VARIABLES
IN PREDICTING PHYSICS ACHIEVEMENT \& ENGLISH PROFICIENCY

Correlation Matrix for Table 4.11

| 1 | 2 | 3 | 4 | 5 | 6 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1. English Structure 1.00 | -. 15 | . 01 | -. 25 | . 16 | . 15 |
| 2. Mechanical Reasouing | 1.00 | .18 | . 19 | .17 | . 04 |
| 3. Desi..e to Learn Physics |  | 1.00 | -. 27 | . 02 | . 06 |
| 4. Sclf Concept of Academic | Ability |  | 1.00 | -. 18 | $-.20$ |
| 5. Chinese Verbal Reasoring |  |  |  | 1.00 | - 42 |
| 6. Crinese Langaage Usi.ge |  |  |  |  | 1.00 |

Correlation Matrix for Table 4.13

|  | 1. | 2 | 3 | 4 |
| :--- | :---: | ---: | ---: | ---: |
| 1. Self Concept of Academic Ability | 1.00 | -.22 | -.35 | -.18 |
| 2. Cainese Language Usage |  | 1.00 | .12 | .42 |
| 3. Motivational Intensity in English |  | 1.00 | -.02 |  |
| 4. Chinese Verlal Reasoning |  |  |  |  |

## APPENDIX 20

Intercorrelation Matrix for the Aptitude Scores

## Correlation 1 fitrix of the Aptitude Scores for the Two Schools Together

| $\ldots$ | 12 | 3 | 4 | 5 | 6 | 7 | 8 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1) $M R$ | 1.00 . 24 | - 30 | .54 | . 19 | -. 02 | . 00 | . 14 |
| 2) $A B$ | 1.00 | . 21 | . 17 | .14 | . 13 | . 04 | . 13 |
| 3) HERR |  | 1.00 | . 53 | .17 | . 04 | -. 09 | -. 08 |
| 5) $S R$ |  |  | 1.00 | . 16 | -. 05 | . 04 | . 05 |
| 5) CVR | - |  |  | 1.00 | . 42 | . 29 | . 33 |
| 6) CLD |  |  | - |  | 1.00 | . 38 | . 31 |
| 7) EL d |  |  |  |  |  | 1.00 | . 54 |
| 8) EVE | $\cdots$ |  |  |  |  |  | 1.00 |

Correlation Hotrix of the Aptitude Scores for the A C S only


DOLUME II The ohegials of those appendices stared
were not heccived in Special Collections.
APPENDIX 1 Pretest
APPENDIX 2 Content Analysis of Pretest
APPENDIX $3^{3}$ Chinese Translation of Pretest
APPENDIX 4 Teaching Schedule of optics;
Appendix $5^{*}$ Teaching Material in optics
APPENDIX 6 Questionnaire
APPENDIX 7 Chinese Translation of the Questionnaire
APPENDIX 8 Optics posttest 2
APPENDIX 9 Retest in Optics

APPENDIX 11 Teaching Schedule of Mechanics
APPENDIX 12 Test in Mechanics
APPENDIX 13 Lesson Plan in Atomic Physics
APPENDIX 14 Test in Atomic Physics
APPENDIX 15 English Proficiency Test Battery
APPENDIX 16 Scores of Individual Students
APPENDIX $17^{*}$ Discussion about Item Deletion in Some Scales
APPENDIX $18^{*}$ Item Intercorrelation Matrix for Scale Having Low, Reliabilities

APPENDIX 19* Intercorrelation Matrix for Significant Variables in Predicting Physics Achievement and English Proficiency APPENDIX $20^{*}$ Intercorrelation Matrix for the Aptitude Scores



Phonies Pretest (First Pert-tand)
MING KED COLLEGE
FORM 4
PHYSICS TEST

Precast ulminiulered on $\mathrm{X} / \mathrm{P} 48$
to 86 Ming Ken $F .4$ students
Imine: 30 mantis

A1. Whenever the centres of the sun, moon and earth are in a straight line (in that order):
I. some part of the earth must be in the moon's umbra
II there is a total eclipse of the sun visible from somewhere on the earth
"III part of the earth is in the moon's penumbra
Which of the above statements is/are true?
A. I only B. II only
C. III only
D. I and II only
E. I, II and III

A2. The effect of increasing the diameter of the pinhole in the pinhole camera is

$2,2,2$

| A. increased | sharper | B. reduced sharper |  |
| :---: | :--- | :--- | :--- |
| C. increased | unchanged | D. reduced blurred |  |
| (E) increased | blurred | . |  |

A3. We can see the image of ourselves in the plane mirror but not on a plane sheet of white paper because
A. white paper absorbed all the light energy falling on it.
$2,2,2$
(B. white paper is too rough to give regular reflection.
C. white paper transmitted nearly all the light falling on it.
D. the coefficient of white paper is unknown.
E. the image formed in white paper is virtual.
$A^{4}$.


The rays $H$ and $K$ diverging from a point source $S$ are reflected from a plane mirror MM'. The reflected rays $X$ and $Y$ will now diverge at on angle of
A. $7 / 2^{\circ}$
(B. $15^{\circ}$
C. $30^{\circ}$
D. $40^{\circ}$
E. $75^{\circ}$

A5. Which of the following mirrors can give an image (real or virtual) of the same size as an object which is not in contact with the mirror?
${ }^{\wedge}$ I plane mirror
II convex mirror
$\checkmark$ III concave mirror
A. I only
B. III only
C. I and II only
E. I, II and III
(D.) I and III only

If an object is placed 20 cm from a convex mirror of focal length 20 cm , the image formed by the mirror will be
A. magnified.
B. real and inverted.
(C. diminished and upright.
D. between the object and the mirror.
E. at infinity.

FORM 4
(i)

(iii)
(ii)



3,32
The above diagrams show a parallel beam of light entering from one medium to another. Which of the beam will emerge as converging ways in the above 3 cases.
A. i only
C. iii only
E. i and :
18.


Bu ii only
(D, $i$ and $i i$

Rays from a point source at $S$ are reflected by a concave mirror $M$ and converge to a. point $F$ as shown in the diagram above. If we wish to 133 obtain a parallel beam of light after reflection we could
I move the mirror $M$ further away from $S$
II move the mirror $M$ nearer to $S$
III sep the source at $S$ and replace mirror $M$
a suitably chosen concave mirror of short
focal length
C. I only
C. III only
E. II and III drily.
E. II , and III drily.
19. When a beam of monochromatic yellow light pass from air to glass, there must be a change in the ...

Í, speed at which the light travels
ii directions of propagation of the light wave | |
iii frequency of the light wave
(12) $i$

Bo ii
E. i, in and ti
" 110 . Total intern" respocion cen occur at a surface of separation between a d்tnse medium $A$ and a rare medium $B$ only when


A ray of light coming from point; 0 in a clear liquid approaches the surface, ss shown by ray $O Q$ making an angle with the normal which is less than the critical angle. After meeting the surface, the ray will continue along the path or paths
B. $Q Y$ only
D. QX and $Q Z$
A. black spot at $X$ inside a block of glass is observed from the point $Y$. The image $C A^{-} X$ appears to be
A. between $y$ and $Z$.

Bo between $Z$ and $X$.
C. $\mathrm{a}^{2} \mathrm{X}$ 。
(D) between $X$ and $V$

$$
\frac{1}{u}+\frac{1}{v}=\frac{1}{f}
$$

113. The angle of incidence of a ray of light on a liquid is $45^{\circ}$ and its angle of rotarian is $300^{\circ}$ What is the critical angle for the Iiguta?
$\therefore \quad 15^{\circ}$
B. $30^{\circ}$
(C) $45^{\circ}$
E. $75^{\circ}$

A14.
geswhitan

f. I only

I and ITI Cit

* II and IT on s
$\Lambda 15$.

A. 1
C. 3

卫. 5

The fish in the above diagram will appear to the observer to be
/I shorter than it actually is
II longer thou it. actually is
III nearer to the' $/$ observer
IV further away from the observer
B. IIT only
D. I and IV only

The diagram shows a thinwalled prism filled with cir. The air prism is immersed in water. is ray of light is incident along the line Po. flong which line the direction of the light merges...
(3) 2

A16. Which of tho folloung give optical instrument use concave lens as the eye-pipoe?
A. Compound microscope
B. prism monocular
C. prism binocular
D. "terrestrial telescope
417. in object is placed between a concave lens and its focal point. What is the nature of the image produced?
As Magrised, virtual and erect
B. Magnified, mat an inverted
C. Diminimed; mol and inverted
(D) Diminishes, virtual and erect
E. No inge is produced by the arrangement

HUKM 4 PHYSICS TEST
$-4=$


With a lens of x , a real, inverted and magnified image of tho illumated pire is'seen on the screen. When the lons is moved to position $Y$, an image of the pin is seen again. This image will be
A. real; inverted and diminished
B. real; invertod and magnified
C. real, crect and magnified
D. real, erect and diminished
E. vircual, onect and magnified
.19.


A parallel beam of rays after passing through a converging lens L converges to a point $F$. If the lens is now completely surrounded by a clear liquid. having the sane rofrective index as the lens, you would expect the bearn to
A. converge to the point $X$.
F. converge to the point $F$ as before. $\quad, \quad$,
C. convorge to the point $Y$.
D. emerge as a perallel beam.

En diverg fron the point $Z$.
A20.


A real image $I$ of an object is formed by a convex lens, locate at a distance of 25 cm from the . lens. If a plane mirror incline at $45^{\circ}$ in the axis of the lens is placed at a distance of 15 cm from it, as shom in the diagram above. What will be the nature and position of the fincl image formed.
Q. real; 10 on bolow the axis of the lens.
B. real, 15 an below the axis of the lens.
C. virtual, 15 cm below the axis of the lens.
D. virtual, 15 cm above the axis of the lens.
E. virtucl, 10 cm above the axis of the lens.

A21.


Tro parallal rays of light pass through a box containing a piece of glass and mange as shown.
(I)
(II)

(D)



Which of the above pieces of glass could produce this result?
A. I only
B. II only
C. III only
either II ow IV
D. IV only

132

Cont'd

BEOAUSE the image seon through a concave lens appears to be closer than the object.

| A. True | True | (correct explanation) |
| :--- | :--- | :--- |
| B. True | True | (irrelevant or wrong explanation). |
| C. True | False | 2 |

A23. The reason why a rainbow has several colours is that
(A) the refractive indices for colours in white light are. not quite iduntical.
B. all of the colours in sunlight have the same refraciive index.
C. the diffoncit colours in sunlight have travelled from the sun at the same velocity.
D. the different colours in sunlight have travelled from the sum at different velocjty.
E. the caiticel ongle for different colours is always the sane, regercless of the colour.

A24. A red disc is placed on a green grass ground and is then
illuminated with coloured light given below, which could make the disc in-distinguishable from its background...
A. red

B: white
C. green
I. magente
n25. Red end blue filters are placed directly in the path of white light. What in the colour of the light coming through?
A. magenta
B. white
C. yellon
D. green
(E. black (no light pass through)

A26. Which of the following will affect the velocity of sound in air?
I the frequancy of sound
II. the Ioudness of sound

III the temperature of the air
A. I only $\therefore$ B. II only
<C. III only D. I, II and III
F. none of the above

A27. Which of the following will occur at a displacenent node of the longitudinal wave set up in an air column?
i. Marimum variation in pressure and maximum displacement of air peirtjcles
(3. Maximuin variation in pressure but no displacenent of air paxticles
C. Modeate variation in pressure and moderate displacenent of air particles
D. No chenge in pressure but maximum displacement of air particles
E. No chenge in pressure and no change in displacement of the air paricles.

A28. $\quad$| N | $\hat{A}$ | N | $\hat{N}$ | N | $\hat{N}$ | N |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

The closed pipo shown is 0.9 m long and contains a stationary sound wave with nodes $N$ and antinodes $A$ at the position shown. The wave length of the sound is
B. $\quad 0.6 \mathrm{~m}$

Cont' d
429.


The velocity of some in air is $340 \mathrm{~m} / \mathrm{s}$. "An electronic whistle, situated 34 m from a vertical wall, sounds sharply from $t=0$ os to $t=0.4 s$ only n $A$ sound recorder (which draws an mpitude tint graph) is started at the same moment as the . whistle. The graph obtained is:


A30. A loudspeaker" ti s citing sound waves of frequency 500 Hz towards a solid walt, On moving a microphone between tho loudspeaker and the wall, tit is fund that there are positions of maximum loudness at regular spaced intervals of 0.3 m . We can deduce from this that the mav-langth of the note is
A. 0.3 m
(B. 0.6 m
332
C. 0.66 m
D. 1.2 m
To imposibio to cellmate

A. II only I and TTH mist I, II and III

The abode diagram shows a disc siren; the nite emitted by this disc will depone on
I the number of holes in the disc
IT. the distance of the holes from the axle of the disc the mounter of revolutions the disc cures through per second

Bo' I and II only
$D_{0}$ II and III only

A32. Tho Joudsreaters $X$ ara Exoarcest the same puronote. The sound from loudspeaker $X$ in wow n han that from loudspeaker $Y$. The sound waves produced by $x$
i. have higher frequency then these by $Y$
B. have longer wave iongth than those by $X$
C. have shorter wardmote thar those by $Y$
(1.) have greater whintude thai those by $Y$.
E. travel raster shan those by $Y$
i33. With respect to a sound wave,
I the with commends on frequency
II the quality depones on velocity
III the loudness dopers on amplitude
Which of the above statements is/are correct?
io I only
B. II only
C. III only
.D. I and II only

A34. Anote sounded on a violin is richer in hermonics than the same noto produced by a

EECAUSE a violin sets more air in vibration than a tuning fork tuaing fork

| Q. True | True | (Correct explanation) |
| :--- | :--- | :--- |
| B. True | True | (Wrong or irrelevant explanation) |
| C. True | False |  |
| D. Frlse | True |  |
| E. Felse. False |  |  |

A35. When the air in a tube closed at one end and open at the other is made to vibrate, it has
A. an antinode at the closed end
B. an antinode oxactly at the open end
C. meximum omplitude halfway along its length
D. the froquancy of any strongly vibrating tuning fork pleced noar the open end
9, a node at the ciosed end
A36. The souncl in oir caused by the vibrating string must.. .
$i$ hav same frequency as the stationary wave
ii have the same wavelength as the stationary wave
iii. also be a stationary wave

Which of the above statements is/are correct?
C. 1

卫. aily
B. 2
D.. 1 and 2 only
137. Sound is procuced by pouring water into a resonance tube closed at one und. as the tube fills, it is found thet

I I the velocity of the sound produced remains constant
II the pitch of the sound produced becomes lower and 1omeer
-III the pitch of the sound produced becomes higher and
A. I only
B. II only
C. III only

I and III only
D. I and II only

A38. A sonometcr wire emits a note of frequency 300 Hz when under a tension of 2 kgf . If the tension is increased to 3 kgf and the length is kept constant, the frequency of the note becomes
A. 75 Hz
B. 150 Hz
C. 600 Hz
D. 1200 Hz ,

A39. An open tube a has a diameter twice than that of nother open tube $B$, but the fundanculal length of $A$ is only half of $B$. Neglecting the and comection, frequency of the sound emitted by $\Lambda$ will be ...
A. 4 times then emitted ky $B$. (B), 2 times then enittod by $B$.
C. same is B .
E. holif of that emitted by B.

A40.


[^28]Aplenara 2

| $\begin{aligned} & 2512 \\ & .2512 \end{aligned}$ | $\begin{aligned} & 115 \\ & 115 \end{aligned}$ |  | DEFINED $\mid$ LRI ${ }_{\text {G }}$ |
| :---: | :---: | :---: | :---: |
| ${ }^{2516}$ | 115 115 |  |  |
| 2516 | 115 | +60 | GO |
| 2522 | 115 | +SET PR = , 12ri2. | DEFINED IPB! |
| 2522 2522 | 115 115 |  | DEFINED ILRI |
|  |  |  |  |
| 2528 | 115 |  | DEFINED IPRI |
| 2528 | 116 |  | DEPINED 1LRI |
| 2528 | 115 | +60 |  |
| 2538 | 116 |  |  |
| 2538 | 115 | +SEP LR $=$, \|lbil ${ }^{\text {a }}$ | DEFINED [LRI |
| 2538 | 116 | +60 | GO |
| 2544 | 116 |  | DEFPINED \|PR, |
| 2544 | ${ }^{115}$ |  | DEFINED \|LRI |
| 2544 | 116 | +60 | 60 |
| 2545 | 115 | +SET $\mathrm{PR}={ }^{\prime}$, $112 \mathrm{ri2}{ }^{\text {, }}$ | depined \|ra| |
| 2545 | 116 |  | defing \|lid |
| 2545 | 116 | +GO |  |
| 2546 | 116 |  | DEFINED ${ }^{\text {Prat }}$ |
| 2546 | ${ }^{116}$ |  | $\mathrm{G}_{\text {GO }}$ |
| 2591 | 118 |  | DEFINED \|PRT |
| 2591 | 118 |  | depined \|l8! |
| 2591 | 118 | $+60$ | GO |
| 2612 | 119 |  | depined \|Pr| |
| 2612 | 119 |  | DEFINED \|lit |
| 2612 | 119 | +60 | G0 |
| 2621 | 119 |  | ${ }_{\text {deprined }}$ Prif |
| 2621 | 119 |  | DEPINED [LBI |
| 2621 | 119 | +GO | Go |
| 2630 | 120 | +SET PR = ' $112 \mathrm{ri3}{ }^{\text {a }}$ | DEFINED \|PR| |
| 2630 2630 | 120 120 | $+\operatorname{set}$ le $=$ ' 1 lri3 ${ }^{\prime}$ |  |
| 2630 | 120 | $+60$ | 60 |
| 2638 | 120 | *SET PR $=$, , 12ri3 ${ }^{\text {, }}$ | DEFINED \|PR| |

## Teaching Schedule of F. 4 Physics (1978)

| Date | Period | Content | Page |  |
| :---: | :---: | :---: | :---: | :---: |
| 4/9 | 0 | Pretest on light and sound。 |  |  |
| 6/9 | 1 | Rays and beams of light, the pinhole comera. | P.239-240 | Ch. 21 |
| 8/9 | 2.3 | Shadows, eclipses, the nature of light, reflection of light, laws of reflection, experiment to verify the law of reflection. | P. 241 -243 |  |
| 12/9 | 4 | Parallax, to locate images by noparallax; looking into a plane mirror, how the eye sees an image in a plane mirror: | P. 244 -245 |  |
| 14/9 | 5.6 | Images formed in two mirrors inclined at $90^{\circ}$, kaleidoscope, experiments to study image formed in a plane mirror and images formed in two mirrors. | P. 246 |  |
| 19/9 | 7.8 | Parallel mirrors, the periscope, pepper's ghost, diffuse reflection, experiment to study rotation of reflected ray. | P. 247-248 |  |
| 21/9 | 9 | Further explanation on how the eye can see an image, discussion of exercise. | P. 249 |  |
| 25/9 | 10,11 | Principal focus, mirrors of large aperture, the focal length of a spherical mirror, construction of ray diagrams, image formed by a concave mirror. | P.250-253 | Ch. 22 |
| 27/9 | 12.13 | Parallel beam from curved mirrors, the reflecting telescope, experiment to measure the focal length of a concave mirror. | P. 254-255 | . |
| 29/9 | 14 | Images formed by a convex mirror, accurate construction of ray diagrams, worked example, prove of mirror formula $\frac{1}{u}+\frac{1}{v}=\frac{1}{1}$. | P.256-258 |  |



25/8/78 Ch.22 P. 250-254 (wanqe formed hy a conoweminol) (10-18) (somedifficiely on $\mathrm{Fig}^{248 \text { ) }}$
27/9/78 7tofe $7_{y} 248$ parablic minov, rectetring telescope expol. To measure focal longth [iis unsige of a far ofject iii $\frac{1}{a}+\frac{1}{v}=\frac{1}{f}$ ] $12-13$
29/Pho inses form ly cowerx memior prove of $\frac{1}{a}+\frac{1}{a}=\frac{1}{f}$

 $5 / 1078$ Fi.265 2 verifig Snell's laws P. 47 Some effein on refraction, P.26f Enptom rest \& upparentiphth, jwi wad the jlowe bleck \& thuinb tick (thereticil explemathin will be timgit in the next penod)
9/10 2 otal Internal Reflection, $\rightarrow$ Fisho syeviewr
12/10 Inet (1 hour) on Replection ly plane ©plencal murror
17/10 Riscwinon of 2 ent, exption. teter intinap iffleition ey prsim



$3 / 10$ Esft to nerour foul leyth of lems (P. $22-284$.
$2 / 11$ maginficition, levo formula, projecter icamera eye

8/1. Resconsain of Exerasis

$20 / 11$ Jught fetter $\rightarrow$ the and af the chaptor $22 \%$ Whrothchin to Somei velerity of Somad in avi $27 / 11$ Ficto which affect the velenty of somed $\rightarrow$ echo
27/1" Echelon Echr $\rightarrow$ the end of chapter
30/1. Pitch L. 7requery $\rightarrow$ Porlem of tumific eegbocard instrument
1/12 Falling plect expt $\rightarrow$ end of chapfer
4/12 Exarace, startch, standiny wowe, sonopueter
$7 / 12$ Expt with Sonowter \& resiname tule



| Date | Period | Content | Page |
| :---: | :---: | :---: | :---: |
| 3/10 | 15,16 | Magnification formula, mirror formula, sign convention, worked examples, discussion of exercise. | P.259-263 |
| 5/10 | 17.18 | The law of refrotion, to verify Sinell's law of refraction, refractive index, geometrical construction for refracted ray, some effects of refraction, the principle of reversibility of light, real and apparent depths, refractive index related to real and apparent depth, experiment to measure refractive index by the real and apparent depth method. | p.264-269 |
| 9/10 | 19 | Total internal reflection, critical angle, relation between critical angle and refractive index, the fish's eye view. | P. $270-271$ |
| 12/10 | 20,21 | Test on Ch. 21 and 22 |  |
| 17/10 | 22,23 | Discussion of test, experiment to measure the critical angle and refractive index of a prism. | P. 271 |
| 23/10 | 24 | proof of apparent and real depth formula, multiple images formed by a thick glass mirror, total internal reflection in prisms, mirage. | P.272-273 |
| 25/10 | 25,26 | To study the deviation of light by a prism, discussion of exercise 23. | P. 274 -276 |
| 27/10 | 27,28 | Technical terms, lenses compared with prisms, optical centre of lens, focal length, a lens has two principal foci, construction of ray diagrams, formation of images ly a converging lens, images formed by a diverging lens, solution of problems by graphical construction. | P.277-281 |


| Date | Period | Content | Page |
| :---: | :---: | :---: | :---: |
| 31/10 | 29 | Experiment to measure the focal length | P. 282-284 |
| 2/11 | 30,31 | Magnification, lens formula projector, camera, eye. | P. 285-286 |
| 6/11 | 32,33 | Defects of vision and their correction, compound microscope, angular magnitude and apparent size, astronomical telescope, sign conventions, worked examples. | P.287-290 |
| 8/11 | 34 | Discussion of exercise 24. | P. 291-293 |
| 10/11 | 35,36 | Newton!s experiment with a prism, improvement on Newton's original experiment, production of a pure spectrum, spectrometer, recombination of the colours of the spectrum, colour of objects in white light, rainbow. | P.294-297 |
| 14/19 | 37.38 | Test on Ch. 23 and 24. |  |
| 16/11 | 39 | Discussion of test. |  |
| 20/11 | 40,41 | Ifght filters, appearance of coloured objects in coloured light; primary and secondary colours; mixture of coloured iights; mixing coloured pigments; infrared and ultraviolet light. | P.297-300 |
| 22/11 | 42,43 | Sound produced by vibration, sound waves require a material medium, sound can travel through solids, velocity of sound in water; velocity of sound in air: | P.329-330 |
| 27/11 | 44 | Factors which affect the velocity of sound in air, sound waves, Crova's disc, an experiment on the refection of sound, echoes. | .7.331-334 |

(4)


Iext : A.F. Abbott Ordinary level Phyeics. ( 2 nd ed.)
Hernemann Educatinal Books.



中四 物理测嬐 $A$
1．每當太陽地球，地球依次同在一直线上時：
I．地球上某些地熩必定位於月球的本影區上
II，在地球上某些地區可看到日全蝕的景像
III，地球上某些地區位於月球的半影區上
問上术阿些叙述正磪
A．只有工 $B$ ，只有II C，只有正

2．增办針孔照相机的邻孔县徭健
（iI）对下术有何影响？

像的亮度
A．曾水

$\therefore$ 我训可正平電镜中看到自己的开 像
因芎…
A．向纸吸收所有落在它占面的光；
B．向纸非常粗徙了致不能産生规则反射
ㄷ．向纸戋乎把全部落在它上面的光傅送出去。
D．白纸的保数是未知值
E．当纸上的成像是虚像。
4.
（II）

全意 M M 之射，则反时线XY之本角为

Pretest raministerel on Sept 5，78． to 93 pui yuing stridents
$\begin{array}{cccc}\text { 4．（㕢）A．} 7 \frac{1}{2}^{\circ} & \text { B．} 5^{\circ} & \text { C．} 30^{\circ} \\ \text { D．} 40^{\circ} & \text { E．} 75^{\circ} & \end{array}$
5．下列何者合使实物僮生一间大小相等的实像或虚像；該实物並不勿鏡面接解者。
I．平面镜
I 』镜
A．只有工 B只有亚 C．只有工及I
D．只有 工及亚
E．工，II及亚全部
鐘前，距鐘面20 20 ，则其成像捊合是
A．放大的像 B．实潒旦剧立
C．㴼11旦正立 D 位斿实物分全童面開 E 位旅恠㔛虎。
7.


上同中的平街总线由一種介筫隻入另一种介贸（a，化表空荓，g代表玻动）上逐䂙些情说畣毫生會聚的折时光线
A．只有工 只只有而 C．又有亚。 D，只有工及IIE．只有工及正。
 M所议射而合聚礼F点上。如欲毫生平行的食射光线；则要

亚把M移近S
II．固定S 而把多
—赖短焦距之心鏡更「代M。
A．只有工 B 只有工
D，只有级攻 $E$ ，只有正及吕

空員 隻体
13．光线自液体進入空氣，入射自是 $45^{\circ}$折射角是 $30^{\circ}$ 则淁種液体的臨界角是
A．${ }^{5} 5^{\circ}$
B． $30^{\circ}$
c $45^{\circ}$
D． $60^{\circ}$
E． $75^{\circ}$

观察者之眼

$$
\left[\begin{array}{r}
-\infty  \tag{iii}\\
- \\
\hline
\end{array}\right.
$$

上图中之观察者所看到的游鱼
I．比实物学短
II． $\boldsymbol{H}^{\text {实物为表 }}$
III距缡比实際者为近
立距離比实際者為遠
A．只有 I B 只有亚
C．只有工及亚
D，只有级其 E只有亚及昰。

之夜体鼻達入液体南空氧之分界面；

角時，则該光成合依下列何種全得前㟟
A．只有 $Q X B$ 只有 $Q Y$ C贿 $Q Z$
D．$Q \times B Q Z E Q Y B Q Z$

12


有一累点入位於玻璃䃁内，观察者自个点观察，则x之像位方
A．W田E之問
B，正如僴
－$\times$ 句 $\vee$ 之間
鹤每个之間
C在×上
18.


圆中意镜置旅义，有一倒立实像成旅幕上如此透镜稳至个虐慮，另一像再现斿銀幕上。此像是
A．塀立，缩小实像 品倒立放大实像
C．正立，放大实像 D，正立，缩小实像
三 区立，放大虚像。


事行光通遏一鿖聚秀镜而票
旅下点上。如秀鎊完全被
一同折时率之液体包園
则此光将倉
A．合票於X点 B，含聚旅F点
C．合察䇊Y点 D．平行出射 E，自己点復散


一实物的老香显息透镜成一实像工，像距鏡 25 cm 。若平面镜置涪镜主铀上，近主神成 $45^{\circ}$ 角旦距透镜 15 cm ，如上固所示；则最後成像之性贸及位置如何？
A．孝实象，在主蚰下 10 cm
B 为实像在主車本下 15 cm
C．太空潒，在主事种下 15 cm
－学虐像在主軸上 15 cm
E美虚像在主聑上 10 cm
21.


