VANCOUVER HIGH SCHOOL

VANCOUVER, BRITISH COLUMBIA
CANADA

COURSE OF STUDY

FOR THE YEAR

1895-6

AND

CATALOGUE

FOR THE YEAR

1894-5

VANCOUVER
NEWS-ADVERTISER PRINTING AND BOOKBINDING ESTABLISHMENT, CAMBIE STREET
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BOARD OF SCHOOL TRUSTEES

VANCOUVER, B.C.

A. H. B. MACGOWAN, *Chairman*, '97
C. W. MURRAY, *Secretary*, '97
WM. TEMPLETON, '96
C. C. ELDRIDGE, '96
G. R. GORDON, '96
DR. BRYDONE-JACK, '97
C. F. FOREMAN, '97

FACULTY OF INSTRUCTION

HIGH SCHOOL DEPARTMENT

ALEXANDER ROBINSON, B.A. (Dal.), Principal—
Greek and French.

JAMES C. SHAW, B.A. (Dal.), A.M. (Harv.)—
Latin and Ancient History.

JOHN H. KERR, B.A. (Toronto)—
Mathematics and Commercial Branches.

GEORGE E. ROBINSON, B.A. (Dal.)—
Senior Mathematics.

JOSEPH K. HENRY, B.A. (Dal.)—
Science and English.

PUBLIC SCHOOL DEPARTMENT

F. M. COWPERTHWAITE, B.A. (U.N.B.) - - - - Principal Central School
G. H. TOM - - - - - - - - - - - - - - Principal East End School
T. A. MCGARRIGLE, B.A. (U.N.B.) - - - - Principal West End School
G. W. JAMIESON - - - - - - - - - - Principal Mount Pleasant School

(*b*). Composition.—The structure of sentences and paragraphs, correction of errors, familiar and business letters, themes on familiar subjects.

(*c*). Grammar.—~~Smith's~~ English Grammar, ~~analysis and parsing of passages from authors not prescribed.~~

2. *Geography.*—Particular geography of Europe. Elementary exercises on the use of the terrestrial globe.

3. *History.*—~~British and Canadian~~ History.

4. ~~*Book-keeping.*~~—Single entry Book-keeping, commercial forms.

5. *Mathematics:*—(*a*).—Written Arithmetic.—Percentage, ~~simple and compound~~ interest, discount, ~~profit and loss~~, ~~extraction of~~ square and cube roots.

(*b*). Mental Arithmetic.

(*c*). Algebra.—Four fundamental rules, factoring, elementary formulæ.

(*d*). Geometry.—Euclid Book I., first twenty propositions, with deductions.

6. *Classics:*—Latin.—To the end of the ~~Regular Verb.~~

"CLASS "D."

1. *English.*—Extension of the course for class "E."

2. *Geography.*—Particular geography of Asia, with special reference to China, Japan and India. Further uses of terrestrial globe. ~~Oral instruction in physical geography.~~

~~3. *History:*—(*a*). Canadian History completed.~~

~~(*b*). British History completed, with special reference to the history of the nineteenth century.~~

~~4. *Book-keeping.*~~—Double entry Book-keeping.

5. *Mathematics:*—(*a*). Written Arithmetic.—Stocks and shares, circulating decimals, miscellaneous problems.

(*b*). Mental Arithmetic.

(*c*). Algebra.—Factoring continued, finding ~~the H. C. F. and the L. C. M.~~, fractions, ~~simple equations.~~

(*d*). Geometry.—Euclid Book I., ~~completed and reviewed, with~~ deductions.

6. *Classics:*—(*a*). Latin.—~~Pronoun and regular verb reviewed irregular verb, elementary Latin construction.~~

~~(*b*). Greek.—Declension of the noun and adjective.~~

* At end of Class C.
Students who purpose taking Additional Mathematics Matriculation must take high marks in these subjects the Promotion Examinations. Their examination includes harder Quadratics, the Theory of Indices, and Euclid, Bo

CLASS "C." (a) Language.

1, *English*. ~~*Language and Literature*~~.—Extension of the course for class "D," with Increased attention ~~given~~ to the derivation of words. (b) Literature. Critical reading of ~~an English classic.~~ selected poems (Hales)

2. *Geography*.—~~Particular geography of Oceania, with special reference to Australia. Increased attention to physical geography and the uses of the terrestrial globe.~~ Physiography.