两平行光穿越一盒，金中荿下列光等器是之一 $0_{I} \int_{\text {II }} \Leftrightarrow \frac{\pi}{\text { III }}$ II上述何者可童生園中的结果？
A．只有 工
B．只有近
c．只有四．
D．只有 II
E．ㅍ⿹⿺⿻⿻一㇂㇒丶⿱口一戋正
22．近视可用適合之所秀镜矯正因䧟通過叫秀镜所观客到的像車定实物学近
A．前説及後説均正碓，且为合理能轱
B．前説及役説均正碓，但不是合理解挠
c．前説正譙後説不正確。
b．前站不正確後説正権。
两涚均不正確。

A．氯存与 B 氧楻
E，电荄波。
23）天虹有多種颜色的理是


（0）由大陽来的各芫色有相等的速度
（D）由———不相等的速度


列何種色光照射可令两者鱼洛被辨認出束？
A．红
C．绿
D．蓝 E 品红
25．白光先须面遏红，蓝澞色鏡该，其出讨免线的颜色是？缘



声持罂由 $t=0 \mathrm{~s}$ 至 $t=0.4 \mathrm{~s}$ 止。
一纪録器䥀不㝵声音捻幅对時間的闺係圆线，並由电鸣哭発声時開始纪睩，则所得图线是

匂摭音器？間。测得有一周定的最大声型 階）之距离隹为 0.3 m ，豪人因此可推出此声波之被長甞 A． 0.3 m B． $0.6 \mathrm{~m} \quad 0.0 .6 \mathrm{~m}$ D． 1.2 m E不可計算


图中若一狑音盤，其㿮声之音調直下列何者有関？
I，盤中：扎數
II．玌勾中車由的路離
亚色移盟車雪動的次數
A．只有 II
B，只有工及II
C：只有工及亚 D，只有但及正
E．II及II

3尔，又及个两摭咅器産生同一音調的声浓。若X叕声声害度軨：为大，则入所産生声波
A．比Y羞生者有朝高频卒
B比个産生者有颠長波兵
包比个産生者有畭短波長（II）
D．比 Y産生者有敗大搑䀦
E．比 Y 産生者有蚛大㐁度

33．对声浓而言
工，音調㘯频率有阐
I音品如声速有阅
III簎度分振幅有闺上进何者 確
A．只有工 B 只有攻 C只有巫
D，只有级 I E，只有I及亚。
34.

振重力。
前後詋均工確，且移者学合理解精
前後説均正確，但後者非合理解楞
前梳正破役説不正管。
前詰不碳後説正挽。
西者均不正确。
垄据動，则形成政皮

但A之等長学B之一半，则A贸声声，咅之頻养B之
A．出言 官 2 倍 C 同一大小 O专倍 $E_{\text {I }} \frac{1}{2}$ 倍

40 ．


園中之玻锌会中三空氧柱旬億起共鸣，但频率为未知值。著水位上升•1 白，又有共＂身现象商生。下列加些物理量可由此致果確过之：

IT．此声波波尾
III，水中之声速

A，只有工 B，只有正 C只有正只只有工及百 E 全部
（完）

37．明中注入一端封閉时其喚告中，在倾注娔可臂现？
I\％．的所唯声被束度不变
II 管的爱声波 频率澌低
II 管的数声波频卒嘲高。
A．只有工 B 只有工


38． 3 刻音計發香之频率是 300 H 子，其伭所受弦力是 $\alpha$ 绍f。若張力增至 8 kgf 而氧長保持不变，其登音频管变为（II） | $A$. | 75 Hz | $B$ | 150 Hz | $C 600 \mathrm{~Hz}$ |
| :--- | :--- | :--- | :--- | :--- |
| $D$. | 1200 Hz | $E$ | 4800 Hz |  |

$$
\begin{aligned}
& \begin{array}{lc}
\vdots & \ddots \\
\vdots & \vdots \\
\vdots & \vdots
\end{array} \\
& \begin{array}{r}
\because \\
\because \ddots
\end{array}
\end{aligned}
$$



1. A thin converging lens of focal length 5 cm forms a virtual image twice as large as the object. Calculate the distance of the object from the lens and draw a ray diagram to scale showing how the image is formed.
2. A small objeat is viewed through a diverging lens (ooncave Iens) held closed to the eye. An image 2 cm long is formed 30 am from the lens whose focal length is 40 cm . Find the position of the object and its size.
3. $A B C$ is a triengular prism made of glass of refractive index which the angle A isfor . A ray of light is inofdent on the face as shown. Delorlate the angle of emergence and the angle of deviation of Iight.

4. There is a partiale inside a rectangular transparent blook. The apparent depth of the particle is 8 cm if viewed on the side $A B$. The apparent depth is 6 cm if viewed on the side $C D$. Find the refractive index of the block and the distance $X$ shown in the diagram.

5. a) State the reason of long sight and the method of correction.
b) Write down the structural differences and similarities between the eye and the camera.

## F.4. Phyeics Examptios I

1. A thin converging lens of focal length 4 cm forms a real imege twice as laree as the object. Calculate the distance of tho object from the lens and draw a ray diagram to scale showing how the image is formod.
2. A small object is viewed through a diverging lens (concave lens) held closed to the eye. An image 1.5 cm long is formed 25 cm from the lons whose focal length is 40 cm . Find the position of the object and its size.
3. $\angle S C$ is a triangular prism, made of glass of refractive index 1.5 , in which the angle $A$ is $30^{\circ}$ and the encle $B$ is $60^{\circ}$. 1 ray of light is incitiont on the face $A B$ with an anele of incidence $30^{\circ}$ as the diagram shown. Cacilate the ande of emersence and the angle of deviation.

4). A glass enbe of lingth 15 cm on each side has a small eutble inaide it If observe this memble on one foce, the apperent dupth is 6 cm . Fif aiserive it on the sppasite focce, the apperent dapth is 4 cm . Find the ditinnce beutrear the tublle and the frist face and the refiactuve, midex of glass aloo
5). Capy the following table on the answer sheat, fill in suitalle words


F． 4 Physics Answer I
1）Let object abidance be $u$ ， making voe of the Real is Positive convention，then $v=+2 u ; f=4 \mathrm{~cm}$ ．
Substitute in lavs formula


$$
\frac{1}{u}+\frac{1}{v}=\frac{1}{f} \quad \frac{1}{u}+\frac{1}{2 u}=\frac{1}{4} \Rightarrow u=6 \mathrm{~cm} \& v=12 \mathrm{~cm}
$$

Answer：affect a image are on oppaite site of the lavs；and the object is 6 cm from the lems
2）Let object distance be 4 ，mating vase of the Real is Positive convention，them $v=-25 \mathrm{~cm}$（virtual），$\hat{f}=-40 \mathrm{~cm}$ ．
Firm leno formula

$$
\frac{1}{u}+\frac{1}{-25}=\frac{1}{-40} \quad \because \because u=66.7 \mathrm{~cm}
$$

Let the light of object be $x$, as $\frac{\text { sine of pelage }}{\text { singe of object }}=\left|\frac{v}{u}\right|$ so $\frac{1.5}{x}=\left|\frac{25}{66.7}\right| \Rightarrow x=4$ ，
Ansever：She cfject is on the serve side of the image of a distance of 66.7 cm from the lens，and of a height of 4 cm
3）The chagram show how the light ray pass through． the prism．Making wee of the law of refraction：

$$
\begin{gathered}
\frac{\sin 30^{\circ}}{3 \sin x}=\frac{1.5}{i} \Rightarrow x=19.5^{\circ} \\
y^{\circ}=A-x=30^{\circ}-19.5^{\circ}=10.5^{\circ} \\
\frac{\sin 10.5^{\circ}}{\sin r}=\frac{1}{1.5} \Rightarrow r=15.9^{\circ}
\end{gathered}
$$

Angle of deviation $\alpha=\cdots\left(30^{\circ}-x\right)+(r y)=15.9^{\prime \prime}$

$\rightarrow$ ．Set the bubble be a distivici $x$ awry firm face $A B$ ．Making uss

Let the refractive under of glom le $n$ ．then

$$
\begin{equation*}
\frac{x}{6}=\frac{n}{1} \tag{1}
\end{equation*}
$$

when the 或serven l look ax the en bible through face，$D C$ ，then


$$
\frac{15-x}{4}=\frac{11}{1} \quad \ldots(2)
$$

Serving（1）又（2）$\quad \frac{x}{6}=\frac{15-x}{4} \Rightarrow x=9 \quad ; \quad \frac{9}{6}=n \Rightarrow n=1.5$
7）

F.4. Plygaics Example II
1). Iur plane muriors making $45^{\circ}$ with ench other are thown in the diagiam. A point source of light is placed between the turo muriors. Following the scale shown in the dhagram, construct ray daagrams to shous how light is first reglected by inuror : $z$
 then inuror 2 to form an unage. Find the position of the unage alko. (Iwo rays are requilied.)
2) A concave mensor of sadiw of curvatme 40 cm frimo a sharply focused image of a small ofject on a screen placest at a distance of 80 cm from the missor. Calculte ( $a$ ) the position of the ofiect (6) the magnification.
3) An objectio peaced on and perpendecula to the aixa of a remiex miver of frocal length 8 cm . Weotget is at a distance of ${ }_{5} 5 \mathrm{~cm}$ away from the minaor. Find. fy accurate drawing, the position of the image anst its mature.
[SOLUTION

2) Let ofject ditame be $U$, Grum $v=80 \mathrm{~cm}, R=40 \mathrm{~cm}$ $f=20 \mathrm{~cm}$
lianig the moter formula, Real is Poartive comention

$$
\begin{aligned}
& \frac{1}{u}+\frac{1}{v}=\frac{1}{3} \Rightarrow \frac{1}{u}+\frac{1}{80}=\frac{1}{20} \\
& u=26.7 \mathrm{~cm}
\end{aligned}
$$

maginfication $m=\left|\frac{v}{n}\right|=\frac{80}{2,1}$

$$
=3
$$

Amaver: The ofject in placed 26.7 m in fornt of the concove muror, magurificetion is 3 .


Answer: The unige fromed is 3.2 om : lehehind the murior. A critival, erect inminisket ungag: (aherimencial answer mey thifer a.

F. 4 optics test ,

1) A small affect in placed on the prucipel ara if a convex invirer of focal lengtifi 10 cm and the correct $\because 1.5 \mathrm{~cm}$ from the murior. Ind by calculation, the position and nature of the unoys
2) A concave sphencol minor of radio of curvature 20 cm forms an erect ingege 40 cm from the mirror. Find the position and size of the ofject and show r with a scaled diagram how the vinage is fomined.
3) A man is standing in a room of area $6 \times 6 \mathrm{~m}^{2}$, height 3 m . The deagranu shown is a cross section of the rory. A large
mirror $P Q$ of height 1.2 m is hanged on the middle
of wave $C D$ if th of wail $C D$. If the observer wants to see the whore wage of wail $A B$ in the nurior $P Q$ : find the puarthat position of the observer from The mirror (ie fund $x$ \& $y$ in the chagrom)

4). An optical pin of length. 10 cm is pard in grout of a comer mure of formal leregth 20 cm . Find the position er the wings. of the optical pion is placed munch that it hes on the principal axis with to hind of 50 sm ddatance from the mirror is tail is 10 cm further away from the minor, Find The length of the mage. (Note: not the height of the winger !)
5). As shown in the diagram, $P Q \therefore Q B$ ane tho plane martens placed perpendrcilar to each other with $Q B$ eying $30^{\circ}$ with, the horizon. Pole $\Lambda B$ of lameth 2 in is placed pependuciilar to the horizon. Draw this dragiaim, on your answer Sheet with exact scale: Construct a ray diagram $Q$ to show how the light from $A B$ would resected from $Q B$, then $P Q$ to form un unage. Find
 the position of the unigg also.



This self-report form is for your own use. If you fill it out at the time your students are filling out the Student Instructional Report, you will have the opportunity to compare your own perceptions with those of your students when you receive the SIR Report.
Respond to each item according to how you would describe this course, your teaching, or the studentsenrolled. The items paralle] those in the student form, with those asking for student background information left out.
SECTION I Items 1-20. Directions: Circle the number that represents the response closest to your opinion.
NA $(0)=$ Not Applicable or don't know. The statement does not apply to this course or your teaching, or you simply are not able to give a knowledgeable response.
SA (1) = Strongly Agree. You strongly agree with the statement as it applies to this course or your teaching.
A (2) = Agree. You agree more than you disagree with the statement as it applies to this course or your teaching.
D $\quad(3)=\frac{\text { Disagree }}{\text { to }}$. You disagree more than you agree with the statement as it applies
SD (4) to this course or your teaching.
SD (4) $=\frac{\text { Strongly Disagree. You strongly disagree with the statement as it applies }}{\text { to this course or your teaching. }}$

1. I feel my objectives for the course have been made clear to students.. $\begin{array}{cccccc} & N A & S A & A & D & S D \\ 0 & 1 & 2 & 3 & 4\end{array}$
2. There has been considerable agreement between the announced objectives of the course and what is being taught.......................................
$\begin{array}{lllll}0 & 1 & 2 & 3 & 4\end{array}$
3. I feel that I have been using class time well .......................................... 1
4. I have been readily available for consultation with students ......... 0
5. I feel I knew when students didn't understand the material ............. 0
6. Lectures were repetitive of what was in the textbook(s) .................... 0
7. I encourage students to think for themselves in this course............ 0
8. I have been genuinely concerned about whether students learn and I try to be actively helpful .............................................................
9. I made a point of adding helpful comments on student's papers or exams $\begin{array}{llllllllll}0 & 1 & 2 & 3 & 4\end{array}$
10. I have been raising challenging questions or problems for discussion.. $\begin{aligned} & 0 \\ & 1\end{aligned} \quad 2 \quad 3 \quad 4$
11. In this class, students were free to ask questions or express their opinions ............................................................................
12. I think that I have been well-prepared for each class .................... 0 1 1234
13. I have informed students of how they would be evaluated in the course. 0
14. I have summarized or emphasized major points of lectures or discussions 0 者 $\begin{aligned} & 2 \\ & 3\end{aligned}$
15. I feel that students' interest in the subject area has been stimulated by this course
$\begin{array}{lllll}0 & 1 & 2 & 3 & 4\end{array}$

16. Examinations reflected the important aspects of the course ............. 0
17. Students seem to be putting a good deal of effort into this course ... 0
18. I feel that I have been open to other viewpoints
19. I feel that I am accomplishing my objectives for the course at this point
01234

SECTION II Items 21-25. Directions: Circle one response number for each question.

## 21. For the students enrolled, the level of difficulty of this course is:

1 Very elementary
2 Somewhat elementary
3 About right
4 Somewhat difficult
5 Very difficult
22. In my opinion the work load for this course in relation to other courses of equal credit is probably:
1 Much lighter
2 Lighter
3 About the same
4 Heavier
5 Much heavier
23. For the students enrolled, the pace at which the material in this course is being covered is:

1. Very slow

2 Somewhat slow
3 . Just about right
4 Somewhat fast
5 . Very fast
24. I have been using examples and illustrations to help clarify the material of this course:
1 Frequently
2 Occasionally
3 Seldom
4 Never
25. Was class size satisfactory for the method of conducting the class?
1 Yes, most of the time
2 No, class was too large
3 No, class was too small
4 It didn't make any difference on way or the other

## SECTION III Items 32-39. (Item numbers correspond to SIR answer sheet) Directions: Circle one response number for each question.

32. Overall, I would rate the textbook(s)

| $N A$ | $E$ | $G$ | $S$ | $F$ | $P$ |
| ---: | :--- | :--- | :--- | :--- | :--- |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 |



| 299 | 15 | +SETPR = , 12ri2 | DEFINED JPRI |
| :---: | :---: | :---: | :---: |
| $\begin{aligned} & 299 \\ & 299 \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \end{aligned}$ | $\begin{aligned} & \text { +SET LR }=\text { ILRI2 } \\ & \text { +GO } \end{aligned}$ | $\begin{aligned} & \text { DEFINED \|LR\| } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r} 328 \\ 328 \\ \hline \end{array}$ | 16 <br> 16 | $\begin{aligned} & + \text { SET PR }=\text { ) } 12 \text { ri } 2 \\ & +S E T L R=1 L R I 2 \end{aligned}$ | $\begin{aligned} & \text { DEFINED \|PR\| } \\ & \text { DEFINED \|LRI } \end{aligned}$ |
| 328 | 16 | +GO | GO |
| $\begin{aligned} & 389 \\ & 389 \\ & 389 \\ & \hline \end{aligned}$ | $\begin{aligned} & 18 \\ & 13 \\ & 18 \end{aligned}$ | $\begin{aligned} & \text { +SET PR }=:\{12 r i 1 \\ & + \text { SET LR }=:\{L R I ~ \\ & +G O \end{aligned}$ | DEFINED $\|P R\|$ DEFINED $\|L R\|$ GO |
| 402 | 13 | + SET PR $=$, 12ri2 | DEFINED \|PR| |
| $\begin{aligned} & 402 \\ & 402 \end{aligned}$ | $\begin{aligned} & 18 \\ & 18 \end{aligned}$ | $\begin{aligned} & \text { +SET LR }=\text { \|LRI2 } \\ & +G O \end{aligned}$ | $\begin{aligned} & \text { DEFINED ILRI } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r} 408 \\ 408 \\ \hline \end{array}$ | 19 19 | $\begin{aligned} & +\mathrm{SET} \mathrm{PR}=1, \text { 12ri2 } \\ & +\mathrm{SET} L R=1 \\ & \hline \end{aligned}$ | DEFINED \|PR| <br> DEFINED \|LRI |
| 408 | 17 | +GO | G0 |
| $\begin{aligned} & 417 \\ & 417 \\ & 417 \end{aligned}$ | $\begin{aligned} & 19 \\ & 19 \\ & 19 \end{aligned}$ | $\begin{aligned} & + \text { SET PR }=\text { 12ri2 } \\ & + \text { SET LR }=\text { LRI2 } \\ & + \text { GO } \end{aligned}$ | DEFINED $\|P R\|$ DEFINED $\|L R\|$ GO |
| 422 | 19 | +SET PR = ' 12 2ri2 ${ }^{\text {a }}$ | DEFINED \|PR| |
| $\begin{aligned} & 422 \\ & 422 \end{aligned}$ | $\begin{aligned} & 19 \\ & 19 \end{aligned}$ | $\begin{aligned} & \operatorname{+SET} L R=, \operatorname{LBI} 2 \quad \\ & +G O \end{aligned}$ | $\begin{aligned} & \text { DEFINED ILRI } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r} 427 \\ 427 \\ \hline \end{array}$ | 20 <br> 20 | $\begin{aligned} & + \text { SET PR }=, 12 \text { ri2 } \\ & + \text { SET LR }=\text { LRI2 } \\ & \hline \end{aligned}$ | DEFINED \|PR| <br> DEFINED \|LR| |
| 427 | 20 | +GO | GO |
| $\begin{aligned} & 431 \\ & 431 \\ & 431 \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { +SET PR }=\text { ) LLII2 } \\ & + \text { SET LR }=\text { LRI2 } \\ & + \text { GO } \end{aligned}$ | DEFINED \|PR| DEFINED $\mid \mathrm{LR\mid}$ GO |
| 434 | 20 | 4 SET $\mathrm{PR}=$ ', ) $12 \mathrm{ri} 1{ }^{\circ}$ | DEFINED \|PR| |
| $\begin{aligned} & 434 \\ & 434 \end{aligned}$ | 20 20 | $\begin{aligned} & \text { +SET LE }=\text { \| LRIT. } \\ & \text { +GO } \end{aligned}$ | DEFINED \|IR | GO |
|  | IB | : MACRO MPIL' DEFINE |  |
| 481 | 22 | +LFOOTER | LEFT FOOTER |
| $\begin{aligned} & 481 \\ & 481 \end{aligned}$ | 22 22 | $\begin{aligned} & \text { + BFOOTER } \\ & + \text { GO } \end{aligned}$ | $\begin{aligned} & \text { RIGHT FOOTER } \\ & \text { GO } \end{aligned}$ |
| 481 481 | 22 22 | + SET PR $=$, 12rio + SET LR $=$ LRIO | DEPINED \|PR| <br> DEFINED \|LR| |

第一部份
Tromblite ey myaif
請回答下列問題：
1）年踰 $\qquad$
2）居住地區 $\qquad$
3）你在家裏説甚麼方言？
4）出生地點（如非本港出生者，請詳述國家，省份和縣名） $\qquad$
5）何時到港？ $\qquad$
6）父親職業
7）你預算將夷從事何種職葉？
8）你記得开中試的成績嗎？要是記得，請填窇下列
的空格；
（a）中文 $\qquad$
（b）英 文 $\qquad$
（c）数閔 $\qquad$
（d）總成績 $\qquad$
9）你現在所就謮的學校是否你开中試的首三個志徝之一？是 $\qquad$杏
10）與别人相比之下，你的家庭總收入怎樣？（照你自己的看法）
（a）貧笨
（b）中下
（c）中等
（d）中上
（e）富有

11）在下列各物中，請你特家裏经有的圈出：
（a）雪匮
（b）電話
（c）私家車
（d）浴缶工
（e）金岡琴
（f）洗衣机
（g）彩色電視
（h）音响器材
（w）冷氧机
12）你家害有佣人没有？
（a）有．
（b）没有
13）你曾有過私家補習老所嗎？
（a）有
（b）没有
14你有自己個人的睡房嗎？
（a）有：
（b）没有
15）你的家人會不間中囄港到外地渡假？（澳，門和豦東省除外）
（a）有
（b）没有
16）你母親書過中段没有？
（a）有
（b）没有
17）你母親声過雰上舄院没有？
（a）有
（b）没有
(第一自)

18）你父親讀過中與没有？
（a）有
（b）没有
19）你父親䜋過專上興院没有？
（a）有
（b）没有
20）你家裏有多少書籍？（稚誌報刊不㖕在内）
（a）一互本以下
（b）一百至五百本
（G）五百本以上

21）你的父親跟你説英語否？
（a）很少
也）偶然
（c）有時
（d）很多時
（e）红常
22）你的父母有否教你㶅習英文？
（a）很少
b）偶然
© 有 時
（d）很多時
（e）絰带
23）你何待開始䛼英文？
（a）仂兒班或之前
b）幼程園
（c）一年級
（d）二年級
（e）三年級或以上
(第三頁)

24）你曾否讀過英文小學？
（a）曾，由一年級起
（b）曾，由三年級起
（c）曾，由五年級起
（d）曾，由六年級起
（e）没有
25）你僙小學時的英文程度怎様？
（a）很差
（b）中下
（c）中等
（d）中 $上$
（e）很 好
26）你在中學過去䇦年的英文程度怎樣？
（a）很 差
（b）中下
（c）中等
（d）中 上
（e）很好
27）除了上英文課外，你有用英文䙵問或回答問題不？
（a）很少
（b）偶然
（c）有 時
（d）很多時
（e）差不多全部
28）在上課的時候，你是犮跟同孯説英語？
（a）很 少
（b）偶然
（c）有 時
（d）很多時
（e）不 多 全 部
29）下課後，你是否跟同楽説英㻅？
（a）很 少
（b）偶然
（c）有時
（d）很多時
（e）差不多全部
（第四夏）

30）當你富信給朋特，你通常雷用何種語文？
（a）中文．
（b）主要是中文，間中用些英文
（c）半中半英
（d）主要是英文，間中用些中文
（e）英 文
师當你看西片時，你會否看中文字幕？
（a）很 ${ }^{\prime \prime}$
（b）偶然
（c）．有時
（d）很多時
（e）経常
32）你有否收聽英文電台？
（a）很 少
（b）偶然
（c）有時
（d）很多時
（e）經常
33）你有否收看英文電視台？
（a）很少
（b）偶然
（c）有時
（d）很多時
（e）緯常

第三部份
請在下列各題中選挥最適合你的答案
34）你的父母用英語跟明友交談否？
（a）誔不
（b）有洔
（c）很多時
（d）常常

35）你的父母在工作時需否應用英語？
（a）不 需 要
（b）有 時
（c）很多時
（d）常 常
36）你的父母閲䜖英文書，報，案誌嗎？
（a）従不
（b）有時
（c）很多时
（d）常 常
37）你的父母察英文信嗎？
（a）從不
（b）有 時
（c）很多時
（d）常 常
38）你的父母收看英文電視節目嗎？
（a）従不
（b）有時
（c）很 多 時
（d）常常
39）你的父母收聽英文電台嗎？
（a）従不
（b）有時
（c）很多時
（d）常 常
40）當你用英文做功課時，考遇到困難，你的父母
能在語言方面㨍助你嗎？
（a）不 能
（b）有時
（c）很多時
（d）常 常
(第六面)

第四部纷
下面＂是＂佃人們通常䯻習英文的理由，請細讀每個理由 $\therefore$ 然後哭下面的尺度表示你的看法：


意

41）門習英文會琵助我更明白説英語的人及他們的生活方式。
$\qquad$
42）它撞我能更容易在一些珫英語的人中結交到—些好朋友。
$\qquad$
43）它能讓我有英國人的想法及表現。
$\qquad$
44）它讓我能與更多不同的人有交往及傾談。
$\qquad$
作。
$\qquad$
46）一個人要在社霄上蓮得一些名声，他最少應懂得一種外國語言。
$\qquad$
47）我認為除非一個人能流利地傕用英文，他不能真正算启受過教育。
$\qquad$
48）我需要學習英文才能中㙠倳業。
$\qquad$
（第七百）

第五部份
這問巻的用意是測量不同的人對一些題目或觀念的看法。测量方面是請你特該題目或觀念放置在下列一個描述性尺度的適當位置上，正確的答案因人而異，最重要的是你调人對這些題且或觀念的感受。有時你或許以為你已見過同一個尺度，但實際亚非這樣，故此請你作答時不要前後参閲尺度上的項目，而只就該題作一獨立的決定。
請迅速的選擇答宓，不要犮個別的愐目猶疑，我們所需要知道的是你的第一個印象—即時的反㦄！
桼語言＂的看法如坷？

$\begin{array}{lllllllll}\text { 51）聰明 } & 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text { 愚笨 } \\ \text { 52）同意 } & 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text { 不同意 } \\ \text { 53）有中 } \\ \text { 縮性 }\end{array}$
54）公平 1－2 3 4 5 $6 \quad 7$ 不公平
$\begin{array}{llllllllll}\text { 55）重要 } & 1 & 2 & \frac{3}{3} & 4 & \frac{5}{4} & \frac{6}{6} & \frac{7}{7} & \text { 不需要 } \\ \text { 56）適合 } & 1 & 2 & - & 4 & 5 & \frac{5}{7} & \text { 不適台 } \\ \text { 57）困難 } & 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text { 容易 }\end{array}$
（第八百）

第六部份
58）縱然學校没有夫見定，我仍會選詳外國語文。
（a）必定拿
（b）大概會
（c）有可能
（d）大概不全
（8）必定不鿖
59）我喜歡觀看没有中文䆘幕的外國電影。
（a）絶不喜歡
（b）不大咅歡
（c）有時喜敬
（d）頗喜歡
（e）十分喜歡
60 我們很多外交上的困難是由於缺三外文知識所造成的。
（a）非常同意
（b）同意：
（c）不能決定
（d）不同意
（e）非常不同意
61）我要閲謮众团文學的原著。
（a）非常同意
（b）同意＂
（c）不能決定
（d）不同意
（e）非常不同意
62）我渴望能説一口流利的外文。
（a）十分渴望
（b）頗渴望
（c）有時望
（d）不大渴望
（e）絶不渴望

63）畐是高計副移居外地，縦然中文过很多旬用，仍鿖一表力去學猊該地的語文
（G）一定不！雷
（b）大根不皊
（c）可可昏會
（d）概会
（e）
6故交上齐説，雖然香港跑離説其他語文的國家很逐。呾學習外文们是很重要的。
（a）非常同意
（b） $\mathrm{r}+$
（c）不矣决定
（d）不的意
（e）葯不 同 意
第十部佫
以下䯮一些見解，有很多人同意，亦有少少人不同采，因為各人的觀點不同，故此没有標棌的结。以下有六個不同程度的看结，請你䑧最能存達自己看法的号影填在每题之前的空格上。
＋1：袝微同意
＋2：17意
$+3: 十$ 分同意
$-1: ~$ 甚同意

- 2：不同意
- 3：十分不同意

65）—移居号港而又説英詰的外或人封本港社

（6） $\qquad$点成合暩解説英詻的外國人時，我急希能説他們的語言。
67）—真語的外國人在政治和答皿方市面都是很质主的。

68） $\qquad$在説語的外國人中有很多傑出的薿術家和作家。

6 ） $\qquad$権英語的成人特西方的生活方式带進的的土全封改進我們的生活方式有䘞。 （第十蒠）

70） $\qquad$談英語的外國人＂對宗教信仰的信心成了現代社會的推動力。
71）——説英語的外國人有充份理由為他們自己的種族和㖊統而騎傲。
72） $\qquad$要是香港失去了説英語的外或人的影向。這特雪是一個很太的挰失。
73） $\qquad$在香港，説英語的外國人比較中國人更有裋貌。

74）
的亨铨，＂服侍和款待＂的方法＂
75） $\qquad$説英語的外國人是可靠的。

76） $\qquad$
可以與到很多有價值的東西。
77） $\qquad$説失語的外國人的家庭生活是我桪一，個很好的榜樣。
78） $\qquad$説英語的外國人對阳生人很慷慨和熱誠。
79） $\qquad$查港的中國人應加倍努力去認識更多説英語的外國人。
80）—強逼説英語的外國人，完全中國化是不對的。
81）—要是住或選擇，我寧可離開香港住在一個説英語的地方。
香港鄶成為一個更好的城市。
83） $\qquad$
式上表現了很大的諒解。
84） $\qquad$一般來＂説，香港的工業每每因僱用了説英語的外國人而得到益處。
85） $\qquad$説英語的外國人是摔直和誠實的。
86） $\qquad$説英語的外國人容易信任別人。 （第十一自）

87）光語的外國人對困苦中的人富同情心。
88）——説英語的外國人是有原則的人，他們寻求積極有意義的人生。

89）——説英語的外國人是知識份子，我們可以在他們的知識和經验上得到很大的益處。
90）——説英語的外國人有高尚的道德水平，應該為別國人所倣效。
91） $\qquad$説英語的外國人真正閣心意港的中國人，他宬渴望跟中國人學習和镹取中國人的意㫕。

92） $\qquad$説英語的外或人誠懇地杸身在香港及她的間解上，他㑡捨已地为香港的進步而努力。
93）—説英諨的外國人真誠地特香港當馬自己的家，他假非常関心香港的前途。
94） $\qquad$説英語的外國人很小心的避免表現出自己是個＂萬事通。他門仔細考查事情始末之後才表達自己的看法及提議。
95） $\qquad$説英語的外国人對香港的中國人平等看待。

第一頁
紫—部份
請細䜋下面各题，羔指出最適合你的答案：
1）以英文科來説，與其他同驾比較，我認鳥我；
（a）不反大部份何舆那度理功

（c）較大部份同緊用功
》如舆敉内没有教授费文，我
$\because=$ 合档英文
墙可能常説英語等等。）
（c）㓱認法在別虑上英文課
（d）不是以上任炣一项（説明）
3）等主動地去思考上英文課時閣到的東西 （ 18 共不
（b）俱一禺
（C）䜌常如此
的的
（－）人 以五分理童
（b）$十$ 玉盆鍾至一小時
（C）一小時以上
5）以我的響習情況來看，坦も地説，我

（b）只做少許的工天，得過且過便算
（c）確䀂努力等英文
（d）不㱜以上任炣一項（説明）
6）翌業後。㦱多数

（b）會嗑量荤用英文

（d）不是以上任炣 $\rightarrow$ 項（説㕨） $\qquad$
7）㔡其他拏科比效，我
（i）花晆少工夫在英文科上
（b）的 二奌文的工天踉其他住何一科相间
（c）较合用非整習英文

第二部份


9）父母認茼奓校裏有其他神目較央文页为重要。

$$
1234567
$$

教或帐是量量


聞的事
定要或做
13）公安热気我応該用功緊好夷文。

第三部份。
擐指出最適合的答案。
14）請在下面其才—格风加上符号，以密示在其荅畔科中你鞍欨英文的领度莫 又是你最不英文是你最喜


（a）感到十分厭頊
（b）施延到其他功捰都做完了才去做
c）首先散遣家㗍

16）上英文堂洔，你是各：
（a）感到十务厭烅
（b）有㳉思数想的傁向

（d）完全杸入
 （a）永不
（b）多篗不合等带境
（c）烣島定明
（d）惡可能党常歵

18）温習英文片刻後，你叕學自己：
（a）每等想及基他事情
（b）發生鼠趣云色成它
（c）封該楼功䐂極感興趣

（a）减少倸程
（b）保淂原有深程
（）的加探程
20）你認着英文


（1）應授予所有中學生
21你覺得臨習英文是：
（a）総不有趣
（b）跟大部络科目一嵄不自得特别有趣
©）非常有趣
第正都份
請指出最適合的答案：

（a）基少
（b）堣疑
（c）有時
（d）暗常
（6）紫于常常 604

（a）甚少
（b）偶然
（c）有昍
（d）時常
（e）多争常常女0此

（河基少
（6）偶然
c）有時
（d）㭙常
（e）幾平常常如妇

25）営我优某種無法避免的原国以鞂氻深落璣的㶽我

（a）甚少
（b）偶然
（c）有时
（d）時常
（c）乎乎常常如地
26）常我温習時，因想反約䆨特束的計㨋等就不能隹中精神在英交碌本上。
（a）甚少
（b）偶然
（c）有時
（d）時常
（i）笌乎常常如此

（a）甚 少
（b）偶然
（c）有洔
（d）時常
（E）響常常如地

（a）甚少
（b）偶然
（c）有時
（d）時常
（e）然高常常如此
29）䟫我遇上英文奞題時我會找老皈商談
（a）甚 少
（b）偶然
（C）有時
（d）時 常
（G）䈭于常常如此
精神的物只諸如睘畫信件等。
（a）甚＂
（b）偲然
（c）有 $\boldsymbol{o}^{2}$
（d）時常
（e）箴乎常常女如

31）我需要很長的時間才能安走下来謴意 （a）基少
（b）偶然
（c）有喑
（d）时常
（ 4 ）器于常常如此
睡，以致不能女好温垍
（a）基少
（b）㑑然
（c）有暗
（d）多帯
（i）絾乎常常如比
33）品多間関䜠或温習英文使我感到频病。
（i4）甚少
（b）傌然
（c）有時
（d）時常
（8）戠要常常如此
34）譆完幾重英文後我波法記得㤊腩讀週的柰西 （a）甚少
（b）偶然
（c）有時
（d）封常
（e）我于常常如此
等等，以致影响管業。
（a）安少
（b）偶然
（c）有時
（d）時常
（e）戠手常常如此
交時才去做。
（a）其省然
c）届明
（d）峙常
（c）欴齐常常如此

37）我利用校风没有課的時間来温習い蔵䟽晚上㱚工悗
19）基少
（b）偶然
（c）有時
（d）時常
（1）採东当常常如此
38）我隼的交英文明功課
（a）甚少
（b）偶然
（c）有時
（d）時常
（e）絃常常常如此
39）做家䛞時，我喜敬把收音和開了
（a）烍少
（b）偶然
（c）相時
（d）時常
（e）幾于常常如地
40）常我関譡一篇指定要謮的長文時我間歇地停下来細想文章内提及過的要點
（9）甚少
（b）偶然
（c）有洔
（d）時常
（e）幾乎常常如止
41）照時間比例来算在我所童中成的似子很少
（a）基少
（b）偶然
（c）有時
（d）時常
（e）幾手常常如此
42）我喜敬生在課室後面
（a）甚少
（b）偶然
（c）有洔
（d）時常
（e）摔业常常如此
43）垶成来説温習時若不成功就算失敗要看武的心情如可
（a）甚少
（b）偶然
（C）有時
（d）時常
（e）幾常常如此

（a）基少
（b）偶然
（c）有時
（d）時常
（t）䈅手常常如地
45．我每天都有規律地工作以確保自己能依時完成功課
（a）基少
（b）偶然
（c）有時
（d）時常
（e）幾乎常常如此
第五部份
請指出最適合的些案
46）平均条説，你每天用多少時間関謮興功課無閣的書籍？
（d）十五分镜以下
（b）+ 五分全量至半小㘶。
ic）半小時以上
47）空暇时你喜欨讀甚麼畵？
（a）$\phi$ 文
（b）無特辟偏好
（以）英文
48）你喜敬書甚麼報紙？
（a）中文
（b）無特別偏好
（c）费文
49）你青歡鿁基麼雜誌？
（a）中文
（b）無特䟞偏好
（c）英文
50）如果你兼有中英文本的嚲者文摘你咱先债那一本？
（a）中文
（b）無特勋偏好
（c）英文
51）通常你讀那一種文字會較為快速？
（a）中文
（b）相同速度（措中英文）
（c）英文

第云部份
是請各人参照一組描述牲的比例詞来比較那些意義。正碓的岩案正是你自己所選的意義。有時你會晛得某一項目似子在运測験中出現過，事實並非如此，所以請勿前後翻查，亦不必去回想你曾怎焃替覆颣似的项目，裱就每項目分则作一䍜立判断。
請蓝速作答，不要鳥個则项目疑虑我們所需要的是你封各愐目的第一佃印象及即時的感睍。
你龂於査港的生活有何感受？


第七部份
包括多方面的問題，而每句話話都有人同意，亦有人不同意。所以波有全教式全错的替案。請根第你自己同意或不同意的程度，依下列計分法在各題左欄内評分：
十7極之同意
＋1桖之不同意
+6 同意
+2 不同意
－5 稍微同意
+3 稍微不同意
62） $\qquad$鞋䅦威信服及酸敬是兒量最要舆習的美徳
（3） $\qquad$
和䣬門的怘志
（64） $\qquad$現代逗磨多各式各颣人等出来活動，湿在一起，堌人必须特则小心防㿞，以免染上他人的専染病或其他疾病
（5） $\qquad$
勇政，永不病倦，意忠工作，人伊可以信暧的須袖人物
（b） $\qquad$只要有充约的意志力，汉有任何歇點或困難可以谟阻我伊

6 $\qquad$

的人䅛虎得裹。
69 $\qquad$

（o） $\square$
学毛劳
$\qquad$

（3） $\qquad$

3） $\qquad$

74） $\qquad$
所控制。




75） $\qquad$
（6） $\qquad$

7） $\qquad$

（） $\qquad$

（1） $\qquad$

$-89$

31

82） $\qquad$

83） $\qquad$

84） $\qquad$

$\qquad$

86



或説英文
（（i）全 $\pi$
（i） 1
（c）赖好
（0）

（a）全不
（b）少；
（c）农票女
$89 \quad \underset{8}{x}+$
w
ay
（c） A G （o）ita
 （a）全
（b） 5
（c）社好
（d）旗平）

（a）金 $T$
（b）15
（0）寝好

93）武全新敵黄文
（a）盆有．

（a）$\overline{2}$
（b）少
（c）有要要
（ $\mathrm{m}^{3}$
（0）效初


5）我父親要案案
（a）全 7
（b）

（d）ata
p． 1
泡娄
宾一部分•果出最的案案
 （載是曼有
b）我要中娄 2
c）找兵十
d）我是中定定一
（）我是最美蚛

（a）我尾最仔

c）我是中等

e）我是最盖物

（1）最好明一绿
b） 等 2
c）中等
d）$\ddagger$ 等 2 下
（受善的一级

（i）有夜定高
上）有多数育
（6）石和量定
d）多数敃有
a）庣

a）最好的一级
b）中 $2+1$
（）中
d）中等
《最者本一級



（1）斌步可虬
口疑禾可態
引有能肯定
d）$力$ 可能
○多数ぶ可能


（1）我放成绪要爱
b）我妇成淃 展 6




（a）$y^{2}=A$
b）多数是 $B$ 级
c）多数是く级
d）多数是D级
c）多教是 E 级





a）暑最好
b）中是 2
c）中等
d）中等々て
a）魔最差


（i）原最好
1）中
3中
d） 4 等 $<7$
く媚最素


b牵，复害
〕办粑音定
d参数ち拿

是需乐無的

㭠末可转
b）效看可等
c石癿量定
d）战子可癿
－楆之各可能
日你認当佁父母者落你一般可以敫得4磨等织施成结？
0）多数是A级
b）多数是E级
c）多数是 C 级
d）多教是D织
4）多数是衣㚫


可钱花筑力终亲能力？
（1）展最展
b）中等 2 上
c）中
d）中 $2=?$
（）厚是告
5．在乘中
咸结最毛等在？
（1）量最
b） 6 等 2
c）中
d）中等
c）客最眚

（1）家步定变
1）需多数雷
9お路系定
d）多敖8，
0步定名害



涉考可能
b）有葸可能
c开能肯定
的㡎子可能
行文各可能


a）多数是A级
b）多极是B4
c）多敖是（外
d）多数是D级






Q）栱 最
b） 9 年 2
c） 1 等
小中等
e）愿最善

成缭居等级？
（i）最 $\frac{5}{8} \mathrm{E}$
b） 中 -1
（）中 寽
D中等々て
a）展最羔

（i）管量雲
b）弯多娄娄
c）天，蚛肯

0）青定子弯



a）楦 $5 \%$
b）数 $m$ 可
c） 7 的定
9）植 96

p

级的成组
人）数是 4 为
b）多数是 6 象
c）多数电
（1）多真等
0 多数是 5
等二高童






$$
\begin{aligned}
& \text { 十 } 5 \text { 目音榾支措 }
\end{aligned}
$$

$$
\begin{aligned}
& \text { 十7 用毫桯之交样 }
\end{aligned}
$$

$$
\begin{aligned}
& \text { 十 二 白, 向童建度发精 } \\
& \text { 十 1 各同恙㙁々反影 }
\end{aligned}
$$

奇心威意。
古力中心人青为重要。





方式以乎粮杼。




人类告。














 $\qquad$

a） 78
H）一具，之
c）丝果的此



$$
\begin{aligned}
& \text { () 一1時 (61 }
\end{aligned}
$$








4票業有：我多














 $\qquad$咅会人程




$p^{9}$




d）宅事杸入


a）$x$
b）其 5
引碭类定時
d）黄可能营漬

习年每想下其尤事情
b）有䟭復去完成它


法 告霜
2）減少堁㧼

c）䭪等栗程
や体学青物理


c）應模予代目中生

0）药及雷瞰

く非学古蕧



$$
\begin{aligned}
& \text { () } 1 \rightarrow 2+\cdots \\
& \text { b) } \\
& \text { ) } 2=1 \text { 年 }
\end{aligned}
$$


1）的是来点


㛣考 5
1）$x^{2}$
$1)$ 布
－告需
d） 48


取教成坦
（b）
b） 4
3東 4
d）属

必泊大
（）底子委果存此
b）mati
c） 4
d）复
4）委
$p^{\prime \prime}$
式等等。
0）䉝克常帝此
b）湦
c有畤
d）時亭
娄少


a）萎少
b）
c雷時
d）等常
0）気常常的 $\boldsymbol{x}^{2}$



人）等来常常如
b） 频 $^{4}$

d守常
基少

a）妟少
b）禹縟
c）亘的
d）時学
e）聀乎常常处此

居排始。
i） 1
1） 5
0）有䄅
d）年


a）甚
b）䭪
c）$木$ 昭
1）筫章


中 先
（ 曹
b）
c）府時
（）时昜


b）䉝早布复时
b）
）奇
d）客穿
s其



b）M
（） 44
d）时常
（）素者

（i）我十常忞k比
b） 19
（）向果
（1）昌亲
Q 甚
化要西。

b） 15
－离時
1）等窝
（）甚步


（箴手秀常人
b）多
（）有时
d） 1 常
（甚）



日）多
（）有娄
入章
（亲

咸袁瑱上此三
长是
体昰
0 布的
d）時常


i）莫
（1）量
－才㿢
人时䁇
长我常电


b）㜔柴
有時
d） 8 安
里

的要里
a）专
b）
有洔
d）缺常


理来急出
4）戌常常加此
b）良皆
b）有甠
d）時劳
c）甚 少

（）茕 5
0）程然
（有時
d）时常
○复采常高如此


（a）表
0深等
0音時
d）暗辛



（ ）甚
b） 6
C）有柱
d）妾
0）基才黄掌人

家定定花
i） 1
b）泉
c）有
（）${ }^{2}$ 年


能质時亮成诗棌。
数表
人路
○有時
d）的弿
－连才䆧案此
踢二部分







点类者
pio







程类同总






标奇同音
程至同意

稙点同
権步不意

等青意
稙去里复

检类周音

柾奥量

格吉不素


$p^{7}$



至与周类


复吉同美。
電云同意

極答音


4老的么平质平分。
标券白量。 $\qquad$相者历目冟

極吉同意。
地去不同意

和另自美至去冏意
樓点白。点青石美

的重生经常录造的 定些意它

人同意，盾人石同童，行以设在

己同意或各同意的轱蕞：夜下如


続温中國或的生活。



渼語的先诃。
或附正需要固新他用中文：以保棈中國人的票最。

Hpudine 8

| $\begin{array}{r} 717 \\ 717 \\ 711 \end{array}$ | $\begin{array}{r} 32 \\ 32 \\ 32 \\ \hline \end{array}$ |  | DEFINED $\mid$ PR DEFINED GO GO |
| :---: | :---: | :---: | :---: |
| 729 | 32 |  | DEFINED $\mid$ PR $\mid$ |
| $\begin{aligned} & 729 \\ & 729 \end{aligned}$ | $\begin{aligned} & 32 \\ & 32 \end{aligned}$ | $\begin{aligned} & \text { +SET LR }=1 \text { LRI } 2 \mid \\ & +G O \end{aligned}$ | $\begin{aligned} & \text { DEFINED \|LR\| } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r} 730 \\ 730 \\ \hline \end{array}$ | $\begin{array}{r} 32 \\ 32 \\ \hline \end{array}$ | $\begin{aligned} & \text { +SET PR }=: \mid 12 \mathrm{ri3} \\ & +\mathrm{SET} \mathrm{LR}=\boldsymbol{1}=\mathrm{LRI} 3: \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { DEFINED } \\ & \text { DEFINED } \\ & \text { DRFR } \end{aligned}$ |
| 730 | 32 | +GO | GO |
| $\begin{aligned} & 746 \\ & 746 \\ & 746 \\ & \hline \end{aligned}$ | $\begin{aligned} & 33 \\ & 33 \\ & 33 \end{aligned}$ |  | DEFINED <br> DEFRINED <br> GO |
| 756 | 34 | + SET PR $=$, ,12ri3. | DEFINED \|PRI |
| $\begin{aligned} & 756 \\ & 756 \end{aligned}$ | $\begin{aligned} & 34 \\ & 34 \end{aligned}$ | $\begin{aligned} & \operatorname{+SET} L R=1 \\ & +G O \end{aligned}$ | DEFINED ILRI GO |
| $\begin{aligned} & 768 \\ & 768 \\ & \hline \end{aligned}$ | $\begin{aligned} & 34 \\ & 34 \end{aligned}$ |  | $\begin{aligned} & \text { DEFINED } \\ & \text { DEFINED } \\ & \text { DEFIN } \end{aligned}$ |
| 768 | 34 | +GO | GO |
| $\begin{array}{r} 780 \\ 780 \\ 780 \\ \hline \end{array}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ |  | DEFINED \|PR| DEFINED GO |
| 792 | 35 | + SET PR $=$, /12ri3 ${ }^{\text {, }}$ | DEPINED \|PR| |
| $\begin{aligned} & 792 \\ & 792 \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \end{aligned}$ | $\underset{+G 0}{+\operatorname{SET} \mathrm{LR}=1 \mathrm{LRI} 3 .}$ | $\begin{aligned} & \text { DEFINED \|LR\| } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r} 830 \\ 830 \\ \hline \end{array}$ | $\begin{aligned} & 37 \\ & 37 \\ & \hline \end{aligned}$ | $\begin{aligned} & + \text { SET } P R=1,12 \text { ri3 } \\ & +\operatorname{SET} L R=1, L R I 3 \end{aligned}$ | DEFINED DEFINED ILR Ler |
| 830 | 37 | +GO | Go |
| $\begin{aligned} & 835 \\ & 835 \\ & 835 \end{aligned}$ | $\begin{aligned} & 37 \\ & 37 \\ & 37 \\ & \hline \end{aligned}$ |  | DEFINED DERI DEFINED GO |
| 849 | 33. | +SET PR = , 12ri3. | DEFINED \|PRI |
| $\begin{aligned} & 849 \\ & 849 \end{aligned}$ | $\begin{aligned} & 38 \\ & 38 \end{aligned}$ | $\underset{\substack{+G E T \\+G B}}{ }$ | DEFINED \|LRT GO |
| 861 | $\begin{array}{r}38 \\ 38 \\ \hline\end{array}$ |  | $\begin{array}{ll} \text { DEFINED } & \text { IPRI } \\ \text { DEFINED } & \text { ILRI } \\ \hline \end{array}$ |
| 861 | 39 | ${ }_{+}$GO | G0 |

Administered on Jan., 1979

MING KEX COLLEGE

## Mid-Year Examination 1978-79

FORM 4
PHYSICS

## Time allowed : 2 Hours

## SECTION A: MULTIPLE CHOICE (32\%)

1. If the object distance is halved and the diameter of the hole in a pinhole camera is doubled, what effect does this produce on the size, brightness and sharpness of the image formed?

|  | $\frac{\text { Size }}{}$ | $\frac{\text { Brightness }}{\text { brighter }}$ | $\frac{\text { Sharpness }}{\text { lessened }}$ |
| :--- | :--- | :--- | :--- |
| A. | doubled | unchanged |  |
| B. | doubled | doubled | fainter |
| C. | halved | brighter | lessened |
| E. | halved | brighter | unchanged |
| increased |  |  |  |

2. When the eye is looking at an image in the mirror, the image formed on the retina of the eye is virtual because the image which appears in retina is virtual.
A. True True (correct explanation)
B. True True (wrong or irrelevant explanation)
C. True False
D. False True
E. False False
3. When an object is put in front of a concave mirror, a real, inverted, magnified image is formed. Find the position of the object.
A. infinity
B. beyond the centre of the curvature
C. on the center of curvature
D. between the focus and the center of curvature
E. between the focus and the pole
4. Which of the following can produce a virtual image of a real object?
I. Plane mirror
II. Concave mirror
III. Convex mirror
A. I only
B. II only
C... I and II only
D. I and III only
E. I, II and III
5. Convex mirrors are more suitable than plane mirrors for use as rear-view mirrors for cars mainly because convex mirrors can give
A. a magnified image
B. a real image
C. a sharper image
D. an undistorted image
E. an image convering a wider angle of view
$\qquad$
6. 



In the figure, the position of the pin has been so adjusted that the pin and its image may be observed with no parallax between them. What is the focal length of the mirror?
A. 10 cm
B. 20 cm
C. 24 cm
D. 40 cm
E. It cannot be determined from the information given.
7. A straight stick appears to be bent when partly immersed in water. This is due to which of the following?
I. Interference
II. Reflection
III. Refraction
A. I only
B. II only
C. III only
D. I and II only
E. II and III only
8. $\Lambda$ man looks vertically down at an object 2 m under water. If the refractive index of water is $4 / 3$, find the apparent depth.
A. $1 / 2 \mathrm{~m}$
B. 2 m
C. $2 \frac{2}{3} \mathrm{~m}$
D. depends on how clear the water is
E. depends on the distance of the observer above water
9. The path of a ray of light through a glass prism can be calculated if we know ......
I. the refracting angle of the prism
II. angle of incidence in the side of prism
III. refractive index of the glass
A. III only
B. I and II only
C. I and III only
D. II and III only
E. All three
10. In the above diagrams; the critical angle of the glass is $42^{\circ}$. Which diagram shows the correct path for the light ray through the prism?

11.
B. II
A. I
D. IV
C. III
E. V


What are the mistake, if any, in the ray diagram shown above?
he. There is no mistake,
B. There should be one white emergent ray.
C. The red and violet emergent rays should be interchanged.
D. Dispersion of the white light should occur at the first face.
E. The diagram has both the mistakes mentioned in options $C$ and D.
12. A diver at $x$ metres under water looks up at the water surface and observes the sky appears to be a circle. What is the diameter of the circle if the critical angle of water is $\Theta$ ?
A. $2 x \tan \theta$ metres B. $2 x \sin \theta$ metres $c . ~ x \tan \theta$ metres. 3.2
D. $\frac{x}{\sin \theta}$ metres . E. $\frac{2 x}{\sin \theta}$ metres
13.


Which of the points I, II, III and IV can be seen by the fish in the pond as shown in the diagram above?
A. I and II only
B. I and IV only 33
C. I, II and IV only
D. I, III and IV only
E. All the points can be seen.
14. Which of the following statements concerning a simple astronomical telescope is/are correct?
I. the first image is always near the focal plane of the objective
II. the eye-lens is used as a simple magnifying glass to observe the first image

III. the final image appears to be enlarged
A. I only B. II only C. III only
D. II and III only E. I, II and III
15.


The diagram shows two incoming parallel rays of light which pass through a lens 'L'. The ray XY after passing through the lens will pass through the point
A. I
B. II
D. IV
E. V
16. A long needle is viewed through a lens. The needle and its image appear as in Figure 1. When the head is moved to the left, the needle (object), and its image appear as in Figure 2. Which of the following statements is/are correct?
I. The object is more distant than the image.

II. The image is more distant than the object.
III. The lens is convex. IV. The lens is concave.
A. III only
B. I and III only
C. II and III only
D. I and IV only
E. II and IV only
17. A pair of rays converge on the point $I$ as shown in the diagram. Which of the following pieces of apparatus, placed along the line MN will displace the convergent point to the right?
I. a concave lens
II. a convex liens

III: a rectangular slab of glass
A. I only
B. II only
C. III only
D. I and III only

3.

18 .


3

In the diagram, the ray between the lenses is parallel to the axis. only one incident ray and one emergent ray are correctly drawn. Which of the following pairs are the correctly drawn rays?

19. Which of the following is a property of a sound wave?
A. It does not require a material medium.
B. It is an electromagnetic wave.
C. It is a transverse vibration.
D. It travels most rapidly in a vacuum.
E. It is a longitudinal vibration.
20. Sound waves differ from electromagnetic waves in the following respects:
I. Sound waves cant be refracted.
II. Sound waves have a greater velocity in a denser medium.
III. Sound waves can only travel in a gaseous medium.
li. I only
B. II only
C. III only
D. I and II only
E. None of the above
21. A sound wave of frequency $f$ travels in air with a velocity $c$. Under the same conditions, the velocity of the sound wave of frequency $2 f$ will be
A. $1 / 2 \mathrm{c}$
B. c
C. $2 c$
D. 4 c
E. undetermined

2
22. Two men $\hat{A}$ and $B$ stand on a line vertical to and in front of a high wall. The distance between $A$ and the wall is 330 m , between $B$ and the wall is 660 m . When A makes a whistle, B hear the sound first and then the echo from the wall. Let the velocity of sound be $330 \mathrm{~m} / \mathrm{s}$, find the. length of time between the sound and echo $B$ heard.
B. 1 sec
C. 2 sec
D. 3 sec
E. 4 sec
I. 0

Form 4
23. With respect to a sound wave.,
I. the pitch depends on frequency
II. the quality depends on velocity
III. the loudness depends on amplitude

Which of the above statements is/are correct?
h. I only
B. II only
C. III only
D. I and II only
E. I and III only
24. The quality of the same note produced from different musical instruments depends on
A. the combination of overtones.
B. the length of the sound wave.
C. the energy of the sound wave.
D. the amplitude of the sound wave.
E. the density of the medium transmitting the sound.
25. A commonly used method of tuning a sonometer wire into resonance with a tuning fork employs a paper rider.
Which of the following statements is/are true?
I. the wire vibrates because energy taken from the tuning fork is transferred to the wire and the paper rider.
II. the position of the rider is unimportant......... 2
III. the mass of the rider is unimportant.
A. I only B. I and II only C. I and III only
D. II and III only E. I, II and III
26. Which of the following is/are transverse waves?
I. Light waves
II. Sound waves
III. Water waves
h. I only
B. II only
C. I and II only
D. I and III only
E. II and III only
27. Of the following radiations, the one which has nearly the same natures as X-rays is
A. infra-red
B. ultra-violet
C. visible light
D. radio wave
E. gamma-ray
28. F.M. broadcasting with a frequency 92 M Hz is transmitted by radio Hong Kong every day. The wave length of this broadcasting is approximately.
A. 0.3 m
B. $186 \times 10^{14} \mathrm{~m}$
C. $3 \times 10^{8} \mathrm{~m}$
D. 3.3 m
E. 1.7 m
29. If the distance between a point source of light and a surface is tripled, the intensity of illumination on the surface will be
$\therefore$ triple
B. doubled
C. : reduced to $1 / 2$
D. reduced to $1 / 3$
E. reduced to $1 / 9$
30.