(c) ~~3. *History*:—(*a*). British History.—Critical study of Stuart period.~~ English History, continued.

~~(*b*). Outlines of Ancient History, with special reference to the history of Rome.~~

See foot of next page

4. *Science*.—(a) Elements of Botany. (b) Introduction to Chemistry (Ren

5. *Mathematics*:—(*a*). Written Arithmetic.—The Metric system, alligation, miscellaneous problems.

(*b*). Mental Arithmetic.

(d) ~~(*c*)~~. Algebra.—Simple equations continued, extraction of square and cube roots, introduction to quadratics. Simultaneous Equations, Evolution and Simpl

(e) ~~(*d*)~~ Geometry.—~~Euclid Book II.~~, treated according to both the diagrammatic and line methods, algebraical equivalents, deductions. Euclid. Deductions (Book I.) and

(c) ~~(*e*). Mensuration.—Areas of surfaces.~~ Simplified

6. *Classics*:—(*a*). Latin.—Latin grammar completed, ~~and reviewed,~~ introduction to ~~Latin~~ elementary prose composition, Cæsar, *De Bello Gallico*, Book III. Frank

(*b*). Greek.—~~To the end of the regular verb.~~ Accidence (Smil

IV. ~~X~~

CLASS "B."

1. *English Language and Literature*.—Extension of the course for class "C." Critical reading of an English classic, history of English literature, rhetoric.

2. *Geography*.—The subject completed and reviewed.

3. *History*:—(*a*). British History.—Critical study of the Guelph period.

(*b*). Outlines of Ancient History, with special reference to the history of Greece.

4. *Science*:—(*a*). Botany.—The subject continued.

(*b*). Chemistry.—Elementary inorganic chemistry.

5. *Mathematics*:—(*a*). Written Arithmetic.—The subject completed and reviewed.

~~IV.~~ Modern Languages. (a) French – Exercises continued. System. Reading of Grammar, the end of Adverbs. Reading of an easy author.

(b) German – Simple oral and written work

(*b*). Mental Arithmetic.—The subject completed.

(*c*). Algebra.—Quadratics completed, indices and surds, the roots of equations, indeterminate equations, introduction to the binominal theorem.

(*d*). Geometry.—Euclid, Books III. and IV., with deductions.

(*e*). Mensuration.—Volumes of solids.

(*f*). Trigonometry.—To the end of the area of triangles.

(*g*). Natural Philosophy.—Peck's Ganot; Statics.

6. *Classics*:—(*a*). Latin.—Latin prose composition continued, Cæsar, *De Bello Gallico*, Book II., Vergil, *Aeneid*, Book I.

(*b*). Greek.—Greek grammar completed, introduction to Greek prose composition, Xenophon, *Anabasis*, Book I.

CLASS "A."

1. *English Language and Literature.*—Extension of the course for class "B." Critical reading of an English classic. History of English literature and rhetoric completed.

2. *History*:—(*a*). British History.—Critical study of the remaining portion.

(*b*). Ancient History completed.

3. *Science.*—Inorganic chemistry completed.

4. *Mathematics*:—(*a*). Algebra.—The subject completed and reviewed.

(*b*). Geometry.—Definitions of Book V., Book VI., with deductions.

(*c*). Mensuration.—The subject completed and reviewed.

(*d*). Trigonometry.—The subject completed and reviewed.

(*e*). Natural Philosophy.—Peck's Ganot completed, Dynamics and Hydrostatics.

5. *Classics*:—(*a*). Latin.—Latin prose composition continued, Vergil, *Aeneid*, Book II., Horace, *Odes*, Books I. and III.

(*b*). Greek.—Greek prose composition continued, Xenophon, *Anabasis*, Book II., Homer, *Iliad*, Books I. and II.

NOTE.—1. The courses given in classes "C," "B" and "A" are partially adapted to candidates for Third, Second and First Class Certificates, respectively.

2. The courses given in classes "B" and "A" are also intended to prepare candidates for first and second year college matriculation.

V. Science (a. Physiography.
(b. Elements of Botany, Field work.
(c. Introduction to Chemistry (Remsen)

PRIZES.