The diagram represents the pattern of water waves observed when an obstacle is placed in a ripple tank. Which of the following physical phenomena does the diagram illustrate?
f. . Reflection
B. Refraction
C. Dispersion
D. Diffraction with interference
E. Diffraction without interference
31. Which of the following is used to measure the internal diameter of a pipe?
A. a metre
B. a vernier
C. a micrometer screw gauge
D. a measuring cylinder
E. slide calipers
32. Which statements are correct about a burette?

1. It should be. read at a position right angle to it.
2. The zero mark is at the bottom.
3. There is only one division on the burette.
4. It can be used to run out small quantities of liquid repeatedly.
A. 1, 2 and 4
B. 1 only
C. 1, 2 and 3
D. 1 and 4
E. None of the above combinations.

## SECTION B: LONG QUESTION $(68 \%)$

1. Describe fully the apparatus used, how it is set up, and the precautions which are taken, in order to obtain an accurate value for the focal length of a concave spherical mirror. Show how the observations made are used to give the final result.
a concave spherical mirror has a focal length of 10 centimetres. Where must an object be placed in order to produce a real magnified image three times as tall as the object?
How far, and in what direction, does the object need to be moved to. produce a virtual image three times as tall as the object?
2. Distinguish between a real image and a virtual image. Give ray diagrams to show how a converging lens can form (a) a real image, and (b) a virtual image, of a small object. Label each diagram clearly and mark the positions of the principal foci of the lens:
If the focal length of a camera lens is 10 cm how far away from the film must the lens be set in order to photograph an object 100 cm away from the lens?

State and explain one way of controlling the light energy falling on the film in a camer?.

Appendici 9

| $\begin{aligned} & 881 \\ & 881 \\ & 881 \\ & \hline \end{aligned}$ | $\begin{array}{r} 39 \\ 39 \\ 39 \end{array}$ |  | $\begin{aligned} & \hline \text { DRFINED } \mid \text { PR\| } \\ & \text { DEFINED } \mid \mathrm{LR\mid} \\ & \text { GO } \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| 883 | 39 | + SET PR = , 12ri2 | DEPINED \|PR| |
| $\begin{aligned} & 883 \\ & 883 \end{aligned}$ | $\begin{aligned} & 39 \\ & 39 \end{aligned}$ | $\underset{\substack{\text { SET } \\+G A}}{ }$ | $\begin{aligned} & \text { DEFINED \|LR\| } \\ & \text { GO } \end{aligned}$ |
| $\begin{aligned} & 890 \\ & 890 \end{aligned}$ | $\begin{aligned} & 40 \\ & 40 \end{aligned}$ |  | $\begin{aligned} & \text { DEFINED } \mid \text { PR\| } \\ & \text { DEFINED ILRI } \end{aligned}$ |
| 890 | 43 | +GO | GO |
| $\begin{aligned} & 904 \\ & 904 \\ & 904 \\ & \hline \end{aligned}$ | $\begin{aligned} & 40 \\ & 40 \\ & 40 \end{aligned}$ | $\begin{aligned} & \text { +SET PR }=1 \text { \| } 12 \mathrm{riz}{ }^{\prime} \\ & \text { + SET LR }=1 \text { LRI2 } \\ & +G O \end{aligned}$ | DEPINED $\mid$ PR\| DEFINED GO GR |
| 912 | 41 | + SET PR = , 12ri2 ${ }^{\text {c }}$ | DEFINED \|PR| |
| $\begin{aligned} & 912 \\ & 912 \end{aligned}$ | $\begin{aligned} & 41 \\ & 41 \end{aligned}$ | $\underset{+G O}{+\operatorname{SET} L R=1} \begin{aligned} & \text { LRI2 } \end{aligned}$ | $\begin{aligned} & \text { DRFINED \|LRI } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r} 930 \\ 930 \\ \hline \end{array}$ | $\begin{aligned} & 41 \\ & 41 \end{aligned}$ |  | DEPINED \|PR| <br> DEFINED \|LRI |
| 930 | 41 | *GO | GO |
| $\begin{aligned} & 953 \\ & 953 \\ & 953 \\ & \hline 9 \end{aligned}$ | $\begin{aligned} & 42 \\ & 42 \\ & 42 \\ & \hline \end{aligned}$ |  | DEFINED <br> DERINED <br> DEPINED <br> GO |
| 958 | 43 | + SET $\mathrm{PR}=$ - $112 \mathrm{ri2}$. | DEPINED \|PRI |
| $\begin{aligned} & 958 \\ & 958 \end{aligned}$ | $\begin{aligned} & 43 \\ & 43 \end{aligned}$ | $\begin{aligned} & \text { +SET LR }=\text { JLRI } 2 \quad \\ & +G O \end{aligned}$ | DEFINED \|LR| GO |
| $\begin{array}{r} 964 \\ 964 \\ \hline \end{array}$ | 43 43 4 | $\begin{aligned} & + \text { SET PR }=\text {, ) 12ri2 }{ }^{\prime} \\ & +\operatorname{SET} \text { LR }=\text { LRI2 } \end{aligned}$ | DEFINED \|PR| DEPINED |LRI |
| 964 | 43 | +GO | GO |
| $\begin{aligned} & 976 \\ & 976 \\ & 976 \\ & \hline \end{aligned}$ | $\begin{aligned} & 43 \\ & 43 \\ & 43 \end{aligned}$ |  | $\begin{array}{ll} \text { DEFINED } & \text { PR \| } \\ \text { DEFINED } & \text { \|LR } \\ \text { GO } & \\ \hline \end{array}$ |
| 978 | 43 | +SET PR $=$, /12ri2 | defined \|PR| |
| $\begin{aligned} & 978 \\ & 978 \end{aligned}$ | $\begin{aligned} & 43 \\ & 43 \end{aligned}$ | $\underset{\rightarrow G O}{+\operatorname{SET}} \frac{\mathrm{LR}}{}=\mathrm{JLRL}^{2}$ | $\begin{aligned} & \text { DEFINED \|LRI } \\ & \text { GO } \end{aligned}$ |
| $\begin{array}{r}989 \\ 989 \\ \hline 989\end{array}$ | 44 44 4 4 |  | $\begin{array}{l\|l\|} \text { DEPINED } & \text { PR } \\ \text { DERINED } & \text { ILR } \\ \hline \end{array}$ |
| 989 | 44 | +60 | GO |

1) We can see the image of ourselves in the plane mirror but not on a plane sheet of white paper because
(A) white paper transmitted nearly all the light falling on it.
(B) white paper absorbed all the light falling on i.t.
(C) light is diffusely reflected from the white paper.

Comprehension
(D) the image formed in white paper is virtual.
(E) the refractive index of white paper is unknown.
2) The rays $A$ \& $B$ diverging from a point source $P$ are reflected from a plane mirror MM': The reflected rays C \& D will now diverge at an angle of
(A) $5^{\circ}$
(B) $10^{\circ}$
(C) $20^{\circ}$
(D) $30^{\circ}$


Whenever the centers of the sun, moon and earth are in a straight line (in that order):
I. Some part of the earth is in the moon's penumbra
II. some part of the earth must be in the moon's umbra

III some part on the earth can see a total eclipse of the sun ... recall
Which of the above statements is/are true?
(A) I only
(B) II only
(C) III only
(D) I \& IT only
(E) All three
4) Which of the following mirrors can give an image (real or virtual) of the same size ás an object which is not in contact with the mirror?

```
I concave mirror
II convex mirror
III piane mirror recall
```

(A) I only:
(B) III only
$\sqrt{(D)}$ I \& III only
(E) All three
5) In the figure, the position of the pin has been so adjusted that the pin and its image may be observed with no parallax between them. What is the focal length of the mirror?
$V(A) 12 \mathrm{~cm}$
(B) 20 cm
(C) 24 cm
(D) 40 cm
(E) It cannot be determined from the information given.

6) Rays from a point source at $U$ are reflected by a concave mirror $M$ and converge to a point $V$ as shown in the diagram. If we wish to obtain a parallel beam of light after reflection, we could

I move the mirror closer to $U$
II move the mirror away from U
III keep the source at $U$ and replace $M$ by a suitably chosen concave mirror of shorter focal length

(A) I only
(B) II only
(C) III only
(D) I \& II only
(E) II \& III only
7) Total internal reflection can occur at a surface of separation between a dense medium $X$ and a rare medium $Y$ only when

I the refractive index for light from $X$ to $Y$ is greater than 1
II the angle of incidence is greater than the critical angle
III the ray travels from $X$ towards $Y$
7) Which of the above statements is/are correct?
(A) I only
(B) II only
$\checkmark$ (D) II \& III only
(E) All three
(C) I \& II only
8) The angle of incidence of a ray of light on a liquid is $45^{\circ}$ and its angle of refraction is $30^{\circ}$. What is the critical angle of the liquid? apphcation.
(A) $75^{\circ}$
(B) $60^{\circ}$
(C) $45^{\circ}$
(D) $30^{\circ}$
(E) $15^{\circ}$
9) The diagram shows a thin-walled prism filled with air. The air prism is immersed in water. A ray of light is incident al ong the line AB. Aiong which line will the light emerge?
(A) 1
(B) 2
(C) 3
(D) 4

(E) 5 compreherivions
10). The path of a ray of light through a glass prism can be found if we know:
I. the refractive index of the glass
II the refracting angle of the prism
III the angle of incidence at one side of the prism
(A) III only
(B) I \& II only
(C) I \& III oniy
(D) II \& III only
$V(E)$ All three
11) A diver at $h$ metres under water looks up at the water surface and observes the sky appears to be a circle. What is the diameter of the circle if the critical angle of water is C? (in metre)
(A) $\mathrm{h} \tan \mathrm{C}$
$\checkmark$ (B) $2 h \tan C$
(C) $2 \mathrm{~h} \sin \mathrm{C}$
(D) $\frac{h}{\sin C}$
(E) $\frac{2 h}{\sin C}$
application:
12) In the diagrams shown, the critical angle of glass is $42^{\circ}$. Which diagram shows the correct path for the light ray through the prism?
(A)
(D)

(B)

$\sqrt{ }(E)$

(C)

cupplication
13) When a lens is placed at $M$, a real, inverted and magnified image of the illuminated pin is seen on the screen. When the lens is moved to position $N$, a sharp image of the pin is seen again. This image will be


(A) real, inverted and magnified.
(C) real, erect and diminished.
${ }^{\wedge}$ (B) real, inverted and diminished.
(D) real, erect and magnified.
(E) virtual, erect and magnified.
compisetimiors


Two parallel rays of light pass through a box containing a piece of glass and emerge as shown.
I)

II)

III).
IV)
v)
14) Which of the above pieces of glass could produce this result?
(A) I only
(B) III only
${ }^{\circ}$ (C) II or III
(D) I or IV
(E) All four
compreheneron
15) When the eye is looking at an image in the mirror, the image formed on the retina of the eye is virtual BECAUSE the image which appears in the eye is virtual.

| (A) True | True | (correct explanation) |
| :--- | :--- | :--- |
| (B) True | True | (wrong or irrelevant explanation) |
| (C) True | False |  |
| (D) False | True |  |

16) 



The diagram shows two incoming parallel rays of light which pass through a lens I. The ray PQ after passing through the lens will pass through the point.


In the diagram, the ray between the lenses is parallel to the axis. Only one incident ray and one emergent ray are correctly draw. Which of the following pairs are the correctly drawn rays?

## Incident Ray

Emergent Ray
appheatran.

| (A) |  | IV |
| :--- | :--- | :--- |
| (B) |  | I |
| (C) |  | II |
| (D) | II | IV |
| (E) |  | III |

18) A red disc is placed on a green grass ground and is then illuminated with coloured light given below, which could make the disc indistinguishable from its background?

Comprehension
(A) magenta
(B) blue
(C) green
(D) white
(E) red
19) Red and blue filters are placed directly in the path of white light. What is the colour of the light coming through?
(A) black (no light pass through)
(B) green
(C) yellow
(D) white

Comprichersin.
A
(E) magenta
20)

| N | A | N | A | N | A | N |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

The closed pipe shown is 0.9 m long and contains a stationary sound wave with nodes $N$ and antinodes $A$ at the position shown. The wavelength of the sound is (in $m$ )
(A) 0.15
(B) 0.3
(C) 0.45
(D) 0.6
(E) 0.9
21) Sound waves differ from electromagnetic waves in the following respects:

I Sound waves have a larger velocity in a denser medium
II Sound waves can only travel in a gaseous medium
III Sound waves cant be refracted.
compretemeio
$D$
(A) I only
(B) II only
(C) III only
(D) I \& II
(E)
None of the above
22) A sound wave of frequency $f$ travels in air with a velocity $C$. Under the same conditions, the velocity of the sound wave of frequency $2 f$ will be
(A) 4 c
(B) $2 c$
(C) c
comperhenevion
(D) $1 / 2 \cdot \mathrm{c}$
(E) cannot be determined
C
23) Two men $X$ \& $Y$ stand on a line vertical to and in front of a high wall. The distance between $X$. and the wall is. 330 m , between $Y$ and the wall is 660 m . When $X$ makes a whistle, $Y$ hear the sound first and then the echo from the wall. Let the velocity of sound be $330 \mathrm{~m} / \mathrm{s}$, find the length of time between the sound and echo $Y$ heard (in sec.)
application C.
(A) 4
(B) 3
(C) 2
(D) 1
(E) 0


The diagram shows a disc siren, the pitch emitted by this disc will depend on

I . the number of revolutions the disc turns through per second
II the distance of the whales from the axle of the disc recall
III the number of holes in the disc.
c
(A) II only
(B) I \& II only
(C) I \& III only
(D) II \& III only
(E) All three
25) Two loudspeakers A \& B broadcast the same pure note. The sound from loudspeaker $A$ is louder than that from loudspeaker B. The sound waves produced by A
(A) have greater amplitude than those byte. recall
(B) have longer wavelength than those byrd. A.
(C) have shorter wavelength than those byby.
(D) have higher frequency then those by $B y$. ,
(E) travel faster than those by By.
26) The quality of the same note produced from different musical instruments depends on
(A) the length of the sound wave.
(B) the energy of the sound wave.
(C) the amplitude of the sound wave.
(D) the combination of overtones.
(E) the density of the medium transmitting the sound.
27) When the air in a tube closed at one end and open at the other is made to vibrate, it has
(A) a node at the close end.
recall
(B) an antinode at the closed end. $B$.
(C) an antinode exactly at the open end.
(D) maximum amplitude halfway along its length.
(E) the frequency of any strongly vibrating tuning fork placed near the open end.
28) A sonometer wire emits a note of frequency 300 Hz when under a tension of 2 kgf . If the tension is increased to 8 kgf and the length is kept constant, the frequency of the note becomes (in Hz).
C.
(A) 4800 .
(B) 1200
(C) 600
(D) 150
(E) 75
29) A commonly used method of tuning a sonometer wire into resonance with a tuning fork employs a paper rider. Which of the following statements is/are true?

I the mass of the rider is unimportant
II the position of the rider is unimportant
III the wire vibrates because energy taken from the tuning fork is transferred to the wire and the paper rider.
(A) I only
(B) II only
(C) III only
(D) I \& II only.
(E) I \& III only

Apendix 10


Immelted ly．C．C．Wony（B．Sc，Dip．Sytewann，Dip E．）
的题旅发
Question No．
平面镜更


佰距離减半，此種改变对成像的大小，光度及清晰度有何影响


2．眼注視 像内的像時，視细脱上的成像是是虚像。
因岪出现在视细膜上的像是虚像
A．前後联均正確，且为合理解穑
B 前後䛤均不確，但准今理解程

－前諟不正碾，得説正磪
VE两誁为不正誰。
3．一物置施䟚鏡前，得一倒立放大之实像，則該物應在
A．兴限㝨虔。
B．曲率中心以外
C．曲畜中心点
D．曲卒中心気焦勲之間
E 焦点勾鏡面之間

的倒後鏡，因为足鏡能着生
A．放大的鏡像，B实像
C．更清盺之像D．不变形之像
作有較大視面的像。

$\sqrt{ } \cdot 10 \mathrm{~cm}$ is 20 cm C． 24 cm
D． $40 \mathrm{~cm} E$ 垂法由已知中求得。
部分污入水中而
四下列何者虽？
I．千涉 I．仅时 亚折射


8：某人垂直期青水面下 2 米虔
一物体，苦水之折皎率为
4．，期其視深
$\begin{array}{lll}\text { A．} 1 \frac{1}{2} m & \text { B．} 2 m\end{array}$
C． $2 \frac{2}{3} m$
D．因水之澄清度而定。
E，每观察者祻水面高度有闺

4．下列何者可坆生宽物之虚像。

A．戈有 $\quad$ B只有I
C 只有工凡亚 D只有正及世
$J_{E}$ ．I．I．\＆I．

9．光线通過三变镜的路线
可以計算出本，如知道下列
I．基錇的萲鏡鱼正，入射经入的菨鏡一侧的入射角。
II 変鏡玻璃的折时率。

C．又有级正
D．\＆有 II及且


| $\frac{y}{v}$ 生編號 |
| :---: |
| Candidate Number |
|  | HONG KONG CERTIFICATE OF EDUCATION EXAMINATION

本真皘分 Page Total
试題號數
Question No．
10．在上葍中，㱟璃的榢界苗是 $42^{\circ}$ 。那及一伺京影示光缕奴正確路琈。
A．

$t$


11．固中有何全著誤

A．䒜锯該
B．只有一條白光出射

c．红艺邪紫光位置㢈对換

E．C．D．攻中所过的敛誤皆存在
玲，看到直天空呈回形，言式求
是 $\theta$ 。
$\checkmark$ A． $2 x \tan \theta m$
C．$x \tan \theta m$
E．$\frac{2 x}{\sin \theta} m$
2x $\sin \theta m$
D．$\frac{x}{\sin \theta} m$
（20
13 下列何區域工．II．I丩亚可被看到池井比鱼？
A有工道正
B．叹有工及正
c．又有工，正攵正
D．有I II 及 II
E．所有區域坞可看到。


盆中的针必其像
通造一違镜看長拴。圆一影示针勿其像的位置，学㖣移白左遇，全十（实物）力像如同二所示，下列何老正磪
I，实物校像为袁 II像较实物身兄。



E．ス有II R IL

碓。
物最全竞的
I 第一倜像是時草靠一近焦面
II目镜是用作算單放大镜以观音要的镜所屋生的像
II．最後的像是放大的像
A．X有I．
B．只有並
（1）有 III
D 有而及正
E．I．II及II．


Holendic 1
$\therefore$
$\because \vdots \quad \vdots$
$\therefore$



Teaching Schedule of F. 4 Physics (1979)

| Date | Period | Content | Page |
| :---: | :---: | :---: | :---: |
| 7/2 | 1 | What is force, gravitational force | P. 13 |
| 9/2 | 2.3 | Centripetal force, Weights of stondard masses, | P. 14 |
|  |  | Why the weight of a body varies, relation | 1 |
|  |  | between gravitational force and weight, action | P. 20 |
|  |  | and reaction forces, weightlessness, weightlessness in space vehicles, artificial weight in a |  |
|  |  | space station, friction, static friction, sliding friction, coefficient of friction, the nature of friction, friction and brakes, lubrication, air | (ch.2) |
|  |  | Iubrication, further developments. |  |
| 13/2 | 4 | Discussion of exercise 2, average speed, actual speed, scalar and vector quantities, distance and displacement. | P. 21 |
| 15/2 | 5,6 | Experiment to determine the coefficient of | L.56-57 |
|  |  | Iimiting static friction between two solid | $\text { P. } 23$ |
|  |  | surfaces, velocity, uniform velocity, |  |
|  |  | acceleration, uniform acceleration. | (Ch.3) |
| 19/2 | 7.8 | Equations of uniformiy accelerated motion; | P. 24 |
|  |  | velocity-time graph, uniformly accelerated motion | 1 |
|  |  | represented graphically, velocity from distance- | P:30 |
|  |  | time graph, acceleration from velocity-time graph; worked examples, Galileo Gallilei, the simple |  |
|  |  | pendulum experiment to study the simple pendulum; the measurement of g. |  |
| 21/2 | 9 | Distance moved by a freely falling body related to | P. 31 |
|  |  | time of fall; to measure $g$ by use of a centisecond timer, discussion of exercise 3 . | $\text { i } 34$ |
| 23/2 | 10,11 | Newton's first law of motion, momentum, Newton's | P. 35 |
|  |  | second law of motion, weight of a body expressed | $\mathrm{p} \cdot 37$ |
|  |  |  | P. 40 |
|  |  | newtons, use of a calibrated spring balance, can a | P. 40 |
|  |  | spring balance be used to measure mass as well as weight, weight of a body in a lift. | P:43 |
|  |  | welght, welght of a body in a lilt. | (Ch.4) |


| Date | Period | Content | Page |
| :---: | :---: | :---: | :---: |
| 27/2 | 12 | Newton's third law of motion, law of the conservation of momentum, to verify the conservation of momentum for interacting bodies moving in the same straight line, rocket propulsion jet engines. | $\begin{gathered} \text { P. } 44 \\ \text { P. } 50 \end{gathered}$ |
| $1 / 3$ | 013 | Worked examples, discussion of exercise 4. | $\begin{aligned} & P .51 \\ & P .52 \end{aligned}$ |
| 5/3 | 14,15 | Experiments with an elementary force and motion cart, addition of displacement, polygon of vectors, resultant force, equilibriant, worked examples. | $\begin{gathered} L_{0} .70 \\ L_{.} .74 \\ P_{0} .53 \\ \mathrm{P} .56 \\ \left(\mathrm{Ch}_{.} 5\right) \\ \hline \end{gathered}$ |
| 7/3 | 16.17 | Resolution of forces, worked examples, addition of velocities, the parallelogram rule for adding vectors, the ferryman's problem, three forces in equilibrium, experiments to verify the parallelogram of forces and the triangle of forces. | $\begin{aligned} & \text { P. } 57 \\ & \text { p. } 60 \\ & \text { L. } 58 \\ & \text { L. } 61 \end{aligned}$ |
| $9 / 3$ | 18 | Discussion of exercise 5. | P. 61 |
| 14/3 | 19,20 | Principle of moments; resultant moment, experiments to verify the principle of moment and to find the weight of an object: | $\begin{aligned} & \text { P. } 62 \\ & \text { P. } 64 \end{aligned}$ |
|  | ; |  | $\begin{aligned} & \text { L. } 62 \\ & \text { L. } 65 \end{aligned}$ |
|  |  |  | (Ch.6) |
| 15/3. | 21 | Parallel forces, couples; to study parallel forces in equilibrium, centre of gravity, the plumbline. | $\begin{aligned} & \text { P. } 65 \\ & \text { P. } 66 \end{aligned}$ |
| 16/3 | 22,23 | Experiments to locate centre of gravity by a balancing method and by means of a plumbline, centre of gravity of a stool or tripod, to find the mass of an object by means of a metre rule, principle of the beam balance, to measure the mass of a metre rule by using a single known mass; the steelyard, stable, unstable and neutral equilibrium: | $\begin{gathered} \text { P. } 67 \\ \text { \| } \\ \text { P. } 72 \end{gathered}$ |



[^29]$\because$
$\because \quad$
$\because$
$\because$
$\because$

$\therefore$ Appanana

1
$\vdots$
$\vdots$

1

$\because$
$\therefore$


FORM $\qquad$ PHYSICS TEST
Mar 1979

## STATICS AND DYNAMICS

Time allowed: 1 hr 15 min

Answer all 69 items in the M.C. answer sheets. Each carries equal marks.
(1. The coefficient of static friction between two solid surfaces in contact depends only on
A. the surface erea in contact.
$p=0.24 \mathrm{~B}$. the limiting friction betwen the two surfaces.
C. the normal reaction between the two surfaces.
(0. the texture of the surfaces in contact.
E. None of the above
(2.) A 5 kg metal is sliding on a horizontal metal surface. Let the coefficient
0.66 of sliding friction be $\frac{1}{10}$, find the required horizontal force.
A. $0 \mathrm{~kg} w t$
B. $1 / 2 \mathrm{~kg} w t$
C. $2 \mathrm{~kg} w t$
D. 5 kg wt
E. $50 \mathrm{~kg} \mathrm{w}^{\mathrm{t}}$

2
3. The bob of a pendulum consists of a light but not weightless cylindrical tube full of oil. As the oil leaks away from the tube, the pericdic time of the oscillating pendulum
D ( 10 remains unchenged.
B. increases.
D. increases and then decreases.
D. decreases.
D. decreases.
B. decreases and then increases.
(4. Which of the following pieces of apparatus measure(s) weight only, and do(es) compare masses?
I beain balance
II spring balance
III Chinese steelyard
A. I only
D. I and II only ${ }^{\text {E }}$. II and III only
5. Two particles are allowed to fall freely from the same point, one of which is released a short time before the other. Neglecting the resistance of air, which of the following statements are correct?
$0.24: \quad$ While they are falling:
(1)- the two particles undergo the same acceleration
(2) their velocities always differ by the same amount
(3) their distance of separation is always the same
(A) (1) and (2) only B. (1) and (3) only C. (2) and (3) only
D. (1), (2) and (3) E. None of the above
6. An object passing a mark with velocity of $y \mathrm{~m}^{-1}$ castward is subjected to a constant acceleration of $a \mathrm{~m} \mathrm{~s}^{-2}$ in a westward direction. How long
0.2 will it take to return to the same mark?
P. $\frac{y^{2}}{a}$ seconds
Q. $\frac{y^{2}}{2 a}$ seconds
(R) $\frac{2 y}{a}$ seconds
S. $\frac{y}{a}$ seconds
T. $\frac{y}{2 a}$ seconds
7. A stone is thrown vertically upwards, at its highest position it has

| - I | zero velocity |
| :--- | :--- |
| II no acceleration |  |
| III maximum kinetic energy |  |

Which of the above statements is/are correct?
(P)
$\begin{array}{ll}I \text { only } & Q_{0} \text { II only } \\ I \text { and } I I \text { only } & \text { I. } I \text { and III only }\end{array}$
R. III only
$\qquad$
(8) An object, moving up a smooth inclined plane making an angle $\theta$ with horizontal, decreases its speed from $X$ to $Y \mathrm{~m} / \mathrm{s}$. What is the distance travelled in this period?
P. $\frac{X^{2} d-Y^{2}}{2 g}$ metres
R. $\frac{X^{2}-\frac{y^{2}}{2 g} \sin \theta}{\operatorname{metres}}$
T. $\frac{(X-Y)}{2 g \sin \theta}$ metres
9.


A horizontal force is applied to an object resting on a smooth horizontal surface. The relationship between the force and the time of application of this force is represented by the graph above. Which of the following velocity time graphs correctly lustrates the motion of the object under this force?
Q. $\frac{X^{2}-Y^{2}}{2 g \cos \theta}$ metres
S. $\frac{2(X-Y)}{g \sin \theta}$ metres

10. The acceleration exists when the magnitude and direction of the motion of the body is/are described below.


Magnitude of Velocity
p. i only
S. i and ii only

- constant
variable
variable


## Direction of Velocity

constant
constant
variable
R. 'iii only

A metal sphere on a horizontal plane is given a push so that it quickly runs off the edge of the plane. If air resistance is negligible, what is its vertical displacement downwards in $1 / 2$ second after it has left, the plane? (Acceleration due to gravity $=10 \mathrm{~m} \mathrm{~s}-2$ )
A. 5 m
B. $21 / 2 \mathrm{~m}$
(C) $11 \div \mathrm{m}$
D. 0 m
E: uncertain, for it does not start with zero velocity

The time of a simple pendulum making small oscillations depends upon
A the length of the string and the acceleration due to gravity.
B. the mass of the bob and the angle of swing.
$C$. the mass of the bob and the length of string.
D. the mass of the bob and the acceleration due to gravity.