Book Prizes will be awarded to the students standing highest in the departments of Classics, Mathematics, English and Science throughout the various classes.

In addition to the above the following special prizes will be awarded, viz:—

1. THE McLEOD PRIZE, which is offered by the Rev. J. M. McLeod, will be awarded to the student of class "E" standing highest in Reading.

4. THE EVANS PRIZE, which is offered by J. E. Evans Esq., will be awarded to the student writing the best essay on a subject to be announced during the session, the winner of the Stewart prize being excluded.

3. THE STEWART PRIZE, which is offered by A. C. Stewart, Esq., will be awarded to the male student writing the best essay on a subject to be announced during the session, the winner of the Evans prize being excluded.

NOTE.—1. The Prizes will be awarded at the close of the Academic year.
2. The Faculty of Instruction reserves to itself the right of withholding prizes in cases in which sufficient merit is not shown.

RESIDENCE.

The Vancouver High School is not a boarding school. Students from outside districts may, on application to the Secretary of the School Board or to the Principal, obtain a list of suitable boarding houses. Such students are required to report their place of residence to the Principal.

FEES.

No fee is exacted from any student either from the city or elsewhere.

LIST OF STUDENTS

In attendance at the Vancouver High School for the Academic year 1894-95.

CLASS "A."

1	Bennett, Ellen	Vancouver City
2	Bodwell, Charlotte	Lulu Island
3	Bodwell, Louise	"
4	Bovyer, George	South Vancouver
5	Cameron, Florence	Vancouver City
6	DePencier, Percy	" "
7	DePencier, Theodore	" "
8	Edgett, Louise	" "
9	Eggert, Charles	" "
10	Gordon, Jessie	" "
11	Hatch, Sarah	" "
12	Howe, Hattie	South Vancouver
13	Lang, Isabella	Vancouver City
14	McLaren, Lulu	" "
15	McTaggart Henry	" "
16	Moscrop, Susan	" "
17	Moss, Laura	" "
18	Spillman, Margaret	" "

CLASS "B."

19	*Agnew, Sara Beatrice	Vancouver City
20	Allan, Alexander	" "
21	*Bovyer, John Wesley	South Vancouver
22	Brown, Bessie	Vancouver City
23	Brown, Royal Waldo	" "
24	Dodd, Leonard Alleyne	Yale
25	*Garratt, Wilber Hall	Lulu Island
26	Godfrey, Fred. Harold	Vancouver City
27	*Gordon, Alexander Bruce	" "
28	*Henderson, Richard Arthur	Chilliwack
29	Johnstone, Jean Pattison	Vancouver City
30	*McAlpine, Sara	" "
31	Macgowan, Roy	" "
32	*McQueen, Annie, Whetham	" "
33	Moors, Norman	" "
34	Murray, Whitley	" "
35	Nicholson, Malcolm	" "
36	Ogilvie, Ethel May	" "
37	Oppenheimer, Rena	" "
38	Ravey, Martin James	" "
39	Rennison, Winfred George	Comox

40	*Robinson, Esther	Vancouver City
41	Scurry, Albert	" "
42	*Sexsmith, Frances Louise	Lulu Island
43	Short William Andrew	Vancouver City
44	Urquhart, Alice Elizabeth	" "
45	Whitworth, Gladys	" "
46	Wood, Alma Edna	" "

*Promoted to Class "A" at Mid-summer Examination.

"CLASS "C."

47	Armstrong, Mabel	Vancouver City
48	†Barwick, Stanley	" "
49	Berteaux, Ralph	" "
50	Bovyer, Mark Oswald	South Vancouver
51	Breeze, William Graham	Vancouver City
52	Cameron, Sadie Bell	" "
53	Campbell, Jessie	" "
54	†Chapman, Ernest	" "
55	Charleson, Gertrude	" "
56	†Clark, Maggie Belle	" "
57	Clarke, William	" "
58	Dumville, Mary Ellen	" "
59	†Foster, John McGregor	" "
60	Fowler, Hector Allen	" "
61	†George, Mary	" "
62	†Hooper, Lillie	" "
63	†Jones, John Alexander	" "
64	McAlpine, Florence Muriel	" "
65	McAlpine, Olga Elizabeth	" "
66	McLaren, David	" "
67	McLaren, John Archibald	" "
68	McLean, Margaret	" "
69	McLeod, Floretta	" "
70	Magee, Etta	" "
71	Morris, William Alexander	" "
72	Moss, Wilhelmina	" "
73	Oppenheimer, Flora Jeanetta	" "
74	Robinson, Miriam	" "
75	†Springer, Frank	" "
76	Stark, Ernest Wilfred	" "
77	Stitt, Hazel Eleanor	" "
78	†Telford, Robert	" "
79	Tierney, Martha	" "
80	Tracy, Louie	" "
81	Turner, Bertha	" "
82	Wescott, Edith Mary	" "

83	Whitlaw, Lawrence	Vancouver City
84	Wilson, Jean Ingram	" "
85	Wilson, Hugh	" "
86	†Wood, Bertram George	" "
87	Worsnop, Charles Benson	" "
88	†Young, Beatrice Jane	" "

†Promoted to Class "B" at Mid-summer Examination.

CLASS "D."

89	Arthur, Janie	New Westminster
90	Austin, Cassie	" "
91	Barnes, Lena	Vancouver City
92	Blair, Mabel	" "
93	Brown, Willie	" "
94	Burnett, Minnie	" "
95	Carter, Ethel	" "
96	Dixon, Mary	" "
97	Eldridge, Julia	" "
98	Fowler, Archibald	" "
99	Fraser, Mary	" "
100	George, Bessie	" "
101	Johnson, Jennie	" "
102	Lawson, Winnie	" "
103	Livingstone, Eliza	Langley
104	McLeod, Mary	Sumas
105	McKenzie, Kate	New Westminster
106	McKinnon, Mary	Vancouver City
107	McNair, Laura	" "
108	McNutt, Eressa	" "
109	Mathers, Thomas	" "
110	Mitchell, Jennie	" "
111	Moffat, Maud	" "
112	Morris, Ethel	" "
113	Parker, Edith	" "
114	Reid, Jamima	" "
115	Ward, Mary	" "

CLASS "E."

116	‡Baxter, Annie	Vancouver City
117	‡Baxter, Matilda	" "
118	‡Black, Ellen	" "
119	‡Blair, William	" "
120	‡Bodwell, Lue	Lulu Island
121	‡Campion, Rosa	Vancouver City
122	‡Chase, William	" "
123	‡Clements, Jessie	" "

124	‡Clarkson, Bertram	Vancouver City
125	Daniels, Frena	North Arm
126	‡Earle, Harry	Vancouver City
127	‡Ford, Harry	" "
128	‡Fraser, Clifford	" "
129	Graham, Alice	" "
130	‡Hamilton, Myrtle	" "
131	‡Howe, Gertrude	South Vancouver
132	Janes, Albert	Vancouver City
133	McLachlan, Kate	" "
134	‡McNider, Maud	" "
135	McGuire, Jessie	" "
136	Marshall, Ida	" "
137	Matthews, Hilda	" "
138	‡Marsden, Lily	" "
139	Madill, Adella	" "
140	‡Matheson, George	" "
141	‡Mason, Charles	" "
142	‡Mace, William	" "
143	Mills, Maud	" "
144	‡Moscrop, Arthur	" "
145	Morrison, Stanley	" "
146	‡Moffatt, Bessie	" "
147	Nelson, Annie	" "
148	Olmstead, Hattie	" "
149	Purvis, Cecil	" "
150	‡Ridley, Oscar	" "
151	‡Ross, Margaret	" "
152	‡Stanfield, Gertrude	" "
153	‡Slagg, John	" "
154	Southcott, Mabel	" "
155	Thompson, Percy	" "
156	‡Tilley, Jennie	" "
157	‡Tierney, Lena	" "
158	Urquhart, Christina	" "
159	‡Woodward, May	" "

‡Promoted to Class "D" at Mid-summer Examination.

TEACHERS' EXAMINATIONS.

The following students of the Vancouver High School were successful in obtaining certificates at the last Teachers' Examination, viz. :—

(Names in order of merit.)

FIRST CLASS—GRADE A.

McTaggart, Henry Allen
Edgett, S. Louise
Bennett, Ellen Christine

FIRST CLASS—GRADE B.

Gordon, Jessie Fisher
Bovyer, George Mason
Lang, Sarah I.
Ravey, Martin James

SECOND CLASS—GRADE A.