E: the length of the string and tie angle of swing.
$\qquad$
13. Two objects, $X$ of mass 5 g and $Y$ of mass 10 g are projected vertically upwards at the same time with the same velocity of projection. Assuming the air resistance is negligible,
A. Y will come to rest first.
B. X will reach a point higher than $Y$.
C. both objects have the same potential energy at the highest point.
(D) both objects rise with the same retardation.
E. both objects have the same kinetic energy just before getting to the ground.
(14). The period of oscillation of a simple pendulum is 1 second at the surface of the earth. If the acceleration due to gravity at the moon's surface is $1 / 5$ of that on the earth, what is the period of oscillation when the pendulum is on the moon?
A. $1 / 5$ second
B. $1 / \sqrt{5}$ second
D. 5 seconds
E. 25 seconds
(C) $\sqrt{5}$ seconds
15. If a stationary object explodes, breaking into three unequal fragments,
A. velocity of the fragments are equal.
B. velocity of the fragments are proportional to their mass. the velocity of the fragments are coplanar.
D. the fragments fly off along the same straight line.
E. there is no definite route regarding the velocity of the fragments.
16. A car of mass $M$ is travelling at a velocity $V$. If now a $K$ braking force is applied, the minimum stopping distance will depend on
$i$ the coefficient of friction between the tyres and the road ii velocity of the car iii mass of the car
P. i only $Q$. ii only
S. i and iii only I. i, ii and iii
R. i and ii duly

If the resultant of all forces acting on a body is zero, the body may be P. accelerating.
R. falling under gravity.
S. moving with uniform velocity.
T. moving along a circular track with uniform speed.
18. A body of mass 10 kg is moving with a velocity of $5 \mathrm{~m} / \mathrm{s}$.
0.76 force required to stop the body completely in: seconds?
P. 1 N
Q. 4 N
(k) 25 N
S. 50 N
T. 100 N

19: A ball of mass 1 kg is dropped on a hard surface and bounces. If its speed is $20 \mathrm{~m} / \mathrm{s}$ just before impact and $16 \mathrm{~m} / \mathrm{s}$ immediately after impact, its change in momentum is
(P) $36 \mathrm{~kg} \mathrm{~m} / \mathrm{s}$
Q. $20 \mathrm{~kg} \mathrm{~m} / \mathrm{s}$
R. $16 \mathrm{~kg} \mathrm{~m} / \mathrm{s}$
20. Which of the following is an effect, or are effects, due to a force acting on a body?

I the body changes in shape
II the body moves with a constant acceleration in a straight line
III the body moves with a constant velocity in a straight line
P. I only Q. II only R. III only
(S) I and II only T. I and. III only
(21. A block of mass 10 kg is put on the floor of a cage. If the whole system is now falling freely from rest under gravity, what is the magnitude of the normal reaction between the block and the floor?
(A) 0 kgf
B. 10 kgf
C. 970 kgf
D. 980 kgf
E. 990 kgf
$\qquad$
$\qquad$
22.


The two identical spring balances $X$ and $Y$, each of mass 40 g and 600 g flock are suspended as shown in the diagram. The readings of $Y$ and $Y$ are
$\begin{array}{lll}\text { Q. } & 64 \bar{X} \mathrm{~g} & 60 \overline{\mathrm{Y}} \\ \mathrm{g} \\ \text { C. } 340 \cdot \mathrm{~g} & 300 & \mathrm{~g} \\ \text { E. } & 300 \mathrm{~g} & 300 \mathrm{~g}\end{array}$
B. $\quad 60 \frac{\mathrm{X}}{\mathrm{X}} \mathrm{g} \quad \frac{\mathrm{Y}}{00} \mathrm{~g}$
D. $320 \mathrm{~g} \quad 320 \mathrm{~g}$
(23. The weight of a 10 kg object is handing on a spring balance in an elevator. When the elevator is
$0,40 \quad \begin{aligned} & \text { (A) moving up with constant velocity } 5 \mathrm{~m} / \mathrm{s} \\ & \text { (B) : moving up with constant acceleration } 2 \mathrm{~m} / \mathrm{s}^{2} \text {. }\end{aligned}$ The reading from the spring balance will be:


Forces act as show at a point $F$. The effect of these forces is to cause the point $P$ to
A. remain stationary.
B. move at constant velocity in direction of $Z$.
C. move at constant velocity in direction opposite to $Z$.
D. accelerate in direction opposite to $Z$.
(E) accelerate in direction $Z$.
25. A man walks 1 km due west and then 3 km due south. His displacement from the starting point is
0,86
A. $2 \mathrm{~km} 30^{\circ} \mathrm{W}$ of S
C. $1+3 \mathrm{~km} 30^{\circ} \mathrm{W}$ of S
(E.) None of the above
B. $2 \mathrm{~km} 60^{\circ} \mathrm{W}$ of S
D. $1+3 \mathrm{~km} \mathrm{60}$ W of s
26. An object is resting on a rough plane inclined at an acute angle $\theta$ to the horizontal. As the angle $\theta$ gradually increases the frictional force experienced by the object BEFORE it begins to slide will be directly
0.23 proportional to
P. $\frac{1}{6}$
27.

S. $\cos \theta$ T. $\tan \theta$

The above diagram shows the magnitude and direction of three coplanar forces acting at a point 0 . The resultant of these three forces will
P. lie in the dst quadrant
Q. lie in the and quadrant lie in the ard quadrant
S. lie in the 4 th quadrant
T. be zero
$\qquad$
28. Which of the following is a vector quantity?

### 0.86

P. Mass


A lamp of mass 100 g hangs at the end of a light wire. A light string knotted at the middle of the wire exerts a horizontal pull until the upper portion of the wire inclines at an angle of $30^{\circ}$ to the vertical. Whet is the tension of the horizontal string?
$\begin{array}{lllll}\text { P. } 0 \mathrm{gf} \\ \text { (5. } 100 \tan 30^{\circ} \mathrm{gf} & \text { Q. } 50 \mathrm{gf} & \mathrm{T} . & 100 \tan 60^{\circ} & \text { R. } 100 \mathrm{gf}\end{array}$
(5.) $100 \tan 30^{\circ} \mathrm{gf}$
T. $100 \tan 60^{\circ} g f$
(30.)


A load W rests on an inclined plane. The coefficient of kinetic friction is $M$. What is the minimum pull $F$ required to keep the body $W$ moving at steady speed up the plane?
D. $W+\mu W \cos \theta$
Q. $\mu W(\sin \theta+\cos \theta)$
$W \sin \theta+M W \cos \theta$
S. $W \sin \theta+\mu W \sin \theta$
T. $W \cos \theta+W \sin \theta$
31. A man walks 1 km due west and then 3 km due south. His displacement from the starting point is
A. $2 \mathrm{~km} 30^{\circ} \mathrm{m}$ of S
B. $2 \mathrm{~km} 60^{\circ} \mathrm{v}$ of s
C. $1+3 \mathrm{~km} 30^{\circ}$ of S
D. $1+3 \mathrm{~km} 60^{\circ} \mathrm{W}$ of s
32. Which of the following quantities are vectors?

| I | speed |
| :--- | :--- |
| II | velocity |
| III | fluid pressure |
| IV | force |
| V | potential energy |


| A. 'I and II only | B. II and III only |
| :--- | :--- |
| E. II, III and IV only | D. II, IV and $V$ only |

E. III, IV and $V$ only


A wooden block of $W g$ weight rest on a hinged wooden plane. One end of the plane is raised slowly until the block just begins to slide. If this occurs at angle $\theta$, which of the following is true?
A. The kinetic coefficient of friction is $W \sin \theta$
B. The kinetic coefficient of friction is $\tan \theta$
C. The static coefficient of friction is $W \sin \theta$
D. The static coefficient of friction is $W \cos \theta$
(E) The static coefficient of friction is $\tan \theta$

K4: A body of mass 10 g rests on a rough inclined plane at an angle of $30^{\circ}$ to the horizontal. If the body does not move, what is the frictional force between the body and the inclined plane?
A. 0.5 gf
B. 0.866 gf
D. 8.66 gf
E. 10 gf
$\qquad$

A hinged trapdoor is held in the pusition shown by the rope. Under these conditions the direction of the force on the hinge will
A. be vertical.

B . be horizontal.
C. be directed through the C.G. of the trapdoor.
D. be parallel to the rope.
(E) cut the rope above the C:G. of the trapdoor.

Which of the following are vectors?

### 0.47

I Pressure
II Push or Pull
III Power


0,6
In the above diagram, the moment of the force $F$ about the point $A$ is
P. $F \times A B$
Q. $F \times A C$
R. $F \times A D$
38)
0.53


When a meter stick is set up as shown, it will be in equilibrium. : If the pivot point is moved to the 6 cm point, find the position of $E$ so that the system becomes equilibrium again. (Assume the weight of the meter stick is zero.)
P. 28 cm
Q. 34 cm
R. 41 cm S. 66 cm
T. 76 cm
39.

0,24


Two equal and opposite forces $F$ acts on a rod XYZ as shown in the above. Find the total moment due to this parallel forces is
P. greatest above the point X .
Q. greatest above the point $Y$.
R. greatest above the point $Z$.
S. the same about the points $X, Y$ and $Z$ only.
the same about any points.
40. A couple is defined as two parallel forces which are
P. equal and acting in the same direction.
Q. equal but acting in the opposite directions.
R. unequal and acting in the same direction.
S. unequal but acting in the opposing directions.

None of the above

Form $\qquad$
41.


A uniform rod weighs: $60 . \mathrm{g}$ and is: 120 cm long. It is supported on a pivot $X$ which presses upwards with a force of 140 gf . At the 80 cm mark the rod passes through a slot in a fixed metal plate. Weights hang from the ends of rod as shown.
The force exerted by the rod on the metal plate is
42.
A. 0
B. 40 gf upwards


The suspended rod is a uniform metre stick of mass 100 g in both figures. In each case the rod is in equilibrium. Suspended weights are indicated in grams. The type of equilibrium to be found in each figure


In the diagram, what is the effort required to lift the load?
(A). 96 kgf
B. 144 kgf
C. 160 kgf
D. 9.6 kgf
E. 16 kgf
44. A beam balance with unequal arms is used to measure the mass of an object. When the object is placed in the righthand pan, the weighing is $W_{1}$. When in the left-hand pan, the weighing is $W_{2}$. What is the mass of the object?

## 0.2

A. $W_{1} / W_{2}$
B. $W_{2} / W_{1}$
c. $W_{1} \times W_{2}$
(D.) $\left(W_{1} \times W_{2}\right)^{1 / 2}$
E. $1 / 2\left(W_{1}+W_{2}\right)$
45.

II



Fig. I, II and III show $\frac{\pi}{T}$-shaped lamina in equilibrium when supported on a knife-edge in three different ways. The type of equilibrium to be found in each figure is

|  | Figure I |  | Figure II |
| :--- | :--- | :--- | :--- |
| A. | $\frac{\text { Figure III }}{\text { stable }}$ |  | unstable |
| B. unstable | stable | unstable |  |
| C. neutral | stable | unstable |  |
| D. unstable | neutral | neutral |  |
| E. neutral | stable | neutral |  |

$\qquad$
46.


In Fig. I, a graduated uniform steel rod 40 cm long hangs suspended from two wires $A$ and $B$, the tension in each wire being 1 kgf . In Fig. II, when to mass $M \mathrm{kgf}$ is hung from the same rod at a certain position, the tension in wire A becomes 2 kgf and the tension in wire $B$ becomes $2 / 2 \mathrm{kgf}$. What is the mass $M$ and its position on the rod?

|  | Mass M |  | Position | Mass M | Position |
| :--- | :--- | :--- | :--- | :--- | :--- |
| P. | $\frac{\text { Position g }}{2.0 \mathrm{~kg}}$ | at 10.0 cm | Q. | at 16.0 cm |  |
| R. | 2.5 kg | at 22.2 cm | Q. | 2.5 kg | at 24.0 cm |
| T. | 4.5 kg | at 22.2 cm |  |  |  |

47
0.61


A uniform metre rule of weight 0.500 N is maintained in equilibrium as shown above. What is the value of the weight $X$ ?
P. 0.250 N


The figure represents a uniform lamina with the two shaded portions cut out. The centre of the mass of the remaining portion is
$P$. in the first quadrant.
R. in the third quadrant.
T. outside the large circle.
Q. in the second quadrant.
(S.) in the fourth quadrant.
49.


A particle of mass mkg is given a push so that it leaves the table with a velocity of $v \mathrm{~m}^{-1}$ as shown in the above diagram. The energy the particle possesses at a point $x$ metres above the ground is
P. $1 / 2 \mathrm{mv}^{2}$ joules
Q. $1 / 2 \mathrm{mv}^{2}+\operatorname{mgx}$ joules
R. $1 / 2 m v^{2}+m g(h-x)$ joules
(S.) $1 / 2 \mathrm{mv}^{2}+\mathrm{mgh}$ joules
T. $m g(h-x)$ joules
50. A body of mass 10 kg is moving with a velocity of $5 \mathrm{~m} \mathrm{~s}^{-1}$. What is its 84 kinetic energy?
P. 25 J
Q. 50 J
R. 100 J

T. 250 J
$\qquad$
51.


During the motion, a simple pendulum, the work done by the tension in the string is
A. directly proportional to the amplitude of swing.
B. inversely proportional to the amplitude of swing.
C. Zero
D. directly proportional to the length of the pendulum.
E. directly proportional to the mass of the bob.
52.


Two bodies $X$ and $Y$ of masses 1 kg and 4 kg respectively are connected by a loose string as shown in the above diagrarn. $X$ is moving with a velocity of $10 \mathrm{~m}^{-1}$ in the direction indicated; when $Y$ is at rest. What is the final kinetic energy of the whole system when the string becomes taut?
A. 50 J
B. 40 J
(C.) 10 J
D. 8 J
E. 0 ,

A. body of mass kilograms is dropped a point $h$ metres above the ground. When it reaches a point $x$ metres above the ground, its kinetic energy in joules is (Acceleration due to gravity $=g$ )
A. $\operatorname{mgx}$
B. $1 / 2 \mathrm{mx}^{2}$
C. mg
(D.) $m g(h-x)$
E. $1 / 2 m\left(h^{2}-x^{2}\right)$
54. The kinetic energy possessed by a moving body is directly proportional to
A. its velocity. B. its acceleration. C. its displacement. D. its potential energy. $\quad$ © None of the above
55.


A constant force. $F$ in the direction shown, is applied to a body whilst the body moves from H to K . KJ is a construction line. The work done by force $F$ is
(A. $\mathrm{F} \times \mathrm{HJ}$
B. F x HK
C. $\mathrm{F} \times \mathrm{KJ}$ D. $\mathrm{F} \times(\mathrm{RJ}+\mathrm{KJ})$
E. impossible to calculate from the information given

Using the following symbols:

$$
F=\text { force exerted }
$$ $s=$ distance moved

$t=$ time taken for the force to move through distances
$\mathrm{v}=$ velocity of motion
The power produced by a machine is given by
P. Ps
Q. $F / t$
(R) Fv
S. $F / s$ :
T. $\mathrm{Ft} / \mathrm{v}$
57. Unit kinetic energy is the york done
$0.1 \begin{cases}\text { F. per second in bringing to rest a body of mass } 2 \text { units } \\ \text { Q. per second in bringing to rest a body of mass } 2 \text { units moving at } \\ \text { R. in bringing a moving body of unit mass to rest } \\ S_{0} & \text { in bringing to rest a body of unit mass moving at unit velocity }\end{cases}$
S. in bringing to rest a body of unit mass moving at unit velocity
$\qquad$
$58 \%$
The work required to bring a moving object to rest is directly proportional to its

| P. velocity | Q. momentum |
| :--- | :--- |
| S. potential energy | $(T)$ kinetic energy |

(59)
0.43

When the load is 600 N , the efficiency of the pulley system shown is $50 \%$. This means that
P. 300 N is required to lift the load
Q. 300 N is just able to prevent the load from falling
(R. 400 N is just able to lift the load
S. 400 N is able to prevent the load from falling
T. 600 N is just able to lift the load.
60.

## 0.1



Three simple machines are shown as above, their velocity ratio when arranged in ascending order will be:
P. I, II, III
(2) I, III, II
S. II, III, I
T. III, II, I
R. II, I, III


A load $L$ is pulled up as inclined $p l a n e$ by a force $P$. The velocity. ratio of this inclined plane is
A. $\frac{\mathrm{YZ}}{\mathrm{XY}}$
B. $\frac{X Z}{X I}$
C. $\frac{X Z}{X Z}$
(2.) $\frac{X Y}{Y Z}$
E. $\frac{X I}{X Z}$
62. Which of the following statement concerning a single string block and tackle' pulley system is correct?
A. Efficiency of the machine always increases as the number of pulleys in the machine increases
B. Efficiency will be $100 \%$ if the pulleys are frictionless
(C) Efficiency increases with load
D. The mechanical advantage of the machine always equals its velocity ratio
E. The energy output is always greater than the energy input.
63. For a given machine, which of the following depend (s) on the load?
0.4

I Velocity Ratio
A. I only B. II only $\quad$ C, I and II only
D. I an III only
64.
0.23


The diagram shows a movable pulley resting on a rope. What is the velocity ratio of the system?
A. $2 \sec \theta$
B. $\sec \ddot{C}$
(c) $2 \cos \theta$
D. $\cos 2 \theta$
E. $2 \sin \theta$
$0.16^{65}$
A hydraulic press consists of two circular cylinders of radii 1 cm al $d$ 10 cm : The smaller cylinder is operated by a lever of velocity ratio
2. What is the velocity ratio of the whole press?
A. 5
B. 20
C. 50
D. 100
(1) 200
66. Which of the following machines is likely to have the greatest efficiency?
P. screw jack
Q. pulley system
R. inclined plane
S. wheel and axilc
67.


The diagram show is a hydraulic press in which $A_{1}$ and $A_{2}$ are the crosssectional areas of the small and large pistons respectively.

I This machine turns a small pressure at $A_{1}$ into a large pressure at, A己
II It has a velocity ratio of $A / A$
III It may attain an efficiency of $100 \%$

68. When we say that the mechanical advantage of a machine is 15 , we mean that

00 P. the work done by the machine is 15 times the work put into it.
(9.) the resistance overcome. by the machine is 15 times the force
applied to it.
R. the load mores through 15 times the distance moved by the effort.
s. the power put into the machine is 15 times that got out of it.
T. the frictional? fore ie 15 times that of the effort.
69.

01


What is the velocity ratio of the above windlass?
P. $4 / 5$
Q. $5 / 4$
R. $1 / 2$
S. 2
$5 / 2$

Appendine 13


0 N

```
EFFECT OF MEDIUM OF INSTRUCTION UPON
STUDENT LEARNING IN MATHEMATICS, SCIENCE
AND HISTORY: AT FORMS II, III AND IV LEVELS
```

Second Stage:
Four Lessons on ATOMIC STRUCIURE AND RADIOACTIVITY
at Form IV Level

```
The Chinese University of Hong Kong
    School of Education
```

Atomic Structure and Radioactivity

$$
\text { May } 15 \text { - May 17, } 79
$$

```
Lesson One: Atomic Structure (40 minutes).
    I. The Atomic Theory
    II. Atomic Models
    III. Nucleus, Mass Number, Atomic Number
    Lesson Two: Isotopes and Radioactivity (25 minutes)
    I. Isotopes and Its Chemical Properties
    II. Radioactivity and Its Discovery
    Assessment One: (15 minutes)
    15 multiple-choice questions for LessonsOne and Two
    Lesson Three:Radiation and Half-Life (40 minutes)
            I. alpha, beta and gamma radiations
            II. Half-Life and Decay Time
            III. Carbon Dating
    Lesson Four: Tracer and Atomic Energy in Peaceful Uses
            (20 minutes)
            I. , Tracer in Peaceful Uses
            II. . Atomic Energy in Peaceful Uses
            Assessment Two: (20 minutes)
            20 multiple-choice questions for Lessons Three
                    and Four
```


## Time

Allocation

## Teacher's Guide

## (min.)

I. The Atomic Theory

5 The belief that complex substances are composed of simple, elementary components existed in ancient Greece. We know that almost every substance can be breken into smaller parts. About 2500 years ago, a Greek philosopher, Democritus taught that by breaking substances into smaller and smaller parts, one would finally reduce matter to its smallest particles, which could not be broken down any further. These smallest, indivisible particles were called ATOMS.

According to Democritus, atoms, like grains of sand, when packed together could be moulded into any form, so that everything in nature could be built with atoms.

## II. Atomic Models

a. J.J. Thomson Model

5 Atoms had been pictured as small, hard indestructible particles until 1897. When the electron--- a negatively charged particle much smaller than the atom, was discovered. In the next year, J.J. Thonson, the English scientist, who discovered the electron, proposed a so called 'plum pudding' model.

In his model, atoms are pictured as small spheres of positively charged matter in which electrons are embedded. (Figure 1). The atom should look somewhat

2500 years ago, Democritus taught that by breaking matter into smaller and smaller parts, it mat be reduced into its smallest particles-- the atons.

## Hang the figure of THOMSON MODEL.

Thomson proposed a plum-pudding model of the atom. He pictured atoms as small spheres of + charged matter in which electrons are embedded. like a snowball with some pebbles or a lump of raisinstudded pudding.


The Thomson model was soon diecarded as it failed to comply with new experimental findings. Thirteen years later, another English scientist, Ernest Rutherford proposed the 'Nucleon Model', ( Figure 2) here the atom consists of a nucleus at the center surrounded by electrons . which are negatively charged. His model was later modified by Niels Bohr, a Danish scientist.

Bohr pictured the atom as a miniature solar system. Inside the atom, electrons, like those planets revolving round the sun, are whirling round a tiny positively charged particle called the NUCLEUS. (Figure 3)

## c. Our present view

Planets move round the sun in definite orbits but electrons are not. They are whirling round the nucleus with a very high speed, changing their orbits all the time. Because of their rapid motion, it is impossible to find their positions at any instant. The electron can still be found 'somewhere' round the nucleus, but its position can be described only in terms of. 'probabilities'.
III. Nucleus, Mass Number and Atomic Number

III-1 The Nucleus

The nucleus, being much smaller than the atom, has a diameter $\frac{1}{10000}$ part of the diameter of the atom; thus atoms consist largely of empty space. To have some idea of the relative sizes of the nucleus and the atom: if the nucleus were enlarged to the size of a small glass marble, the whole atom would be as big as a giant balloon measuring more than 300 feet across.

Since electrons are much lighter than atoms, (less than one-thousand th part), so that nearly all the mass of the atom is concentrated in the tiny but heavy nucleus.

Particles of Nucleus-- Protons an d Neutrons

Scientists found that the nucleus is composed of two kinds of particles-- protons and neutrons.

The proton is a positively charged particle, possessing a positive charge equal in magnitude to that of the electron. In a neutral atom, the number of protons is equal to the number of electrons. Its mass is about 2000 times that of an electron.

The neutron does not carry any charge, its mass is the same as the proton. For some atoms, the number of neutrons is equal to the number of protons. But in some heavy atoms, those having large number of protons and neutrons, the number of neutrons is larger than the number of protons.

## III-3 Mass Number and ATomic Number

Protons and neutrons are the component particles of all atomic nuclei. To help in identifying various nuclei, scientists derined two numbers, the atomic number and the mass number.

The number of protons inside the nucleus is called the Atomic Number and is denoted by the synbol $Z$. The total number of protons and neutrons is called the Mass Number and is denoted by the symbol $A$.

Less commonly, the number of neutrons is represented by $N$, which can be found by using the formula
$N=A-Z$
when $A$ and $Z$ are known.

Examples: $C$ atom -- 6 protons \& 6 neutrons in nucleus $\square$ Examples
$\therefore Z=6, \quad A=6+6=12$
Na atom-- 11 protons and 12 neutrons
$\therefore \quad Z=11, \quad A=11+12=23$

III-4 Symbolic Representation of Nuclei
5 To represent helium, chemists use the abbreviated symbol : He. Nuclear physicists are more particular, they represent the nucleus of helium as $2 \mathrm{He}^{4}$ where the top-right no. = mass number and the bottom-left no. = atomic number

From this symbol, we know at once that there are 4 particles in the nucleus, 2 protons and 2 neutrons.

In general, $i^{\frac{f}{f}} \mathrm{X}$ is the symbol of the element, its nucleus is represented as $Z^{X^{A}}$. The number of component particles are clearly given from the symbol.
Example: $6^{\mathrm{C}^{12}}, 11^{\mathrm{Na}}{ }^{23}, 92^{\mathrm{U}^{238}}$

```
The nuclei of an
element X is represented
by }\mp@subsup{z}{}{\mp@subsup{X}{}{A}
```


## I. Isotopes and Its Chemical Properties

I-1 Chemical Properties and Atomic Number
All atoms of an element contain the same number of protons. The chemical properties of an element

Chemical properties depend on atomic no. is determined by the number of electrons in an atom, which is equal to the atomic number of the element.

According to the atomic theory, all atoms of an element should be identical. They should have the same size, mass and structure.

Scientists discovered that an element may consist of several kinds of atoms with different masses.

Atoms of the same element but of different masses exist-- they are called ISOTOPES, having the
same $Z$ but different $A$. These atoms of the same element have the same proton. number of the various species of an element having different masses are called its ISOTOPES.

## I-2 Examples of Isotopes

Ordinary hydrogen atoms has 1 proton in its nucleus. Examples
There are also two kinds of hydrogen atoms which have one ${ }_{\mathrm{A}}$ two more neutrons respectively in their nuclei. These are called 'heavy hydrogen'. The 3 isotopes are represented by $1_{1} \mathrm{H}^{1},\left({ }_{1} \mathrm{H}^{2}\right)\left(1_{1} \mathrm{H}^{3}\right)$
Chlorine has 2 isotopes: $17^{\frac{1}{\mathrm{Cl}^{35}} 17^{\mathrm{Cl}} 37}$
Oxygen has 3 isotopes: $\quad 8^{0^{16}}\left(8^{0^{17}}\right),\left({ }_{8}^{0^{18}}\right)$
Lead has 4 isotopes: $82^{\mathrm{Pb}^{204}}, 82^{\mathrm{Pb}}$ 206 $, 82^{\mathrm{Pb}}{ }^{207}, 82^{\mathrm{Pb}^{208}}$
Carbon has 3 isotopes: $\quad 6^{\mathrm{C}^{12}}, \quad 6^{\mathrm{C}^{13}},\left({ }_{6}^{\mathrm{C}^{14}}\right)$

Isotopes underlined exist in majority abundance, while the ones in brackets have an abundance of less than $1 \%$.
II. Radioactivity and Its Discovery

II-I Riscovery of Radioactivity of discovering radioactivity
The story ${ }_{n}$ happened in a dull, misty day in 1896. A French scientist, Henri Becquerel, placed a. uranium salt on a photo plate in a dark drawer. The plate was found to be fogged after development.

Clearly the uranium had exposed it even in the dark and through the protective wrapper. This uranium salt possessed some mysterious activity and gave out some radiations that affected the photo plate.

## II-2 Basic Knowledge of Radioactivity

7 Some atoms possess a large number of nucleons in their nucleus. These particles are restless (or unstable) as they are confined in a small region.

The jostling particles can have a more easy state (or steble state) by expelling some of their neighboring particles, resulting in the emission of some invisible radiation from the nucleus. Those atoms are said to be RADIOACTIVE.

The process of ernitting some particles or radiation due to spontaneous solitting (disintegration) is known as DECAY. This will result in a new element which can contirue, if possibje, this process until a final stable state is attained. A stable state refers to the str te at which elemontacen no loncer give off radiations.

Becquerel accidentally discovered that a photo plate was exposed by uranium.

The uranium salt can emit radiations that affect the photo plate.

Large number of nucleons in a snall space are restless or unstable.

Unstable atoms, which can attain a more stable state after radiation, are radioactive.

Decay process results in a new element which can still be radioactive, until a final stable state is attained.

## I. alpha, beta and gamina radiations

After radioactivity was discovered, hundreds of experiments were performed to study their properties.

```
There are 3 types of
radiations: }\alpha,\beta\mathrm{ and }
```

Scientists soon identified three different kinds of
radiations: (i) alpha $\alpha$ radiation,
(ii) beta $\beta$ radiation and
(iii) samma $\gamma$ rays
I-I alpha $\alpha$ radiation

Alpha radiation is found to be groups of particles having 2 protons and 2 neutrons in each group. Since the helium rucleus is also composed of 2 protons and 2 neutrons, alpha particles are sometimes stated as He nuclei. Due to the 2 protons present, alpha particles are posi.tively charged. When an alpha particle is emitted, the process can be represented symbolically by:

$$
z^{X^{A}} \rightarrow z-2^{Y^{A}-4}+2^{H e^{4}(\alpha-p a r t i c l e)}
$$

$\alpha$-radiation consists of groups of $(2 p+2 n)$, identified as He nuclei. $2{ }_{2}{ }^{4},{ }^{4}$ carrying + charge.

When an alpha particle leaves a nucleus, its $Z$ is less by 2 and its A is less by 4.

Where X is the element to emit the $\alpha$ particle, generally called the mother nuclide, and $Y$ is the residual elenent called the daughter nuclide.

Note that the mother nuclide after emitting an alpha particle has its atomic number decreased by 2 and the mass number less by 4. (Emission of 2 p and 2 n )
Example: $86^{\mathrm{Ra}^{226}} \rightarrow 84^{\mathrm{Rn}^{222}}+2^{\mathrm{He}}{ }^{4}$

I-2 beta $\beta$ radiation
Beta radiation consists of electrons. These electrons are not orbital electrons. This is simply due to the change of a neutron into a proton and an electron.

$$
n \rightarrow p+e(\beta \text { particle })
$$

The electron is emitted as the beta particle, the equation is given by

$$
2^{X^{A} \rightarrow} Z_{+1} Y^{A}+-1 e^{0}(\beta \text {-particle })
$$

The residual daughter nuclide has an atomic number of $Z \notin l$, due to 1 proton more. The mass number $A$ has not changed as the total number of nucleons is unchanged.

Example: $\quad 6^{\mathrm{C}^{14}} \cdots \rightarrow 7^{\mathrm{NN}^{14}}+\mathrm{I}^{e^{0}}$

I-3 ganma 6 rays
The radiation does not carry any charge. It has a nature similar to that of light but its energy is millions of times larger. They possess wave properties -- can be reflected or refracted. (diffract or interfere with each other as well) The radiation travels with the speed of light.

## II. Half-Life

II-1 Tntroduction
From lesson 1, we know that unstable atomic nuclei are radioactive. These nuclei may decay, or break up by itself to form more stable nuclei with the emission of radiation.

The breaking up process occurs randomly. We cannot tell which mucleus will decay in a particular time. But it is true that more nuclei will break up if more unstable atoms are present.

II-2 Half-Life $\left(T_{\frac{1}{2}}\right)$
Some radioactive samples need a long period to be converted to the stable ones and some need a few seconds. As an indication of the ACTIVITY or the power of still being active, we measure THE TIME REQUIRED FOR HALF OF THE TOTAL NUMBER OF RADIOACIIVE NUCLEI ORIGINAL PRESENT TO BE CHANGED.

This is the half-life of the radioactive element.
Example: Radon, a radioactive gas whose $T_{\frac{1}{2}}$ is 4 days, if we start with 256 atoms of radon, in 4 days time, $\frac{256}{2}=128$ atoms will be changed, leaving 128 atoms of unstable radon atoms. in 4 more days, $\frac{128}{2}=64$ atoms are again decayed, leaving 64 atoms still active;

In a total period of 16 days, 16 atoms of radon still remain active.

The half-life is the time for half of the number of nuclei to decay.

HANG THE EXPONENTIAL
DECAY CURVE PROVIDED,
$\square$
Muclei decay randomly. More radioactive nuclei can give more radiation.

Unstable nuclei are radioactive.
$\gamma$-radiation is in fact
waves. of high energy, traveling with the speed of light.

After the enission of a $\beta$-particle, the atomic no. $Z$ is increased by $l$, the mass no. A is unchanged.


Different elements have different half-lives, some may be very long and some very short. Here are some examples:

## Element

Uranium 238
Carbon 14
Radium 226
Polonium 214

## Half-Life

4.5 billion years

5600 years
1620 years
$10^{-4}$ second

From the graph, we see that the number of survivors becomes smaller as time passes, but it may never: become zero. This is another way of saying that we cannot assign any 'definite' life time in which all of the original atoms for a sample will have decayed.

The decay law is a result of statistical analysis, and it is applicable to a sample containirg a large number of radioactive nuclei.

## III. Caxbon Deting

Archeologists, people who study ancient relics, always have interest to determine the age of bones or rocks dug from ancient tombs. If the age of a piece of ancient bone can be found, historians can obtain more information about the cultural development at that time.

The common method of dating makes use of Carbon-14, a radioactive isotope of Carbon-l2, which exists naturally in very minute amounts. The half-life. of Carbon-14 is about 5600 years.

All living organisms, plants or animals, takes in Carbon-14 along with carbon-12 from the surroundings. When the organism dies, there is no longer any intake of Carbon-14 isotopes, and those that remain break down slowly. By measurement of the amount of Carbon-14 present in a specimen, the length of time elapsed since the organism's death can be found.

The number of unstable atoms decreases as time passes.

Dating is important to historians and archeologists.
C-14, a radioactive
isotope of $\mathrm{C}-12$, havig
$\mathrm{T}_{\frac{1}{2}}$ of 5600 years, is
the element used for
dating.

Measurement of the amount of the remaining C-14 helps the dating of the specimen's age.

## ime

 Iin.)Introduction
Many people mowadays still have a belief that radiations can only do harm to living things. This could possibly be due to the vast destructive power from atomic bombs.

Though it is undeniable that radiations can be harmful to body tissues and cells, but it can also become helpful uncer careful control and usage. The most popular application is in the generation of electrical power.

There are other applications in radiotherapy-the treatment of cancer patients with radiation to kill cancerous cells, archeological dating as described in last lesson and to serve as tracers in medical and industrial researches.

8
I. Tracer in Peaceful Uses

I-1 Principle
A score of artificial radioactive isotopes (radioisotopes) are available today for use in industry and medicjne. An important aspect of their usefulness is that they can be traced; a detector of radiation will easily tell their presence anywhere, even in amounts too small to be visible or found by simple means.

## I-2 Medical Applications

Radioisotopes are of greatest value in the diagnosis of human disorders. They help in many cases where X-rays fall short. For example, radioactive sodium, in the form of a salt solution, is injected in the patient's arm. The isotope is picked up by the blood stream and transported to the heart. The position of the isotope can then be located by a detector. This offers a valuable means in the recognition of diseases of the heart or the circulatory system.

Teacher's Guide
Radiation is harmful
due to the vast
amount of energy
released.

Radiation is destructi ve, but it can be constructive if under suitable control.

Applications in power generation, radiotherapy, dating and tracers.

The detection of radioisotopes allow the application of the tracing technique in many fields.

Detection of radioisotopes injected into bodies help in diagnosis.

## I-3 Industrial Appications

Tracing small amounts of matter is helpful in all kinds of research in industry. In oil refineries, radioisotopes can be used to trace oil alone the pipelines. By adding a few tracer -atoms to the oil, batches of different grades of oil can be labelled like letters and followed. Hidden leaks are easily dicovered, they are betrayed by the presence of radioactivity outside the pipes.

## II. Atomic Energy in Peaceful Uses

In reactions concerning nuclides, energy may be absorbed or released. The energy absorbed or released in a nuclear reaction is a million or more than the amount of energy involqed in an ordinary chemical reaction. Hence this property has made the reactions important in industrial and military applications.

Fission-- the heavy metal uranium is a mixture of 2 isotopes of which $92^{\mathrm{U}^{235}}$, Uranium-235, is the most important. Sone atons of U-235 decay naturally, emitting high-speed neutrons.

When one of these neutrons hits the nucleus of a neighboring U-235 atom, it may break into two nearly equal radioactive nuclei, $\mathrm{Ba}^{144}$ and $\mathrm{Kr}^{90}$, ; together with two or more neutrons.
$92 \mathrm{U}^{235}+0^{\mathrm{n}^{1}} \rightarrow 36^{\mathrm{Ba}^{144}}+36^{\mathrm{Kr}^{90}}+20^{\mathrm{n}^{1}}$
The breaking up process results in the liberation of a great amount of energy in the form of heat. The neutrons emitted in the reaction may split other U-235 nuclei, and so a chain reaction is set up, resulting in a continuous liberation of energy.

The energy released is used to heat up circulating cold water into steam, which is used to generate electricity after possins some mechanical devices.

Detection of radioisotope in oil or water helps locate leakages.

Large amount of energy is involved in nuclear reactions.

## U-235 may decay by

 liberation of high speed neutronsWhen the n hits an $\mathrm{U}^{235}$ atom, the atom will be splitted with further liberation of $n$.

Energy is also released in the splitting process The splitting continues by a chain reaction.

The energy released is used to generate electric -ity.

教嵋語言興
中二，中三，中四晚，理，史三科篹腮效果之研究

第二階段：
中四级「要子结構和放射性」
的四課教贯設計

香䜤中文大挐教育典院
一九九九年四月十七日

課程及時間分配
原子＂结＂橝及放射現象

$$
\text { 第一章: } \frac{\text { 原子结偁 (40分) }}{\text { 工原子理餄 }}
$$

B．原子模型
血，原子核，質量皎，原子序數
第二章：$\frac{\text { 同位素及放射現象（25分）}}{\text { 工同位素加其他化学特性 }}$
＂五放射現像及其登現棌過
鲆鑑測驗：第一回（15分）
， 5 题多工頁選擇题（関於第一章及第二章之内容）

第三章：輻射及半衰期
工．$\alpha \cdot \beta$ 和 $\gamma$ 輻射
ㅍ．半衰期占裏変時間
皿 咙一14定年法
第四章：京踪剤及原子能之和平用途
工示踪剆的應用
卫．原子能之和平用逢
評塩測驗：第二回（20分）
20．题多项壁擇題（関於第三孪及第四章三内容）

時間
（分）

的実验结果，又文使福放素方。十三
 （Ruberford）提出了一储新的原子模型。
䄸为原る核模型」（见固＝）
根橡楆模型原子中间有一核心。而那些带负需的電子，散仰在核生外面，不久丹黄的科学家
原子核模型。

的尔把原子描述疗一個小型的态晹要。原子㧼的電子。就好像行星理的売太陽一楾，圈境着一颗带正龟的䏝子不新迥新。透颗现重，带を電的粒子M侁「原子核，（Nucleus） （完图三）

谙将共楊福模型掛图掛还。


请娃实尔模霊脚
国批起
青子琭境着原子中央的核心不停迥舽。


雨军代的看诗


第一深：原子结棈（40分）

時間
（分）I．原子理呫
教咘掌豇
$\qquad$


I．愿畐模型



亚－1原子核
敬師導引


（空团A代主質量数）
备式：$N=A-z$ 计管出来，

例：
碳原子一核中其有 6 颗筑子和 6 颗中子
例子

$$
z=6, \quad A=6+6=12
$$

鿕原子一核中共直11颗罗子和12颗中子
$z=11, A=11+12=23$ ．

苼一4隙子核的表示方法
5



氮（Chomex）亦有雨种同位素， $\mathrm{Cl}^{3}, \mathrm{Cl}^{17}$











枯交勒㘯（Becqumel）意生





以景響要交寝

I－3 放时现象的成因



的店子都具有度槑性。



句结说它是在粰定奖蟹。



時間（分）

其丰衰期 Ty 夋4日。
如果起初有 256 個氧的厚子，

剩下了 128 俱不程的厚子。
再昌四天，共有 $128 / 2=64$ 值原于变变了
剩下了 64 调不穏的原子。
地果理共强過十六天之得则只有 16 個不穆的氧原子留下来。

序子者南定
喑间闺洓

圈楾起

话性虔子数目


不同元裳的丰衰期有很大旺差为
有然很長有些施很短。例如：


8

$$
\begin{aligned}
& \text { 现代的考立学家常常利用科学的方法去桑 } \\
& \text { 定年椪店吉学家 }
\end{aligned}
$$

$$
\begin{aligned}
& \text { 到古墓泉一坞骨领的年代, 学辟史受家来説是非 }
\end{aligned}
$$

有闺当代＂致展


角


死了之设，它不能再吸入碳－14的原了。面那些

科学家量度葉椓本中数下来碳14的份量则
鿗以知通些榎本距今之年代。

教師導引

31
3 在今天，很多人䪏辐射感到害怕，認沩蝠射对身体是有害的；这与观念可能因原子弹或氧弹的破懐能力太浊有阅。
摃害，但在適㖹的控制和引兼下，慗射也有建設性的用途，如推动登电机美産生电力使为最著名的例ま

放射性现象之其他勇虑犬分之痖话，如放射性治療—利用朝射能积死癌细脆来医治有癌症的病人。其次是用在医等或又業硢究方面之「示跡原子法」，甚至如上毫研说的用在則定古代文物年代的定军法等。
8 I．示踪剤（Traerer）的用途
I－1 原理：
人造放射性间份素，在工業和医党方面有重大的周途。其要卓是在钦能鸹以探测


I－2 医学之应用
放射性同位素对診所人体疾病有重大份值，很多使x一克也叀乘的症状也被解决。如放射性钠（Sodicu），以液体形式被注射入病者的体内，循血液榆送至心営。該等全内无素之信置可由探测器楛小出来。这对訜断心臟或血腋㣪澴系统之表病提供有用的资䊀。

I－3 2 掌之應周
追鳆小量之物体对上菐上之矿究有很大幫助。如在提煉石油々業上，效射性元素能闭作曊示出在翰䌷管中石油流动的情说，正如带有記号一様。任何油管的隠蔽裂痕也可由油管多的放射性珼象而㑑察路主

探测被注射入病者体内的放射性同位素能暬助訜迷于疾病。

探側放在动或水中之放射性元素能倬察出運油情㫛或油管之裂痕。
（分）
开．原子：能 的来的来 周迤
9
在核子反应㝵程中，大量的能量会被吸收或效出。在該等及应所涉及之能量比普通化营败应所开需的多違面可信或以上。因此原故，核子只应在工業和晕事上的应用日益重要。

核子分裂
在重金嵓元素一金由的研有同位素之中，$y_{2} u^{235}$称为铀 235 的最为重要。告于全由235 子在本乎的自然衰变中放出高速中子

全由235裏变可放出高適中子。

中子撃中其他荃由235原る，使其引裂显放出硬多中子。

相数的鈿235 原子被这些高速中子摰中而崩裂
或更多中子来

$$
924^{235}+0^{n} \rightarrow{ }_{56} \mathrm{Ba}^{144}+{ }_{36} \mathrm{~K}_{r}^{90}+2{ }_{c}{ }^{1}
$$

铀235核子崩裂除齐生基健孩子和中子好，显以熟能方式效出大量能量。面中子也可使其他全由235核子了裂，量至一链銷反应 （Chain reaction），令能量能夠連绩地放出。

敢出汏量能量被用表黄沸在一环流的冷
机面离生电力。

$$
\begin{aligned}
& \therefore \\
& \begin{array}{c}
\because \\
\vdots
\end{array}
\end{aligned}
$$

$$
\begin{aligned}
& \begin{array}{cc}
\because & \vdots \vdots \\
\vdots & \ddots \\
\vdots & \vdots \\
\vdots & \vdots
\end{array}
\end{aligned}
$$

$$
\begin{aligned}
& \begin{array}{cc}
\vdots \vdots & \because \ddots \\
\ddots & \cdots \\
\vdots & \vdots
\end{array} \\
& \begin{array}{lll}
\because \vdots & \ddots & i \\
\because & \ddots & \ddots \\
\ddots & \ddots
\end{array}
\end{aligned}
$$

$$
\begin{aligned}
& \begin{array}{ll}
\vdots & \ddots \because \\
\vdots & \ddots \therefore \vdots \\
\ddots & \ddots \ddots
\end{array}
\end{aligned}
$$

$$
\begin{aligned}
& \begin{array}{cc}
B 6 & \therefore \ddots \\
\vdots & \vdots \vdots \vdots \\
10 & \ddots \ddots
\end{array} \\
& \therefore \quad \therefore \\
& \therefore \quad \because \because \because
\end{aligned}
$$

$$
\begin{aligned}
& \begin{array}{l}
\because \\
H \\
\because
\end{array} \\
& \begin{array}{l}
\because \ldots \quad \\
\because \because \\
\because \quad \\
\because
\end{array} \\
& \begin{array}{l:l}
\therefore & ! \\
\because & \vdots \\
\vdots & \vdots
\end{array}
\end{aligned}
$$



1. The basic idea of the Rutherford-Bohr Model is that
(1) the atom has some positively charged matter.
(2) the atom is formed by a cloud of electrons.
(3) the nucleus has electrons inside.
(4) the atom has a structure similar to that of the solar system.
(5) the electrons arc moving in changing orbits,
2. According to J.J. Thomson,
(1) atoms cannot be divided into smaller parts.
(2) an atom is a neutral sphere consisting of some positively charged matter with electrons embedded in it.
(3) inside an atom, there will be a nucleus with electrons all around.
(4) electrons are located inside the nucleus.
(5) alpha particles come out from the nucleus.
3. The number of protons in the nucleus of an atom is called
(1) the mase number
(2) the atomic number
(3) the isotope rumber
(4) the ionization number
(5) the nuclear weight
4. The smallest unit of the element that can exist by itself and
retain the same quality as the element is called a/an
(1) atom
(A) molecule
(3) elementary particle
(4) electron
(5) nucleus
5. Uranium was first discovered as a radioactive element by observing its action in
(1) affecting a covered photographic plate.
(2) producing counts on a detector.
(3) making tracks in a cloud chamber.
(4) exploding a bomb.
(5) speeding up a chemical reaction.
6.- 7 refer to Pigure 1, a representation of Bohr Atom.

6. $X$ and $Y$ are respectively
(1) proton and neutron.
(2) electron and proton.
(3)) nucleus and electron.
(4) electron and nucleus.
(5) neutron and electron.
7. $X$ is composed of
(1) protons only
(2) neutrons only
(3) protons and neutrons
(4) neutrons and electrons
(5) protons, neutrons and electrons
8. An electron from a hydrogen atom
(1) is identical to an electron from another hydrogen atom.
(2) has a greater mass than an electron from an oxygen atom.
(3) is larger than an electron from an helium atom,
(4) has a greater charge than an electron from an nitrogen atom.
(5) is lighter than an electron from an chlorine atom.
9. The weakness of the J.J. Thomson Model is that
(1) the total charge of electrons is incorrect.
(2) the size of the atoms is incorrect.
(3) the shape of the atom is incorrect.
(4) each electron is surrounded by ahout the same amount of the other matter.
(5) the number of electrons is equal to the number of the other:. narticles.
10. Using the common convention, the element $21^{45}$ has
(1) 21 protons and 66 electrons
(2) 21 neutrons and 45 protons
(3) 21 neutrons and 2.4 protons
(4) 21 protons and 45 neutrons
(5) 21 protons and 24 neutrons
11. The following table shows four nuclei $P, Q, R$ and $S$ with their mass numbers and atomic numbers:

|  | Nucleus |  | Mass Number |
| :--- | :---: | :---: | :---: |
| I. | P |  | Atomic Number |
| II. | Q | 20 | 9 |
| III. | R | 20 | 10. |
| IV. | S | 21 | 10 |

Which of the above is/are the isotope(s) of an element having a mass number 20 and an atomic number 10?
(1) I, III and IV only
(2) I and III only
(3) II and IV only
(4) I and IV only
(5) III and IV only
12. A beam passes between two parallel plates is deflected as shown. From the picture, we can tell that the beam is composed of
(1)) electrons
(2) protoris
(3) neutrons
(4) gamma particles
(5) alpha particles

13. When a very fast moving proton $P$ approaches a stationary nucleus $S$, the path of $F$ is likely to be
(1) I
(2) II
(3) III
(4) IV
(5) V

T.N:The symbol $2^{\text {He }}$ tay be used for an $\alpha$ oparticle because
(1) it has 2 electrons and 4 nucleons
(2) it has 2 protons and 4 neutrons
(3) it has 2 asutront and 4 protons
(4) it hass 2 protons and 2 neutrons
(5) it has 2 edectrong and 2 protons
2. Biologists are trying to find out more about the metabolsism of plants and animals through the use of
(1) highoenergy particle accelerators
(2) radio isotopic tracers
(3) high power microscope
(4) Xorays
(5) $\alpha$-docay
3. Of the three common types of radiations, namely alpha obeta and amma - Frob radioactive soinces, electriccharge is carried by
(1) $\beta$ and $\gamma$ oniy
(2) and Yonly
(3) $\alpha$ and $\beta$ oniy
(5) oc only
4. The main reason why aneutran ill penetrate a nucleus more readily than a proton ia that the neutron is
(1) slightly more massiye
(2) moving tester.
(3) moving slower
(4) uncharged
(5) unaffected by muclear forces
5. All EXCEPT ONE of the following statements are true. Which one is the exception?
(1) Radioactivity is a natural characteristic of some elements

號
(2) Radioactivitzetsotopes can by proder artifically in the laboratory
(3) Radioactiva isotopes decay by the emission of particles from the puclei
(4) All isotopac axe radioactive
(5) There is a uide varioy of decay rates for radioactive elementa.
6. When the nucleus $97^{231}$ becomes $89 \mathrm{Ac}^{227}$. it has undergone
(1) an $x$ mecey
(3) a $\quad$ (2)-decay
(4) a collision with neutrons
(5) a capture of 1 zeutron and then a release of 1 proton.
7. A radiontite eton emtea ang $\beta$-parttcle. What happens to the mase
number of the esta ?

3:3:
(1) It increases oy 1
(2) It remains unchanged
(3) It decreases by 1
(4) It decreases by 2
(5) It decreases by 4
8. The halfolife of a certain radoactive isotope is 3 seconds. Starting with Nactive atons.
Io thexe will be $N / 8$ active atoms remained after 9 seconds: II。 there will be $N / 16$ active atons remained after 18 seconds $X$ III. threequarters of the active atoms will hate-decayed after 6 seconds $K$ IV. there will be $N / 32$ getive atoms remaining after 21 seconds.

Which of the above statements is/are correct ?
(1) $I$ I 0 I $y$
(2) II only
(3) III only
(4) I, II and XV only
(5) In II, III and IV
9. An unstable element $X$ decays into a stable element $Y$ with a halfalife of 3 days. On 1 st March, a piece of $x$ has a mass of 10 g . What will be the masses-6I $X$ and 46 days later?

|  | Mess of K | Mass of $Y$ |
| :---: | ---: | ---: |
| (1) | 5 g | 5 g |
| (3) | 10 g | 0 g |
| (3) | 0 g | 10 g |
| (5) | 2.58 | 7.5 g |
|  | 7.5 g | 2.5 g |

10. When a chain reaction takes place in $U^{235}$, each nucleus breaks into two parts during fission and also releases
(1) one neutron and one proton
(2) one proton
(3) one neutron
(4)) more than 1 neutron
(5) more than 1 proton
11. The age of an oldotree is found by burning the tree ashes and counting the number of radioactive $C^{14}$ nuclei is detected to be 8 millions:
From the decay eraph of co 14 given on the left. the age of the old tree being tested is found to be
(1) 5.900 years
(2) 11,200 years
(3) $16 ; 800$ yeara
(4) 22,400 years
(5) 2,800 years

12. Some radioactive isotopes have to be injected into a patients vein to investigate his blood circulation. In the list of radio-isotopes given, choose the one youmhink is the most suitable
(1) $X$ of halfmilie 10 seconds
(2) $Y$ of half-life 1 hour
(3) $Z$ of hali-life 10 days
(4) $P$ of halfelife $\{$ year
(5) Q of half-1tif to years
13. An atom with mess number $A$ and atomic number $Z$ decays ingthree stages by the emission of an $\alpha$ particle, $\beta$-particle and a second $\beta$-particle. It then becomes an isotope of the same element with mass number
(1) unchanged
(2) equals A $\quad$ - 1
(3) equals $\quad 1-2$
(4) equals $A-3$
(5) equals $A=4$
14. Which of the following might be the products of the fission of a nucleus of $92^{0^{235}}$ after the nucleus has absorbed a neutron?
(1) $-1^{e^{0}}+2^{H e^{4}}+91^{232}$
(2) $82^{\mathrm{Pb}^{209}}+52^{\mathrm{He}^{4}}+70^{\mathrm{n}^{1}}$
(where $-1^{e^{0}}$ represents an electron
(3) $-1^{e^{0}}+93^{\mathrm{Np}}{ }^{236}$
and $0^{n^{1}}$ represents a neutron
(4) $2^{\mathrm{He}}+90^{4} \mathrm{Th}^{232}$
(5) $38^{S r^{90}}+45^{x e^{140}+6} 0^{n^{1}}$

Imagine that a new isotope of lithium (Li) with atomic number 3 and mass number 5 has been discovered among the radiations emitted from radioactive plutonium ( Pu ) . Which one of the following nuclear equations correctly describe its emission from

$$
94^{\mathrm{Pu}}{ }^{239} \text { nucleus? }
$$

(1) $94 \mathrm{Pu}^{239} \rightarrow \mathrm{~g}^{5}{ }_{91} \mathrm{~Pa}^{234} / 20 \mathrm{P}$

23 mont
as:
(2) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 3^{\mathrm{Li}^{5}}+97^{\mathrm{Bk}}{ }^{244} \times$
(3) $94^{p_{u} 239} \rightarrow 3^{44^{5}}+9 i^{p a^{244}} x^{24}$
(4) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 5^{\mathrm{Li}}{ }^{3}+89^{\mathrm{Ac}}{ }^{236 x}$
(5) $94^{\mathrm{Pu}}{ }^{239} \rightarrow 5^{43^{3}}+{ }_{91^{\mathrm{Pa}}} \mathrm{Pa}^{234}$

## Questions 16-17

A radium source that emits $\alpha, \beta$ and $\gamma$ radiations simultaneously is put in an evacuated box. The radiation coming from the samll lead cavity then forms a narrow bean which passes between two charged metal platesusenowninthe diagram. When the photographic plate as developed. 3 spots labelled P, Q and $R$ are obtained:

16. Which are the radiations responsible for each of the spots? Spot R, Spot Q Spot R $Q$

| $2)$ | $\alpha$ | $\gamma$ | $\beta$ |
| :--- | :--- | :--- | :--- |
| $3)$ | $\beta$ | $\gamma$ | $\alpha$ |
| $4)$ | $\gamma$ | $\alpha$ | $\beta$ |
| $5)$ | $\beta$ | $\alpha$ | $\alpha$ |

17. If more positive charge sa put on the positive plate and more negative charge on the negative plate, what will happen to the spote?

- Spot s
(1) shifts more so the right
(2) shifis alightly to the right
(3)
shifts moxe to the left
(4) shifts slightiy to the right
(5) shites more to the left
spot 9
shides to the left shifte more to the pight
remaine unchanged
remaing unchanged
ghifts to the right
shifts to the raght

Spot $R$ shifte slightly to the lert
ehifts nore to the right
shifts more to the right
shipts slightly to the left

Questions 18-19
An analogy has been drawn between the decay rate, in o radioactive dooay and
the flow of water through the system. In a radioactive sample, the decay rate
number of unstable atomisg down of unstable atoms) is proportional to the
proporkional to the height of the water level the rate of water flow is also


The diagrams above shows tanks of different crossmsectional areas and are
all drained by identical capillary tubes.
18. The half-life period of the water in tank f would be

I half of the time spent by a vater molecuie inside Q's capillary tube
IX. The time taken for the water level to fall to hale of itis original value
III. half of the time required to drain all the water in the tank
(1) Only I is correct
(2) Only II as extrect
(3) Only III is correct
(4) Only I and III are.correct
(5) Only II and III are correct
19.