McLaren. Louise M.

SECOND CLASS—GRADE B.

Burnett, Minnie
Lawson. Winnifred C.
Moss, Laura Emma
Ward, Mary Ellen
Fraser, Mary Isabel
Johnson, Jennie Alice
Moffatt, Maud L.
Livingstone, Eliza J.
Carter, Ethel J.
McKinnon, Mary

THIRD CLASS—GRADE A.

Eldridge, Julia May

THIRD CLASS—CLASS B.

Henderson, Richard Arthur
Parker, Edith Clara
Austin, Catherine Ellen
Brown, William H.
George, Elizabeth
Bodwell, Louise Harwood
McNair, Laura
Barnes, Willena N.
Dixon, Mary
McLeod, Mary Jane

ENTRANCE EXAMINATIONS.

CHRISTMAS, 1894.

Central School (F. M. Cowperthwaite, B.A., Principal)—

Blanche M. Corey, Cecil Purvis, Mabel Southcott, Ethel Barnes, Lena B. Tierney, Annie Nelson, Chas. Mason, J. H. Clarkson, Lue Bodwell.

East End School (G. H. Tom, Principal)—

Myrtle Hamilton, Tena Urquhart, Oscar Ridley, Harry Ford, John Slagg, Bertie Janes.

West End School (T. A. McGarrigle, B.A., Principal)—

Jean Tilley, Rosa Campion, Katie McLachlan, Bessie Moffatt, Harry Earle, Wm. Mace.

Mount Pleasant School (G. W. Jamieson, Principal)—

Matilda Baxter, Clara Wood, May Woodward, Lena Hoffar, Maud Mills, Hilda Matthews, Jessie McGuire.

JUNE, 1895.

Central School—

Edith M. Gordon, Sam A. Rose, Roy L. Anderson, J. E. Rose, Annie G. Revely, Thos. J. Browne, Florence L. Holmes.

East End School—

Maud McGirr, Edwin A. McDonald, Clara McNair, James F. Saunders, James A. McConaghy, Elizabeth Cook, Sarah E. Gordon, Agnes Cooke.

West End School—

Stanley McKay, Nelson Wintemute, Constance Matthews, Thomas Le Cappellain, Wm. Anstie.

Mount Pleasant School—

Frances Murray, Gertrude Whitman, Hope Lawson, James McMillan. Theodora McCleery, Annie Burritt, Annie Marstrand.

PROMOTION EXAMINATIONS.

LATIN.

Examiner.....JAMES C. SHAW, A.M.

CLASS "A."

I.

VERSE PAPER.

Time: Three Hours.

A.

(a.) Translate:

Haec ait, et Maia genitum demittit ab alto,
ut terrae utque novae pateant Karthaginis arces
hospitio Teucris, ne fati nescia Dido
finibus arceret. Volat ille per aëra magnum
remigio alarum, ac Libyae citus astitit oris.
Et iam iussa facit, ponuntque ferocia Poeni
corda volente deo; in primis regina quietum
accipit in Teucros animum mentemque benignam.

I. *Maia genitum.* Who is this?

II. *Hospitio Teucris.* Explain this construction.

III. Comment on the sequence of tenses in the first sentence.

IV. *Animum memtemque.* Distinguish.

(b.) Translate:

Iamque adeo super unus eram, cum limina Vestae
servantem et tacitam secreta in sede latentem
Tyndarida aspicio; dant clara incendia lucem
erranti passimque oculos per cuncta ferenti.
Illa sibi infestos eversa ob Pergama Teucros,
et poenas Danaum et deserti coniugis iras
praemetuens, Troiae et patriae communis Erinys,
abdiderat sese, atque aris invisa sedebat.
Exarsere ignes animo; subit ira cadentem
ulcisci patriam, et sceleratas sumere poenas:
scilicet haec Spartam incolumis patriasque Mycenas
aspiciet, partoque ibit regina triumpho?

I. The episode of which this passage is the opening is bracketed in some editions of Vergil. On what grounds?

II. *Deserti coniugis.* Who is this?

III. Explain the case of *Danaum*; decline *Erinys*; *invisa* may be translated in two ways; give the principal parts of *latentem*, *exarsere*, *ulcisci*, and *parto*.

IV. Scan the last two lines.

V. Give a brief account of Vergil's life and works.

B.

(a.) Translate:

. . . memor
actæ non alio rege puertiæ,
mutatæque simul togæ.
Cressa ne careat pulchra dies nota,
neu promtæ modus amphoræ,
neu morem in Salium sit requies pedum,
neu multi Damalis meri
Bassum Threica vincat amystide,
neu desint epulis rosæ,
neu vivax apium, neu breve lilium.

I. Explain all the customs referred to in this extract.

II. Account for the cases of *nota*, *meri* and *epulis*.

III. Scan any two lines, and name the metre.

(b.) Translate:

Una de multis, face nuptiali
digna, periurum fuit in parentem
splendide mendax, et in omne virgo
nobilis ævum;
"Surge," quæ dixit iuveni marito,
"surge, ne longus tibi somnus, unde
non times, detur; socerum et scelestas
falle sorores;
quæ, velut nactæ vitulos leænæ,
singulos, eheu! lacerant: ego, illis
mollior, nec te feriam, neque intra
claustra tenebo."

I. Tell the story of this extract, giving the names of *una*, *parentem*, and *iuveni*.

II. *Splendide mendax.* What is this figure called?

III. Give the principal parts of *surge*, *falle*, and *nactae*.

IV. Scan the last stanza, and name the metre.

V. What references are there in the Odes to Horace himself and to other poets?

II.

PROSE PAPER.

Time: Three Hours.

A.

(a.) Translate:

Dum haec in colloquio geruntur, Caesari nuntiatum est, equites Ariovisti propius tumulum accedere et ad nostros adequitare, lapides telaque in nostros conicere. Caesar loquendi finem facit seque ad suos recepit suisque imperavit, ne quod omnino telum in hostes reicerent. Nam etsi sine ullo periculo legionis delectae cum equitatu proelium fore videbat, tamen committendum non putabat, ut pulsis hostibus dici posset eos ab se per fidem in colloquio circumventos. Posteaquam in volgus militum elatum est, qua arrogantia in colloquio Ariovistus usus omni Gallia Romanis interdixisset, impetumque in nostros eius equites fecissent, eaque res colloquium ut diremisset, multo maior alacritas studiumque pugnandi maius exercitui iniectum est.

I. *Dum . . geruntur*, and *ut diremisset.* Mention the other meanings and constructions of *dum* and *ut.*

II. Account for the cases of *arrogantia*, *Gallia*, and *exercitui.*

(b.) Translate:

Loci natura erat hæc, quem locum nostri castris delegerant. Collis, ab summo æqualiter declivis, ad flumen Sabim, quod supra nominavimus, vergebat. Ab eo flumine pari acclivitate collis nascebatur, adversus huic et contrarius, passus circiter ducentos infima apertus, ab superiore parte silvestris, ut non facile introrsus perspici posset. Inter eas silvas hostes in occulto sese continebant: in aperto loco, secundum flumen, paucæ stationes equitum videbantur. Fluminis erat altitudo pedum circiter trium.

I. *Sabim.* Give the modern name, and also the ancient and modern names of the other rivers mentioned by Caesar.

II. Explain the following terms: *Exploratores*, *speculatores*, *calones*, *vexillum*, *manipulos laxare*, *sectionem vendere.*

III. Outline the contents of the First and Second Books of *The Gallic War.*

B.

I. The following words are peculiar in some respect: *vulgus*, *instar*, *linter*, *audere*, *tenus*.

II. Give the Latin for the different meanings of the word *country*.

III. *He came to see me.* Use this sentence in illustration of the various ways of expressing a *purpose* in Latin.

IV. Translate into Latin:

(a) There is no one but knows that the general has promised to come to Rome.

(b) This poet came from Athens to Crete, lived there many years, and died in that island at the age of sixty.

(c) As Caesar had arrived among the Remi suddenly and sooner than anyone had expected, they determined to send with all possible speed the chief men of the state as peace envoys to him.

(d) On the day after this a fierce combat of cavalry went on between the two forces from daybreak till dark, and the number slain was very great.

C.

I. "Apart from traditions and written records, there are sources from which a certain amount of historical knowledge can be obtained." Name them.