In this analogy, the height of the water level corresponds to the
number of unstable atoms, Hida the rate of water flow corresponds
to the Fate of decay. This analogy is not a good analogy because
O, the halfolifeof the tanks are different even if the initial heights
of the water levels are the same.
/ the initial water level but also on ony depend on the height of
IIX. the capillary tube where but also on the erossmsectional area the halfalife is too long.
Which of the above reasons is/are correct?
(1) I only
(2) II only
(3) II and III only
(4) I and II onaly
(5) III only

谢駗—：第一，第二課（15分镜）第八真
1．虚德福—波爾（Rutherford－Bohr）原子模型最特别的地方是：
（1）原子中有一些带正電的物質
（2）原子是由一園要子組成
才（3）原子的構造類似我僻的太陽系
（4）原子核內蔵有全部䉓子
（5）電子是依照不固定的軌道行走

（1）原子是不可分割的凅䯚
（2）原子是一個中和的球縳，由一些带正雷的物質组成，而電子刨埋藏在其中。
（3）原子内有一濑被電子急園的原子核
（4）電子是埋藏在原子核め
（5）人一数子是従原子核中射出来的
3．原子核凶質子的敷目被稀薦
（1）質量数
（2）原子序數
（3）同位素數目
（4）游雜數
（5）核子重量
4．最细小而仍能保留其元素之特式的精子稱美
（1）原子 tramentation iputanate
（2）分子
（3）基本精子
（4）電子
（5）核子
5．科学家登现铀具有放射性。最初他們發现铀能多
（1）使一塊色裏着不曝光的威光中威光
（2）使輻射計算器出现䧻數
（3）在雲霖室中産生䈷迹
（4）㨜生核爆
（5）加速化浮作用

6－7参照圖—，其代表一個波雨縸型的原子


匐－

6．囟中所示，X和Y分别代表
（1）質子和中子
（2）電子和質子
（3）原子核和電子
（4）電子和原子核
（5）中子和電子
7．圖中之x是由何種粒子組成？
（1）祋有質子
（2）祋有中子
（3）資子和中子
（4）中子和電子
（5）質子，中子和電子
8．氮原子中的電子
（1）興另一氞原子中的電子辛質上是相同的
（2）其質量應大於氧原子中的雷子
（3）其體積應大於氮原子中的雷子
（4）所带的電荷應圴氮原子中的電子所带者盖多
（5）其重量應較氯原子中的電子落喓
9．湯姆样原子模型之䂈照是
（i）全部電子的德電荷是不正碓的
（2）原子的大小是不正確的
（3）原，子的形状是不正確的
（4）每一精電子是由约数量相同的其他物質環绕着
（5）電子的數目是等秥其他糕子的数目。

（1） 21 粒筫子和 66 精電子
（2） 21 粒中子和 45 穜筫子
（3）则精中子和 24 精䈟子
（4）2！䊏第子和 45 精中子
（5）21精質子和24 数中子
11．下列尊四個不同的原子核 P，Q，R和S及其質量数和原子序數。


现有一元素x，其質量数总20及原子序數为 10 傤找出以上那些原子䠹之元素是×的同位素？
（1）旅有 I，血和正
（2）祇有 工和 II
（3）旊有 II 和亚
（4）低有 工和亚
（5）视有 攻和正
12 —束精子射缘通遇两塊带電的板時，苦折向如圈示，這来拉子㦄是
（1）雷子
（2）質子
（3）中子

（4）$\gamma$ —䊉子
（5）$\alpha$ 一粒子
13．凅一精高速枒動的筫子P接近一腘体留不動的原

（1）I
（2）II
（3）III
（4）IV
（5）Z


測驗二＝第三，第四課（20分镜）
1．以 $5{ }_{2} \mathrm{H}_{e}^{4}$ 來代表 $\alpha$ 一精子的原两是因为
（1）它有两粒電子和四粮核精子
（2）它带两稳質子和四䊉中子

（4）它有两粒筧子和两精中子
（5）它有两粒電子和两粒算子
家便應用
（1）高能精子加速器
（2）電波放射性同位素示路桠
（3）高 信显微鏡
（4）$X$ 一射线
（5）$\times$－裹変

3．従放射性物質登出的輻射有 $\alpha, \beta$ 和 $\gamma$ 三转。電荷是由

（1）祇有 $\beta$ 和 $\gamma$ 两捼
（2）祇有 $\propto$ 和 $\gamma$ 两捒
（3）就有 $\propto$ 和合两雅
（4）紙有 $\beta$ —转
（5）祇有 $\alpha$ —種
4．中子較算子更易穿入原子核内的原因是因为中子
（1）校重一些
（2）移動較快
（3）移動較慢
（4）没有带霍荷
（5）不受核子引力影响
5．下列各項中那一㙏不正確
（1）放射性是某些充素的特質
（2）放射性同位素可在㝜験紫古工人工製造
（3）當放射性同位素䖁变時，精子由潼子核內射出
（4）世上所有的同位素都具奇放射性
（5）放射性元素有各種多異很大的放射率

（1）$\alpha$－裏変
（2）$\beta$－裏变
（3）$\gamma$－裹变
（4）占中子碰撞
（5）先吸敕—核中子後再教出—粒質子
7．放射性原子放出一糕 $\beta$ —粒子後，其質量數
（1）畭前增多 1
（之）保持不变
（3）皎前减少1
（4）較前琙少 2
（5）較前减少4
8．某放准性元素的半衰期是三科。管逗個元素最初有 $N$ 鳰活性原子，則

工． 9 和後稌下 $\mathrm{N} / 8 \mathrm{Cl}$ 活恎原子
II． 18 移後㻌下 N／16湢活性原子
II 6 移该四分三的活性原子置意衰变了
II． 21 秘後稌下 N／32腘活性原子
上述那锤或所线揰情形是正礁的？
（1）祆育 工
（2）祇育 II
（3）䇇青血
（4）祸带工，II和正
（5）I，II，而和正
之早衰期为三日。在三月—日，一塊元素 $\times$ 的質量要 10 克。结䢡六天復，X和Y的留量分则美
（3）
（4）

| $\frac{\text { 元素 } X}{}$ |  |
| :---: | :---: |
| 5 克 素 $Y$ |  |
| 10 克 |  |
| 0 克 |  |
| 2.5 克 |  |
| 7.5 克 |  |
|  | 7.5 克 |
|  | 2.5 克 |

10．當鈾 $U^{235}$ 發生…鎮反應時，其原子核分裂鸢两部仿，並放出
（1）一精中子和一精質子
（2）一梚質子
（3）一吿中子
（4）多放一糕中子
（5）多族一䅝質子
 14 （ $C^{14}$ ）的愿子核擞目亘出。今登现這堁澍共有八
這棵摌的年龄盖
（1）5，600 年
（2） 11,200 年
（3） 16,800 年
（4）22，400 箖
（5）2，800年


時閶（年笚位）

合選用？
（1）单裏期业十可之之×无素
（2）半衰期券一小時之Y元素
（3）半裏期踏十日之之元素

（5）半衰期美十冬 2 元素

13．一個管量數盖A和原子序數盖工的原子经過了三次衰变：第一次射出一轻 $\alpha$ —粒子，第二次射出一精 $\beta$－粒子，第三次再射出一䅝 $\beta$ —精子。衰变後，害生了一伺相同充素的同信素，其質量影总
（1）不变
（2）等於 $A-1$
（3）等於 $A-2$
（4）簺方族 $A-3$
（5）等族 $A-4$
14．一图鈾 $\mathrm{O}_{2} \mathrm{U}^{235}$ 的原子核吸收了一粠中子後，登生核子分裂。下列那一项是分裂後可能坆生的结果？
（1）$e_{-1}^{0} e_{2} H_{e}^{4}+{ }_{91} P_{a}^{232}$
（2）${ }_{82} \mathrm{~Pb}^{204}+5, \mathrm{He}^{4}+70^{\prime}$
（3）${ }_{-1} e^{0}+{ }_{93} N_{p}{ }^{236}$
（4）${ }_{2} \mathrm{He}^{4}+{ }_{40} \mathrm{Th}^{232}$
（5）

$$
\begin{aligned}
& { }_{38} S_{r}^{90}+{ }_{45} X_{e}^{140}+6{ }_{0} n^{\prime} \\
& \text { 言主: }{ }_{-1} e^{0} \text { 尝電子, on'为中子 }
\end{aligned}
$$

15．假設従放射性元素鈽（plutorucm）射出的輻射线中蔗
 lithium）的一䅘新同位素。下列即一填核子反應式能正难地表示後 $94 P_{M}^{239}$ 原子核度出的放射现象？
（1）${ }_{94} P_{4}^{339} \longrightarrow{ }_{3} L_{i}^{5}+{ }_{91} P_{a}^{234}$
（2）${ }_{94} P_{4}^{239} \longrightarrow L_{3}{ }^{5}+{ }_{97} B k^{244}$
（3）${ }_{94} \mathrm{Pu}^{239} \longrightarrow \mathrm{Li}^{5}+{ }_{91} \mathrm{~Pa}^{244}$
（4）${ }_{94} \mathrm{Pu}^{239} \longrightarrow{ }_{3} \mathrm{Li}^{5}+{ }_{89} A c^{236}$
（5）${ }_{94} P_{\mu}^{234} \longrightarrow 5^{L_{i}^{3}}+{ }_{91} P_{a}^{234}$

射线徒一细小的制孔放系，形成一狭長射来，真通遇




16．首三慮班照分别由何種輻射线産生？

$$
\begin{array}{ccc}
\frac{P}{\alpha} & \frac{Q}{\beta} & \frac{R}{\gamma} \\
\alpha & \gamma & \beta \\
\beta & \gamma & \alpha \\
\alpha & \alpha & \beta \\
\beta & \alpha & \gamma
\end{array}
$$

17．着我们增强两塊全屈化上的電荷，便带正電的一野
熙鿖有何变化？


射性倳本之裏变率是肖其存在之不穏定原子之数目成正比。同様理由，水流速度京间高放水流出口零的水位高度成正比。




以上各图乃关三個不同撗切面之水箱，各有一同等的细水管接在其 －出水豦。

18．水箱 $Q$ 戍的半衰期荨
工冰分子在接上水箱Q的细水管内逗雷時间之一半 I水箱肉水位降至原来水位高摩的一半所需之時间亚水箱冈金部渎水流出去所需酧蔺之一半對放上述之解释。
（1）旅有工是䊦的。
（2）祇有 II是對的。
（3）祈有亚是教的。
（4）林有工和亚是對的。
（5）就有 II和亚是對的。


工，蜼然各水位的原来高度都是一様，各水箱的半裹斯皆不一様
II，水箱的伴豪期不単旅由原来的水位高度去決定亦要由水箱的横切面大小去決定。
皿由於躳水流出箱外的细水管太细因而水管的半衰期便太長了。
對族上术的三樋解释，下列那一㙏是正碓的？
（1）祀有工
（2）讴有 I
（3）低有正和再
（4）斌有 工和正
（5）祋有无



## LISTENING COMPREHENSION

Time- 40 minutes

In this section of the test, you will have an opportunity to demonstrate your ability to understand spoken English. There are three parts to this section, , with special directions for each part.

## PART A

DIRECIIONS: There are two kinds of problems in Part A. One kind is answering a short question; the other is understanding a short statement.. These questions and statements will be spoken just one time. They will not be written out for you, so you will have to listen carefully in order to understand what the speaker says.
When you hear a question, read the four possible answers in your test book and decide which one would be the best answer to the question you have heard. Then, on your answer sheet, find the number of the problem and fill in (blacken) the'. space that corresponds to the letter of the answer you have chosen.

Look at Example I.
You will hear: when did Tom come here?
You will read: (A) By taxi.
(B) Yes, he did.
(C) To study history.
(D) Last night:

The best answer to the question, "When did Tom come here?" is (D), "Last night." Therefore, you should choose answer ( $D$ ).
Then you hear a statement, read the four sentences in your test book and decide which one best gives the meaning of the statement you have heard. Then, on your answer sheet, find the number of the problem and mark your answer.

Look at Example II.
You will hear: James relaxed with a sigh of relief when he heard the news.

Sample Answer
(A) (B) (C) (D)

You will read: (A) The news was very disappointing.
(B) The news made James very sad.
(C) The news was better than expected.
(D) The news made James extremely nervous.

Sentence (C), "The news was better than expected," is closest in meaning to the sentence "James relaxed with a sigh of relief when he heard the news." Therefore you should choose answer ( $C$ ).

## PART A

1. (A) He's studying.
(B) He spends more time teaching.
(C) He studies longer than $I$ do.
(D) I study more time than he docs.
2. (A) Henry's a baker.
(B) Henry's a drummer.
(C) Henry's at the door.
(D) Henry's a batter.
3. (A) She is a banker.
(B) She is a merchant.
(C) . She is a teacher.
(D) She is a chemist.
4. (A) The magazines are in the basket.
(B) The magazines are on the floor.
(C) The magazines are on the table.
(D) This is about furniture.
5. (A) I like monkeys but not lions.
(B) I like cats but not lions.
(C) I like lions but not cats.
(D) I like lions but not monkeys.
6. (A) It's only eleven o'clock.
(B) It's time for Iunch.
(C) Our Iunch time is ten o'clock.
(D) I'm hungry but it's too early for lunch.
7. (A) The blue car is not worth buying.
(B) The green car is expensive.
(C) Both cars are cxpensive.
(D). The green gar is cheaper than the blue car.
8. (A) She arrived at 11:00
(B) She arrived at 11:30.
(C) She arrived at 12:00.
(D) She arrived at 12:30.
9. (A) The two girls are standing there.
(B) They're not relatives.
(C) The two girls are relatives.
(D) They are sjsters.
10. (A) Dorothy was late for the train.
(B) Dorothy was trying to catch the train.
(C) The train had left before Dorothy came.
(D) Dorothy made them late for the train.
11. (A) Bob aiways makes girls nervous.
(B) The girls before Bob are always nervous.
(C) Giris alvays make Bob nervous.
(D) Both the girl and Bob are nervous.
12. (A) Weire on diet.
(B) We eat more than we usually do.
(C) We don't eat very much, for we take vitamin pills.
(D) It is important to care for the balance of our diet.
13. (A). Ten days ago, the people were trying to leave the town.
(B) The flood made fifty families homeless.
(C) I was by tine river ten days ago.
(D) The river was sicuated near the town.
14. (A) They went on honeymoon right away.
(B) They did go cn honeymoon immediately after their wedding.
(C) They spent a week having honeymoon.
(D). They went on their honeymoon a week after their wedding.
15. (A) Jean was too busy to go shopping.
(B) Jean's sister has no time to buy dresses.
(C) Jean and her sister have a lot of time to spend.
(D) Jean wasn't a good buyer of dresses like her sister.
16. (A) The monerymade flin of Laura.
(B) Laura's monkey coulcin't dance.
(C) Her monkey made furmy faces.
(D) The monkey danced and laughed.
17. (A) She decices to siop smoking, because cigarettes are harmful.
(B) She's arraid of gaining weight if she quits, smoking.
(C) She doesn't like to gain weight.
(D) She's not awawe of the consequences of smoking.
18. (A) Mr. Scots aidait come.
(B) Mr. Scott attended the meeting.
(C) Mr. Scott almost attended all mectings.
(D) Mr. Scutt was late for the meeting.
19. (A) Nobody was missing.
(B) Several people wore missing.
(C) One persor couldn't be found.
(D) Several peopie couldn't be found.
20. (A) He left after he got all the answers.
(B) He left as soon as he asked him all the questions.
(C) Nobody answers Eddie's questions.
(D) He left after he answered all the questions.

## PART B

DIRECTIONS: In Part B you will hear fifteen short conversations between two speakers. At the end of each conversation, a third voice will ask a question about what was said. The question will be spoken just one time. After you hear a conversation and the question about it, read the four possible answers and decide which one would be the best answer to the question you have heard. Then, on your answer sheet, find the number of the problem and mark your answer.

Look at Example III.

| You will haar: <br> (man) | Hello, Mary. This is Mr. Smith at the office. Is Bill feeling any better today? |
| :---: | :---: |
| (woman) | Oh, yes, Mr. Smith. He's feeling much better now. But the doctor says he! ll have to stay in bed until Monday. |
| (third voice) | Where is Bill now? |
| You will read: | (A) At the office. <br> Sample Answer <br> (B) On his way to work. <br> (C) Home in bed. <br> (A) (B) (C) (D) <br> (D) Away on vacation. |

From the conversation, we know that Bill is sick and will have to remain in bed until Monday. The best answer, then, is (C), 'Home in bed." Therefore, you should choose answer (C).

## PART B

21. (A) At the department store
(B) At the church
(C) In the garden
(D) At the grocery
22. (A) He doesn't have any money to buy the lamp
(B). He has a lot of money to buy the lamp
(C) If he lends her money, she will buy the lamp
(D) If she lends him money, he can buy the lamp.
23. ( $A_{1}$ ) Repairman
(B) Taxi driver
(C) Salesman
(D) Car dealer.
24. (A) 10 h.M.
(B) $12 \mathrm{H} . \mathrm{M}$.
(C) $2 P \cdot \mathrm{M}$
(D) 4 P.M.
25. (A) He's going to find an apartment
(B) He's helping his brother look for an apartment
(C) He already found an apartment
(D) He's looking for an apartment with a girl.
26. (A) The big parties are more impersonal then small ones.
(B) She like big parties better
(C) She likes small parties
(D) The party is nonsense.
27. (A) He is satisfied with driving from his home to work
(B) The distance is about 20 miles
(C) The road is good but there's a lot of traffic
(D) He lives very far from his work.
28. (A) The temperature dropped below freezing
(B) It was mildly cold in the early winter last year
(C) It was very cold
(D) It was very cold during $X$ 'mas time.
29. (A) 504
(B) $\$ 2.00$
(C),$\$ 2.50$
(D) $\$ 3.00$
30. (A) $\$ 19,500$
(B) $\$ 20,000$
(C) $\$ 25 ; 000$
(D) $\$ 40,000$
31. (A) The story was good
(B) The movie was good
(C) Reading novels is more entertaining
(D) The photography was good.
32. (A) Children heve already left for their grandmother's home -
(B) Children will leave for their grandmother's home
(C) Children will loave for their grandmother's after school
(D) Children will play with their grandmother in the school.
33. (A) She's careless
(B) She likes George very much
(C) She's not concerned with George's health
(D) She doesn't care what George said.
34. (A) He hears well
(B) He hears poorly
(C) He's deaf
(D) He's dead.
35. (A) There's another cat
(B) He never loosens the dog
(C) She has mistaken it for his dog
(D) The dog likes to walk on the leash.

## PART C

36. (A) Declined
(B) Depleted
(C) Limited
(D) Unlimited.
37. (A) Because it is important for food resources
(B) Because the great fisheries are to be exhausted
(C) Because the noted biologist insisted on it
(D) Because fishes are fewer than Indian Tigers.
38. (A) Europe and hisia
(B) The whole world
(C) insia and America
(D) imerica.
39. (A). The land and the air
'B) Important species for conservation:
C) Indian Tigers and the American Eagle
(D) The African Elephant.
40. (A) The Indian Tiger and the American Eagle are important
(B) None of the great sea fisheries are to be oxhausted
(C) Fish supply has no effects on people
(D) Sea resources are important to people.
41. (A) The resources of the sea were unlimited
(B) The threats to Animals and Birds
(C) Sea rasources will continue as important food supplies
(D) We must love fishes.
42. (A) Paris
(B) Copenhagen
(C) New York
(D) London.
43. (A) 1
(B) 2
(C) 3
(D) Never.
44. (A) London and Paris
(B) U.S.A.
(C) Paris
(D) Paris and Copenhagen.
45. (A) The Natural Gas Company
(B) Fuel Shortage
(C) The Gas Industries
(D) A warm winter.
46. (A) It was very cold
(B) It had snows
(C) It was a little cold
(D) It was unusually warm.
47. (A) Curiosity about canned sea food
(B) Sincerity and Persuasion
(C) Anger about canned sea food
(D) Ordering canned sea food.
48. (A) Toxic and poison
(B) A clear crystalline substance
(C) Chips of glass
(D) Sea food.
49. (A) Boil them in water
(B) Boil them in warn vinegar
(C) Throw them away
(D) Eat them:
50. (A) Complain to the Federal Food and Drug Administration
(B) nsk for refunding of your money from the canner
(C) Place them in vinegar for a few minutes
(D) Let the particles dissolve.

END OF THE LISTENING COMPREHENSION

1. "Elizabeth borrowed the book, a month ago."
"Then she should $\qquad$ it by now."
(A) to finish
(B) have finished
(C) finish
(D) had finished
2. "Are those men in the blue uniforms policemen?"
"Oh, no; they're $\qquad$ ."
(A) bus drivers
(B) buses drivers
(C) bus driver
(D) buses driver
3. "I'm very tired."
"We really should stop: $\qquad$ and go to bed."
(A) to study
(B) from studying
(C) of studying
(D) studying
4. "I like Mary's parents very much." " $\qquad$ _."
(A) So I do
(B) I so do
(C) So do I
(D) I do so
5. ""That's a beautiful table cloth." "Yes, but it's not $\qquad$ for this table."
(A) nearly enough long
(B) nearly so long
(C) nearly long enough
(D) so nearly long
6. "How did you get your car out of the ditch?"
" $\qquad$ it."
(A) Push
(B) Having pushed
(C) From pushing
(D) By pushing
7. "I got twenty-five problems wrong on that maths test last week." "Well, take your time on this one and you'll probably make $\qquad$ mistakes."
(A) not much
(B) fewer
(C) lesser
(D) very little
8. "How many from your team entered the contest?"
" $\qquad$ but one."
(A) All
(B) Any
(C) Some
(D) Many
9. "I can't see the blackboard very well."
"Perhaps you need $\qquad$ :"
(A) to examine your eyes
(B) to have your eyes examined
(C) to have examined your eyes
(D) to be examined your eyes
10. "I like your new typewriter very much."
"I bought it because it vas $\qquad$ yours."
(A) like.
(B) similar of
(C) like as
(D). as
11. "Will the committee meet during vacation?" "No, I suggested that a'meeting $\qquad$ at some other time."
(A) holds
(B) is holding
(C) be held
(D) hold
12. "How did Carl get the nickname of "Quacker'?"
"Because he $\qquad$ ducks when he was a child."
(A) had been imitating
(B) has imitated
(C) was imitating
(D) used to imitate
13. "Wasn't Joan supposed to be here by now?" "Don't worry". She'll behere $\qquad$ twenty minutes."
(A) by at least
(B) around
(C) at nearly
(D) in about
14. "I wonder how old Mrs. Cliark is."
"She won't tell her age, and $\qquad$ ."
(A) so won't her sister
(B) her sister won't, too
(C) neither will her sister
(D) either won't her sister
15. "Mr. Smith said we could ride to Miami with him."
"Are you going to take advantage $\qquad$ his offer?!'
(A) of
(B) with
(C) by
(D) to
16. "Won't you have more meat?"
'No, thanks. I've had $\qquad$ enough already."
(A) beyond
(B) more than
(C) greater than
(D) plenty
17. "Where would your grandfather live if he retired?"
"He'd have a little place beside the water if he $\qquad$ it."
(A) could have afforded
(B) would afford
(C)' could afford
(D) would have afforded
18. "Will the child recover?"!
"Right now, there's, no way $\qquad$ ."
(A) for knowing
(B) to have known
(C) of knowing
(D) to be known
19. "Do you want to see my driver's license or my passport?" " Ch , $\qquad$ ."
(A) either does well
(B) either one will do
(C) each one is good
(D) each will be fine
20. "Have you gone to see the doctor?"
"No, but $\qquad$ ."
(A) I go
(B) I'm going to see
(C) I go to see
(D) I'm going too
21. "Is Dave about ready?"
"Yes, he's $\qquad$ ."
(A) finished dressing nearly
(B) finishing nearly dressing
(C) nearly finished dressing
(D) nearly finishing dressing
22. "I like toast very much." "That's good, because $\qquad$ is dry."
(A) the most of the bread
(B) almost whole of the bread
(C) the nearly all bread
(D) almost all the bread
23. "I can't imagine how they could put on that play in high school."
"They chose the best scenes, $\qquad$ out everything that was unsuitable."
(A) and were left
(B) left
(C) and leave
(D) leaving
24. "Mr. Wilson is expected back at noon."
"Would you have him $\qquad$ then, please?"
(A) calling me
(B) call me
(C) to calling me
(D) called me
25. "Jack plays the piano beautifully."
ryes, he's $\qquad$ here."
(A) the most talented of any students
(B) the more talented student than any other
(C) more talented than any other student
(D) most talented of students
26. "Are you sure there's nothing wrong with this radio?" "ivell, all of the parts seem to be $\qquad$ :"
(A) in working order
(B) in order of working
(C) in work order
(D) in order of work
27. "The Calhouns have just moved into a larger apartment." "Did they have to buy $\qquad$ for it?"
(A) many new furniture
(B) much new furniture
(C) many new furnitures
(D) much new furnitures
28. "What did you say about the lawnmower?"
"I objected to $\qquad$ ."
(A) its price so high
(B) it has such a high price
(C) its high price
(D) it is high priced
29. "Were you ever able to give the Johnsons the message?"
"Yes, I finally succeeded $\qquad$ by: phone."
(A) to reaching them
(B) of reaching them
(C) to reach them
(D) in reaching them
30. "What excuse did John offter for his rudeness at the committee meeting?" 'He didn't even mention it $\qquad$ explain it."
(A) let alone
(B) and even not
(C) or not
(D) as opposed to
31. "The Ryans watch television all the time."
" $\qquad$ do the Tuckers."
(A) So
(B) Either
(C) Neither
(D) Also
32. "I can't understand what Peirre says."
"I know. That's because he speaks $\qquad$ English."
(A) a little
(B) such small
(C) so little
(D) very small ${ }^{\vee}$
33. "I'm sorry. Were you speaking to me?"
'res, I was. 'Would you please $\qquad$ in this room?"
(A) not to smoke
(B) not smoke
(C) no smoking
(D) no smoke
34. "Did you call Mr. Jackson?"
"No, because he said he would rather not $\qquad$ disturbed this morning."
(A) to be
(B) being
(C) be
(D) been
35. "Do you know Edward Vilson?"
"The name sounds familiar, but I don't remember $\qquad$ him."..
(A) that I meet
(B) meeting
(C) to meet
(D) of meeting
36. "Did your club dance turn out well?"
"Yes. We made a $\qquad$ profit."
(A) five-hundred-dollar
(B) five-hundred-dollars
(C) five-hundreds-dollar
(D) five-hundreds-dollars
37. "What's the matter with that picture on the wall?"
"It needs $\qquad$ " 1
(A) straightening
(B) to be straightening
(C) straightened
(D) straighten
38. "The market won't be open tonight."

IIf I $\qquad$ , I wouldn't have bothered to drive over here."
(A) know
(B) known
(C) would know
(D) had known
39. "Do you have a dictionary?"
'No, but I wish I $\qquad$ ."
(A) have
(B) did
(C) do
(D) have had
40. "Michael left for California this morning."
"Oh, I thought he $\qquad$ until next week."
(A) won't be going
(B) isn't going
(C) wasn't going
(D) hadn't been going

END OF PAPBR

1. He was the only $\qquad$ of the plane crash.
(A) possesser
(B) relic
(C) survivor
(D) finale
2. To repair or improve the appearance of somethingis to fix it $\qquad$ -
(A) out
(B) off
(C) $u p$
(D) over
3. He $\qquad$ for stepping on Mary's foot.
(A) admonished
(B): apologized
(C) ridiculed
(D) humiliated.
4. Because of 2 $\qquad$ engasement, Jeen couldn't ottend the party.
(a) premature
(B) prolific
(C) prescribed
(D) prior
5. The leaders decided to organize $\qquad$ in order to arcuse the members of their party.
(A) a rally
(B) a sensation
(C) a convoy
(D) an exercise
6. His $\qquad$ and experience make him an excellent person for this job.
(A) competence
(B) complacency
(C) compensation(D) compunction
7. A new kind of machine made the old one $\qquad$ $\therefore$
(A) outright,
(B) obstructed
(C) outlandish
(D) obsolete
8. To ask someone for "helr is to turn $\qquad$ hìn.
( $A$ ) to
(B) for
(c) on
(D) by
9. The balloon was $\qquad$ with air.
(A) injected
(B) infused
(C) instilled
(D) infigted
10. We can't understand Uncle George, for he always $\qquad$ whatever he says.
(i) masters
(B) molests
(C) numbles
(D) muzzles
11. To assist someone with something is to helphim $\qquad$ -
(A) around
(B) on
(C) over
(D) out
12. Mr. Robinson was very groteful and thanked us $\qquad$ , though we had really done very Iittle.
(A) eminently.
(B) profucely
(C). arrogantly.
(D) complacently
13. He used the stick as a $\qquad$ to keep the window open.
(A) prop
(B) slot
(C) curb
(D) plug
14. The vase $\qquad$ on the edge of the table, then fell to the floor with a crash.
(A) wobbled
(B) wheedled
(C) wallowed
(D) waddled
15. You haven't reaily answered the question, for what you said is not $\qquad$ -
(A) eligible
(B) peritinent
(C) provident
(D) expeditious

## PART B

16. not real
( 1 ) imaginary
(B) incredible
(C) insensible
(D) unanimous
17. the state of being unoccupied, emptiness
(A) seclusion
(B) exile
(C) vacancy
(D) $r \in c e s s$
18. a part of something
(A) capsule
(B) covenant
(C) symptom
(D) segment
19. to make sad
(A) distort
(B) deplore
(C) depress
(D) disdain
20. according to the law
(A) conspicuous
(B) temperate
(C) sympathotic
(D) legitimate
21. rapid movement back and forth
(A) vibration
(B) acceleration(C)
commotion
(D) versatility
22. the center or central part
(A) cube
(B): cove
(C) core
(D) cult
23. warm and close friendship
( $L_{1}$ ) piety
(B) frenzy
(C) intimacy
(D) enmity
24. to free someone from bieme or cuilt
(A) absolve
(B) exasperate
(C) disengage
(D) unfetter
25. to confuse
(A) focus
(B) bewilder
(C) infect
(D) accost
26. to describe or depict
(A) survey
(B) portray
(C) behold
(D) observe
27. useless, ineffectual
(A) brazen
(B) sluggish
(C) dire
(D) futile
28. to bring back, to rescue
(A) recede
(B) retrieve
(C) retrench
(D) rescind
29. to pretend
(A) feign
(B) fuse
(C) foil
(D) fume
30. very ugly or frightening
(A) sullen
(B) dismel
(C) hideous
(D) gloomy
31. difficult to control
(A) unbiased
(B) uncanny
(c). ungainly
(D) unruly
32. a boginner
(A) riomad
(B) nominee
(C) novice
(D) notery
33. to force.
( $h$ ) coerce
(B) abash
(c) efface
(D) succumb
34. frankness of expression, sincerity
(A) conviction
(B) candor
(C) innuendo
(D) intimation
35." to demand certain conditions
(A) excrete
(B) invoke
(C) postulate
(D) stipulate
35. to explain, to make clear
(A) elucidate
(B) incilcate
(C) infilitrate
(D) expostulate
36. a distressing or unfortinate situation
(A) hazard
(B) guise
(C) plight
(D) blotch
37. returning from time to time
(A) repentant
(B) rocurrent,
(C) recessive
(D) ropugnent
38. an unexpected shock:
(A) clang
(B) blast
(c) jolt
(D) snap
39. insignificant, worthless:
(A) paltry
(B) minimum
(C) stuntéd
(D) compact

In 1686 a minister admitted that many people in New England wanted to see stage plays in spite of the strong opposition of the influential Puritan church. Interest in the drama grew slowly and unsteadily in America, but it parsisted. . By 1800, Thomas Bullfinch had designed an
(5) exquisite theater for Boston with rooms for dances, card games, and teas: Throughout the nineteenth century, playhouses were established in cities along the East Coast from New York to Charleston, South Carolina. Also, as people moved westward to settle new areas, temporary theaters were built in the young townsi. In Columbus, Ohio, trees that were growing on
(10) a Monday would become timber for a theater by the following Thursday. In Natchez, Mississippi, a theater was built in a graveyard, and the audience could see bones beneath the stage. Shows were often presented in taverns and other public buildings.