II. Contrast Asiatic and European institutions.

III. State the age and movement with which the following names are connected: Buddha, Zoroaster, Lycurgus, Pericles, Numa Pompilius, L. Junius Brutus, C. Sempronius Gracchus, Constantine the Great.

IV. Explain the following terms: *Pelasgi*, *Heracleidae*, *Gerusia*, *Eupatridae*, "*The Thirty*," *Lucumo*, *Decemviri*, *Publicani*, *Suffetes*, *Castra Praetoria*.

V. Trace in outline the constitutional development at Athens from Theseus to Cleisthenes inclusive.

VI. Give a brief sketch of the Second Punic War.

GREEK.

Examiner.....ALEXANDER ROBINSON, B.A.

XENOPHON: ANABASIS, BOOKS I, II.

Time: Three Hours.

I.

A. Translate:

Ἄνδρες στρατιῶται, μὴ θαυμάζετε, ὅτι χαλεπῶς φέρω τοῖς παροῦσι πράγμασιν. Ἐμοὶ γὰρ Κῦρος ξένος ἐγένετο, καί με, φεύγοντα ἐκ τῆς πατρίδος, τά τε ἄλλα ἐτίμησε, καὶ μυρίους ἔδωκε δαρεικούς· οὓς ἐγὼ λαβὼν, οὐκ εἰς τὸ ἴδιον κατεθέμην ἐμοὶ, ἀλλ' οὐδὲ καθηδυπάθησα, ἀλλ' εἰς ὑμᾶς ἐδαπάνων. 4. Καί πρῶτον μὲν πρὸς τοὺς Θρᾷκας ἐπολέμησα, καὶ ὑπὲρ τῆς Ἑλλάδος ἐτιμωρούμην μεθ' ὑμῶν, ἐκ τῆς Χερρονήσου αὐτοὺς ἐξελαύνων, βουλομένους ἀφαιρεῖσθαι τοὺς ἐνοικοῦντας Ἕλληνας τὴν γῆν. Ἐπειδὴ δὲ Κῦρος ἐκάλει, λαβὼν ὑμᾶς ἐπορευόμην, ἵνα, εἴ τι δέοιτο, ὠφελοίην αὐτὸν, ἀνθ' ὧν εὖ ἔπαθον ὑπ' ἐκείνου. 5. Ἐπεὶ δὲ ὑμεῖς οὐ βούλεσθε συμπορεύεσθαι, ἀνάγκη δή μοι, ἢ ὑμᾶς προδόντα τῇ Κύρου φιλίᾳ χρῆσθαι, ἢ πρὸς ἐκεῖνον ψευσάμενον μεθ' ὑμῶν ἰέναι. Εἰ μὲν δὴ δίκαια ποιήσω, οὐκ οἶδα· αἱρήσομαι δ' οὖν ὑμᾶς, καὶ σὺν ὑμῖν, ὅ τι ἂν δέῃ, πείσομαι. Καὶ οὔποτ' ἐρεῖ οὐδεὶς, ὡς ἐγὼ Ἕλληνας ἀγαγὼν εἰς τοὺς βαρβάρους, προδοὺς τοὺς Ἕλληνας, τὴν τῶν βαρβάρων φιλίαν εἱλόμην. 6. Ἀλλὰ ἐπεὶ ὑμεῖς ἐμοὶ οὐκ ἐθέλετε πείθεσθαι, οὐδὲ ἕπεσθαι, ἐγὼ σὺν ὑμῖν ἕψομαι, καὶ, ὅ τι ἂν δέῃ, πείσομαι. Νομίζω γάρ, ὑμᾶς ἐμοὶ εἶναι καὶ πατρίδα καὶ φίλους καὶ συμμάχους, καὶ σὺν ὑμῖν μέν ἂν εἶναι τίμιος, ὅπου ἂν ὦ· ὑμῶν δ' ἐρημωθεὶς, οὐκ ἂν ἱκανὸς εἶναι οἶμαι, οὔτ' ἂν φίλον ὠφελῆσαι, οὔτ' ἂν ἐχθρὸν ἀλέξασθαι. Ὡς ἐμοῦ οὖν ἰόντος, ὅπῃ ἂν καὶ ὑμεῖς, οὕτω τὴν γνώμην ἔχετε.