Serious drama did not flourish very far from the East Coast, however. Many talented actors traveled around the country, but they could offer only light entertainment because travel was difficult and not much scenery or equipment could be carried over the rough western roads. But dramatic activity was so popular that a native form of light entertainment developed. In fact, even the humorous tale came to be presented theatrically, as the storyteller relied upon appearance, gesture, and manner of speaking for his dramatic effect.

1. According to the passage, a theater in Natchez was built in a
(A) church
(B) tavern
(C) forest
(D.) graveyard
2. Thomas Bullfinch was most probably
(A) an actor
(B) an architect(C) a minister
(D) a builder
3. According to the passage, most of the development of the theater took place
(A) before 1700
(B) between 1700 and 1800
(C) between 1800 and 1900
(D) after 1900
4. Which of the following factors contributed to the particular kind of native entertainment that developed?
(A) The scarcity of good actors who would travel
(B) The lack of popular interest in serious drama
(C) Difficult troveling conditions in the American West
(D) Cpposition of the Puritan church to serious drama
5. The passage states that the theatrical productions of the American lest developed in the form of
(A) light entertainment
(B) humorous tales
(C) casual songs
(D) serious drama
6. The author suggests that the Puritan church
(A) couid not prevent the building of theaters
(B) tolerated only skilled actors
(C) used the drama for religious purposes
(D) could not discourage interest in the drama
7. The presence of rooms for dances, card games, and teas in the Boston theater shows that
(A) other entertainment was more important than the plays
(B) the church had a great deal of influence
(C) the theater building was elaborate
(D) Boston was an up-to-date city

The gorilla, called fiendishly fierce on the basis of reports from hunters and observers of captive animals, turns out to be quite agreeable in his own domain, according to zoologist George B. Schaller. Every ape is aware of his status in the group, says Dr .
(5) Schaller, so "there is rarely any strife beyond the occasional bicker-. ing which is apt to occur even among the most congenial companions." Averaging fewer than cwenty animals, the gorilla social group always is dominated by a silver-backed older, male, and members of the group seem to like thei" bonevolent dictator. On down the line, males
(10) dominate females and female cominate juveniles: The social exchange is close and affectionate, "much like that of a happy human family with a polygamous matine system," Dr. Schaller observes.

As a captive, the gorilla has been described as introverted and phlegmatic. D:. Schejler cbserved a range of emotions from hesitation and uneasiness to curiosity, boldness, and annoyance. Like humans, gorillas bite their lips when uncertain and frown when annoyed. The young throw tanterms, when thwarted and, like human infants, are intensely curiousi Dr. Duane Rumbaugh, who recently observed and tested a baby gorilla through its first year, found the animel attentive and persevering and judged that its exploratory behaviour equalled that of humen infants.
8. Dr. Schaller reports that within the gorilla's social group
(A) each member knows who is more and who is less important
(B) there is strife when leadership. is contested within the group
(C) each member has a chance to obtain the position of leader
(D) status is determined by the number of female and juvenile followers each maie has
9. An interesting observation concerning gorillas is that
(A) their behaviour is just like that of human babies
(B) their emotions are more intense and erratic than man's
(C) they exhibit a range of emotions very similar to man's
(D) they more often exhibit uncertainly, annoyance, and curiosity than : do men
10. In line 17, "thwarted" could be repiaced correctly by
(A) hungry
(B) frustrated
(C) angry
(D) tired
11. According to the passage, within the gorilla social group, decisions are made by
(A) a group of the oldest males
(B) a consensus among the males
(C) one of the older males
(D) the strongest among the males
12. It appears that keoping a grown gorilla in captivity has the effect of making him
(A) behave like a humen infant, frowning and having tantrums
(B) curious, attontive, end persevering
(C) less lively and less interosted in things around him
(D) imitate adult humans
13. According to the author, in their natural habitat gorillas are
(A) fiendishly fierce
(B) careful to fight only with members of their own social group
(C) more ageressivo than are members of their own social group
(D) likely to indulge in minor quarreling but are amiable on the whole
14. Apparently Dr. Shaller's work was important because he
(A) he observed gorillas in situations that were natural to them
(B) discovered that gorillas are very much like human beings
(C) observed gorillas over a long period and found that they are just like human infants
(D) discovered that gorillas maintain a closeknit, well-organised social group

Every human being, no matter what he is doing, gives off body heat. The usual problem is how to dispose of it. But the designers of the Johnstown campus of the University of Pittsburgh set themselves the opposite problem - how to collect body heat. They have designed a collection system which utilizes not only body heat, but the heat given off by such 'objects as light bulbs and refrigerators as well. The system works so well that no conventional fuel is needed to make the campus's six buildings comfortable.

Some parts of most modern buildings - theaters and offices as well
(10) as classrooms -- are more than amply heated by people and lights and sometimes must be air-conditioned even in winter. The technique of saving heat and redistributing it is called "heat recovery." A few modern buildings recover heat, but the University's system is the first to recover heat from some buildings and re-use it in others.
(15) Along the way, Pitt has learned a great deal about some of its heat producers. The harder a student studies, the more heat his body gives off: Male students emit more heat than female students, and the larger a student, the more heat he produces. It is tempting to conclude that the hottest prospect for the Johnstown campus would be a hard-working, overveight male genius.
15. Until recently, body heat has caused problems because it
(A) was difficult to collect
(B) came in a variety of forms
(C) was difficult to get rid of
(D) tended to be absorbed by physical objects
16. Which of the following is true of the heating system of the Johnstown campus?
(A) The heat is supplied by human bodies only:
(B) The heat is supplied by both human bodies and other heat-emitting objects.
(C) The heat is supplied by both human bodies and conventional fuel.
(D) The heat is supplied by human bodies, other heat-emitting objects, and conventionel fuel.
17. At the Johnstown campus, how many of the buildings are heated entirely by the heat collection system?
(A) none
(B) Two
(C) Four
(D) $\operatorname{Six}$
18. In line 7, "conventional" most nearly means
(A) ordinary
(B) powerful
(C) electrical
(D) extra
19. In line 10, "amply" most nearly means
(A) partly
(B) overiy
(C) warmly
(D) adequately
20. The phrase "even in winter" (line 11) most nearly means
(A) if the winter is especialiy warm
(B) during all of the year except the winter
(C) in the winter as well as in other seasons
(D) during the evenings in the winter
21. In line 12, "heat recovery" refers to a
(A) method of concealing the source of heat
(B) special form of air conditioning
(C) supplementary hot water system
(D) way of reclaiming and re-using heat
22. According to the passage, which of the following would produce the LEAST ${ }^{-}$ amount of heat?
(A) A fat female who studies hard
(B) A thin female who does not study
(C) A fat male who does not study
(D) $\Lambda$ thin mele who studies hard
23. In line 19, the "hottest prospect" means the
(A) most intelligent student
(B) most desirable student
(C) most diligent student
(D) most obese student

In the Mormon company, bugles sounded each morning at five. Two hours were allowed for breakfast and prayers. During the day the company traveled in a close file, most of the men trudging beside the wagons, carrying weapons that were loaded and clearly visible. At
(5) night the wagons were drawn into a tight circle -- or a semicircle if the company camped on a river bank. Usually the animals were pastureed within the circle to keep them from roaming and falling prey to thieves. The men would retire for prayers by groups at eight-thirty, and they were expected to be settled by nine. Fifty of them had been apointed as guards, with twelve of these standing duty each halfnight. At one time, while they, were crossing the prairies, in Indian country, the company drove five wagens abreast.

The Mormons sighted their first buffalo at the head of Grand Island on April 30. Hunters from the camp rode after them and

## (15) succeeded in bringing down eleven, which were added to the larder.

24. How were the Mormons awakened each morning?
(A). By their appointed guards
(B) By light from the rising sun
(C) By a kind of trumpet
(D) By the calls of birds
25. The Mormons placed their wagons in a circle or a semicircle at night because this arrangement
(A) was a quick and convenient way to make camp
(B) helped to shelter the party from wind and rain
(C) was the most appropriate setting for their devotions
(D) gave them a kind of barricade or fort for protection
26. What seems to have been the Mormons' chief worry as they traveled?
(A) Hostile attacks
(B) God's displeasure
(C) Running out of food
(D) Losing their way
27. Which of the following adjectives would NOT describe the Mormons in the passage?
(A) Devout
(B) Disciplined
(C) Wary
(D) Helpless
28. In line 11, "prairies" could be correctly replaced by
(A) riverbeds
(B). flat, open lands
(C) deep valleys
(D) border territory
29. We can infer from the passage that, by carrying their weapons; the Mormon men hoped to
(A) prevent them from being stolen
(B) fight fatigue more easily
(C) discourage possible enemies
(D) travel faster
30. When they pastured their animals, what did the Mormons do with them?
(A) Gave them food and rest (B) 'Provided them. with shelter from
(C) Allowed them to wander freely the elements about
(D) Slaughtered and cooked them
31. When the cleven buffalo were added to the larder, they were added to the
(A) company's herd of animals
(B) hunting records of the men who brought them in
(C) company's store of food
(D) cooking pot

Fund out the purtig the sentince $\frac{\text { PART } A}{}$

1. It is often easier to select $\frac{B}{A}$ the best tool for a particular job $\frac{\text { than }}{C}$ to use $\frac{\text { them }}{D}$ correctly.
2. When a person accepts a dinner invitation, you are expected to arrive $\frac{\text { on time. }}{D}$
3. Today, divorce is not longer $\frac{\text { regarded }}{A}$ as a disgrace, as a tragedy, or even as a failure.
4. Absurdly is one of the most $\frac{\text { prominent }}{C} \frac{D}{A}$ themes of twentieth-century European drama.
5. If the parents had went to the meeting, they could have discussed the problems $\frac{\text { with }}{C}$ the principal $\frac{\text { himself. }}{D}$.
6. It may be said that $\frac{\mathrm{A}}{\mathrm{A}}$ in some countries each of the citizens help to decide government policy.
7. When our neighbor's grandson caught his finger in the car door, he did not cry even though it must have hurted him a great deal.

8: The lawyer, Ben Burstine, he proscnted his case so successfully that the jury $\frac{\text { came }}{C}$ to its decision $\frac{\text { within }}{D}$ a short time.
9. A visit to the chateau includes sampling tho wine, discussing $\frac{\text { its merits, }}{\mathrm{A}}$, and then, $\frac{\text { if }}{C}$ you are fortunate, $\frac{\text { to have }}{D}$ chet with the marquis
10. It may not have been the worse blizzard in history, but I do not want to $\frac{\text { be }}{\mathrm{C}}$ out in another one like it.
11. Japan has experienced $\frac{\text { a }}{\mathrm{E}}$ remarkable economic $\frac{\text { growing }}{\mathrm{C}}$ in the $\frac{\text { past decade: }}{\mathrm{D}}$
12. He generally expresses himself more forceful than $\frac{\text { any of the members of }}{\mathrm{A}} \frac{\mathrm{D}}{\mathrm{D}}$. the opposite party.
13. As a result from hearing the radio announcement, Craig has written to offer himself as a member of the panel for next week.
14. It is surprising that Marquesne is such $\frac{a \text { fine }}{A}$ writer, for he has not read only a few books other than his own.
15. There $\frac{\text { are }}{\mathrm{A}}$ many organizations which sole purpose $\frac{\text { is }}{\mathrm{C}}$ to help mentally retarded children.
16. Waiting for a plane to take off from an airport can often take so long as the trip $\frac{i t s e l f}{D}$.
17. Paul had just returned home and began to read the paper when his sister called to say $\frac{C}{C}$ had arrived $\frac{\text { at }}{D}$ the station. $\therefore$
18. It has been estimated that the efforts of a mere one per cent of $\frac{\text { its }}{\mathrm{A}}$ total population moves the vorld forward.
19. The columnist $\frac{\text { feels sure }}{A}$ that $\frac{\text { who }}{B}$ wins the election will have the support of $\frac{\text { both }}{D}$ parties.
20. Because he was greatly troubled by his conscience, Hamlet was incapable to $\frac{\mathrm{k}^{\prime}}{\mathrm{D}} \mathrm{l}$ the king.
21. Neither Russia nor the United States have been able to discover $\frac{\text { mutually }}{A}$ satisfactory plan for gradual disarmament.
22. The specific gravity of a gas is the numerical ratio of $\frac{\text { its }}{\mathrm{A}}$ density $\frac{\text { with }}{\mathrm{C}}$ the density of a senndard of reference; $\frac{\text { usually }}{D}$ air.
23. Seldom in Western civilization has one man been successful in more
intellectual pursuits $\frac{\text { as }}{D}$ Ieonardo.
24. Far too many owners of color television sets have had a difficult time to find qualified repaixmen.
25. Aside from the resolution to have more ecumenical conferences, the most accomplishment of the group was that $\frac{\text { it met }}{C} \frac{\text { at all }}{D}$.

## PARTB B

26. There is always a gap between what we say and $\qquad$ -
(h) whatever we do
(B) what we do
(C) that which is done
(D) that done
27. A good administrator must know $\qquad$ -
(A) to be firm
(B) to have firmness
(C) the way of firmness
(D) how to be firm
28. In a period of inflation, the value of money drops as $\qquad$ -
(A) prices rise
(B) prices go the other way.
(C) up go the prices
(D) prices arise
29. Because there was little heat in the bedroom, Evan was cold $\qquad$ -
(A) much through the night
(B) most of the night
(C) many parts of the night
(D) the majority part of the night
30. The hikers needed to walk faster to $\qquad$ -
(A) arrive by their destination in time
(B) reach their destination on time
(C) reach at their destination in time
(D) arrive their destination on time
31. The purpose of the research had a different meaning for them than $\qquad$ $\stackrel{\rightharpoonup}{-}$
(A) ours
(B) for ours it had
(C) with us
(D) it did for us
32. It is one thing to accuse a person of a certain crime, but $\qquad$ .
(A) proving it is diforent
(B) how to give proof is no easy
(C) when to prove it is difficult (D) to prove it is quite another matter
33. The party continued through $\qquad$ -
(A) the whole of the night.
(B) nearly whole of the night
(C) almost of the night
(D) most of the night
34. Synthetic fabrics are particulerly valuable in making $\qquad$ -
(A) unheavy clothing for sumers (B) clotnes wearing light in summer
(C) light clothes of the sumertime (D) lightweight summer clothing
35. According to Xenophon, Socrates believed that $\qquad$ -
(A) what a marn does is elso able for a woman to do
(B) a man's abilities can be the sane with a woman
(C) a woman can do the same thing as a man
(D) the same things between mari and yoman can be done equally
36. Nineteen people were already dead, $\qquad$ -
(A) seven of whon were teenagers
(B) sever being teenagers
(C) teenagers were seven
(D) wnong seven were teenagers
37. nccustomed to climbing trees, $\qquad$ .
(A) I had no difficulty reaching the top
(B) reaching the top was not hard to me
(C) the top was not difficult for mo to reach
(D) to reach the top was not a problem
38. The harder they worked, $\qquad$ -
( $A$ ) they seemed to do less
(B) the less they secmed to do
(C) they were doing less
(D) thoy did less
39. In order to be a cood scientist, $\qquad$ .
(A) mathematice is urgent
(B) one sinould heve the mathematics
(C) one must understand nathematics
(D) mathematios is important to bo undenstood
40. Mary had sfent $\qquad$ studying.
(A) the whole doy
(B) all during the day
(C) altogether a day
(D) entircly a day

Listemniy Conpretennión
Mra HII COLEESE Nane:
$\therefore$ -
Gejechive Answer. Shest No:
mixizer
FORM
e.h. "C" is the correct anower



MNG KET Cogrget Hars: $\qquad$
FORM
objective ancuer Shest Ho: .
ene : Bis atm onmeot anover



| $A$ | $E$ | $C$ | $D$ | $E$ |
| :---: | :---: | :---: | :---: | :---: |
| $A$ | $B$ | $C$ | $D$ | $E$ |

## ReadingCampichensian

MIG NI COLVEGE Wams:
FORM $\qquad$ Objectite Aaswor Bheet no:
e.t. "C" 2 s the comrect answe

| 1. | A | 3 | 0 | $\pm$ | $\pm$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2. | A | \# | C | $\square$ | E |
| 3. | A | 3 | - | D | T |
| 4. | A | B | $\nless$ | D | 13 |
| 5. | $\frac{\square}{2}$ | B | $\bigcirc$ | 1) | T |
| 6. | A | E | 0 | - | E |
| 7. | A | B | - | D | 2 |
| 8. | A | B | C | $\square$ | 㫛 |
| 9. | A | B | 8 | i | \% |
| 10. | A | B | 0 | D | E |
| 14. | A | B | < | $D$ | 2 |
| 12. | A | 13 | 8 | D | \# |
| 13. | A | 8 | 0 | 3 | \% |
| 14. | $A$ | B | 0 | D | $\underline{y}$ |
| 15. | A | B | 0 | D | E |
| 16. | A | - | © | $\pm$ | 2 |
| 17. | A | E | 0 | - | \% |
| 18. | $A$ | E | 0 | D | E |
| 49. | A | 3 | $c$ | \% | B |
| 20. | A | B | 15 | 1) | 3 |
| 21. | A | \% | 0 | 8 | \% |
| 22. | A | E | 0 | D | E |
| 23. | A | B | 0 | 0 | 8 |
| 24. | A | B | C | D | $\stackrel{ }{*}$ |
| 25. | A | B | 2 | D | 2 |
| 26. | A | 8 | 2 | . | 3 |
| 27\% | A | B | d | 5 | E |
| 28. | A | B | 0 | D | E |
| 29. | A | B | $\dot{8}$ | D | \% |
| 30. | A | B | 9 | D | \% |


| A | 8 | D | E |
| :---: | :---: | :---: | :---: |

## Vocatulary

FOPM
MNE KBI COIIHES Mame:
Objuctive Arsyer Shest No: $\qquad$
enB: "O" mate borrect answet
$[\mathrm{A}] \mathrm{B}] \mathrm{D}] \mathrm{E}$


English stincture

Mas ESI COLSES Same:
FORM
Otjectite Ansmet macet Ne:
$\qquad$
$\qquad$

Q日G. "CH the tomect subwer





wo

| $A$ | $B$ |
| :---: | :---: |
| $A$ |  |

$\sigma$
D
$=2$
$3 \%$.
54.

53
5
37.
58.
59.
6.


Appendici 6


VGSCH* HAS BEEN CRFATED.



















$\begin{array}{lllllllllllllllllllll}110-40 & 38 & 37 & 36 & 35 & 45 & 41 & 39 & 45 & 29 & 28 & 15 & 12 & 25 & 20 & 25 & 62 & 25 & 27\end{array}$





$\begin{array}{llllllllllllllllllllll}113 & 18 & 36 & 12 & 32 & 36 & 41 & 29 & 37 & 42 & 26 & 24 & 15 & 15 & 24 & 10 & 19 & 52 & 18 & 16\end{array}$

















$\begin{array}{llllllllllllllllllllllll}122 & 13 & 36 & 37 & 40 & 33 & 38 & 37 & 35 & 31 & 29 & 18 & 10 & 14 & 19 & 11 & 15 & 46 & 17 & 14\end{array}$


















```
27111 29 93108 53 21 17 25 43 13 1
```





$\begin{array}{lllllllllllllllllll}231 & 48 & 20 & 29 & 34 & 29 & 23 & 30 & 17 & 18 & 16 & 11 & 16 & 10 & 7 & 10 & 10 & 37\end{array}$









$\begin{array}{lllllllllllllllll}237-13 & 32 & 34 & 35 & 38 & 43 & 33 & 19 & 17 & 13 & 10 & 6 & 10 & 14 & 18 & 28 & 39\end{array}$

$\begin{array}{lllllllllllllll}238 & 18 & 19 & 26 & 33 & 24 & 38 & 43 & 34 & 31 & 19 & 17 & 14 & 15 & 17 \\ 9 & 18 & 56\end{array}$















$\begin{array}{llllllllllllllllllllll}250-25 & 29 & 33 & 32 & 26 & 40 & 34 & 23 & 17 & 15 & 14 & 13 & 14 & 8 & 15 & 23 & 53\end{array}$


























[^0]:    1.6 THE GENERAL SITUATION OF EDUCATION AND LaNGUAGE TEACHING IN HONG KONG

[^1]:    1 The Certificate of Education Examination is an achievement test on various subjects administered to all students at the end of grade 11. The examination in most of the subjects is offered in two equivalent translations, English and Chinese. Candidates can answer in either language.

[^2]:    1 From agassis' study, less than $9 \%$ of the population can speak fluent English. This figure might be a litte bit out of date since there are more anglo-Chinese school students graduated in the past ten years.

[^3]:    1 Quasi-experimental design is included under the title Experimental design. For detailed distinctions between the three kinds of studies, see Gay (1976, Ch. 6)

[^4]:    1 The effect is named after the Hawthorne plant of the Western Electric corporation where it was first noted. It refers to the fact that almost any change, any extra- attention, any experimental manipulation or even the absence of manipulation but the knowledge that a study is being done, is enough to cause subjects to change.

[^5]:    1 The Secondary School Entrance Examination (SSEE) was an achievement test of Chinese, English and Mathematics administered to all students at the end of grade six before 1978. All grade 6 students who had reached a certain standard were then allocated to different secondary schools according to their academic achievement, personal choice and area of residence.

[^6]:    1 In the anglo-Chinese schools, the medium of instruction should be English, but many of the teachers use a good deal of Chinese.

[^7]:    1 One study under the 'General Studies' column covered four levels, so it was counted four times instead of one. Similarly, another study under the 'General Studies' column covered two levels, it was counted two times instead of one.

[^8]:    1 From now on, the two schools will quite often be written in the short-form as CS (i.e. Chinese secondary school) and ACS (i.e. Anglo-Chinese secondary school).

[^9]:    1 The two schools are situated in two different areas of Hong Kong, like North and mest Vancouver in this area. They are about five miles apart.

[^10]:    ${ }^{1}$ The background information collected in the survey will be described in a later section. (Section 3.4.2)

[^11]:    1 Details of the program can be obtained from the Educational Research Service Centre, Faculty of Education, the University of British Columbia.

[^12]:    1 Mr. H.C. Au (B.SC., Dip. Ed.), a bilingual physics teacher. Mr. H. H. Wong (B.SC. Hon., Dip.Ed.), a bilingual physics teacher.

    2 MrS. Y. Y. L. Liu (B.SC... Dip.Ẹ.. M.Ed.). a bilingual physics teacher.
    3 Dr. Gamal Nasr (B.SC., M.Sc., M.Ed., Ph. D.), an Ed. D. student in the Science Education Department, Oniversity of British Columbia.
    The degree of accuracy of translation was arbitrarily divided into five levels:

    Exact - the two items were the same.
    Good - the two items were of almost the same meaning. . Acceptable - the two items were of roughly the same meaning. Bad - the two items were slightly different. Different - the two items were of different implications.

[^13]:    1 Mr. C.C. Kong (B.SC., Dip.Ed., Dip.System Analysis), a bilingual physics teacher.
    2 Miss B.C. Cheng (B.SC., Dip. Ed.), a bilingual physics teacher.

[^14]:    1 The author used these test booklets to prepare for TOEFL and achieved a high score. He concluded from this experience that the test items were very similar.

[^15]:    1 The California F -Scale of Authoritarianism consists of many items originally constructed for Americans. Some items did not suit Hong Kong because Hong Kong people don't have the same back ground as Americans so those items had to be deleted by the author.

[^16]:    1 Miss Bosemary W.K. Lo, (B.A.). a professional translator working for the Hong Kong Government.
    2 Miss K. H. Kong (B.A.. Dip. Ed.), a bilingual English teacher.
    3 Mr. Stanley Taylor (B.SC., H.SC., M.Ed.). a doctoral candidate of the Science Education Dept., the University of British Columbia.
    4 Mrs. B. W. K. Ho (B.A. Dip.Ed.), a bilingual English teacher.

[^17]:    1 Teacher in the Chinese School--Mr. C.C. Mong (B.Sc., Dip. System Analysis, Dip.Ed.) Teacher in the Anglo-Chinese School--the Uriter himself.

[^18]:    1 Actually, this test was a part of the ordinary term examination paper consisting of multiple choice items and essay type questions.

[^19]:    1 The two subtests (English verbal reasoning and English language usage) of the Aptitude Test Battery could be used as a measure of English proficiency also. But the present test battery of English proficiency was an internationally recognized one which should be more reliable and so is adopted.

[^20]:    1 These materials were originally used in a research project named "effect of Medium of Instruction opon Student Cognitive Development and academic achievement" by a research team. from the School of education of the Chinese University of Hong Kong. (Siu, 1979b).

[^21]:    1 The S.S.E.E. results were measured 3 years before the present study. One really doesn't know what happened during that three years before the treatment. Taking them as covariates would be unsatisfactory since some unknown treatments during those three years had been included.
    2 Details of the program can be obtained from the UCLA BMD documentation.

[^22]:    2 Foreign students getting scores above 400 (out of 800) in TOEFL are already considered to be acceptable to some colleges in the United States of America.

[^23]:    : Details of the program can be obtained from the UCLA BMD documentation.
    2 The cutoff value, corresponding roughly to the value of $F(1,60)$ at the 0.05 level of significance, was used in the analysis. All variables associated with $p$-value less than the cutoff value of 4. 00 were not entered into the equation.

    3 Independent variables not listed in Table 4.11 indicated that they were not significant in explaining a substantial variance of physics achievement.

[^24]:    I Independent Variables not listed out in Tale 4.13 indicated that they were not significant in explaining a substantial variance of English proficiency.

[^25]:    1 These 86 students were the same subjects in the original study reported in Section 4.1 and 4.2.

[^26]:    1 Osually, more than $80 \%$ of students stay in the same secondary school for five years.

[^27]:    APPENDIX 14

[^28]:    i friequence of the sound emitted by fork
    ii waveleagth of the sound emitted by fork
    iii velocity of sound in water
    A. i only
    C. iiii only
    E. $\quad$ all
    (B) ii only
    END

[^29]:    P M Abbott, A.F. Ordinary Level Physics (Third edition) Heinemann Educational Books

    L ————Cung, P.W. Practical Physics (Third edition) Hung Fung Book Co.