1. (a.) καὶ μυρίους ἔδωκε δαρεικούς. Reduce to English money:

(b.) ἀνθ ὧν εὖ: Explain the syntax.

2. (a.) Ἕλληνας ἀγαγὼν . . . . , προδοὺς τοὺς Ἕλληνας—κ. τ. λ. : Why are these participles not joined by a connective?

(b.) νομίζω γὰρ ὑμᾶς ἐμοὶ εἶναι καὶ πατρίδα καὶ φίλους καὶ συμμάχους: Quote the line in the Iliad that may have suggested this expression of Clearchus.

3. Parse, giving chief parts:
κατεθέμην, ἀφαιρεῖσθαι, δέοιτο, προδόντα, δέῃ.

4. Account for the cases of the following words and write their nom. and gen. in full in sing. and plural: ἄνδρες, ἐμοὶ, οὓς, ὑμᾶς, αὐτοὺς.

5. Different measures of length are mentioned in the First Book; give their relative lengths and their equivalents in English measure.

6. A short sketch of Xenophon's life.

II.

B. Translate:

Πῶς ἂν οὖν ἔχοντες τοσούτους πόρους πρὸς τὸ ὑμῖν πολεμεῖν, καὶ τούτων μηδένα ἡμῖν ἐπικίνδυνον, ἔπειτα ἐκ τούτων πάντων τοῦτον ἂν τὸν τρόπον ἐξελοίμεθα ὃς μόνος μὲν πρὸς θεῶν ἀσεβής, μόνος δὲ πρὸς ἀνθρώπων αἰσχρός; παντάπασι δὲ ἀπόρων ἐστὶ καὶ ἀμηχάνων καὶ ἐν ἀνάγκῃ ἐχομένων, καὶ τούτων πονηρῶν, οἵτινες ἐθέλουσι δι' ἐπιορκίας τε πρὸς θεοὺς καὶ ἀπιστίας πρὸς ἀνθρώπους πράττειν τι. οὐχ οὕτως ἡμεῖς, ὦ Κλέαρχε, οὔτε ἀλόγιστοι οὔτε ἠλίθιοί ἐσμεν. ἀλλὰ τί δὴ ὑμᾶς ἐξὸν ἀπολέσαι οὐκ ἐπὶ τοῦτο ἤλθομεν; εὖ ἴσθι ὅτι ὁ ἐμὸς ἔρως τούτου αἴτιος τοῦ τοῖς Ἕλλησιν ἐμὲ πιστὸν γενέσθαι, καί ᾧ Κῦρος ἀνέβη ξενικῷ διὰ μισθοδοσίας πιστεύων τούτῳ ἐμὲ καταβῆναι δὶ εὐεργεσίας ἰσχυρόν. ὅσα δ' ἐμοὶ χρήσιμοι ὑμεῖς ἐστε τὰ μὲν καὶ σὺ εἶπας, τὸ δὲ μέγιστον ἐγὼ οἶδα· τὴν μὲν γὰρ ἐπὶ τῇ κεφαλῇ τιάραν βασιλεῖ μόνῳ ἔξεστιν ὀρθὴν ἔχειν, τὴν δ' ἐπὶ τῇ καρδίᾳ ἴσως ἂν ὑμῶν παρόντων καὶ ἕτερος εὐπετῶς ἔχοι.

1. Explain the meaning of the last sentence.

2. παντάπασι δὲ ἀπόρων ἐστι . . . . . οἵτινες ἐθέλουσι κ. τ. λ. Two constructions are combined in this sentence.

3. εὖ ἴσθι ὅτι ὁ ἐμὸς ἔρως τούτου αἴτιος τοῦ τοῖς Ἕλλησιν ἐμὲ πιστὸν γενέσθαι κ. τ. λ.

(a.) What is the government of the infinitives in this passage? (b.) What difference would the reading τὸ (instead of τοῦ) make in the construction?

4. Account for the cases of the following words and give their nom. and gen. in full in both sing. and plural;
ἀπόρων, ἐξὸν, τούτῳ, ὅσα.

5. Parse, giving chief parts:
ἐξελοίμεθα, ἴσθι, καταβῆναι, παρόντων.

6. By what phrases does Xenophon express "at daybreak," "at sunrise," "about midnight," "in the forenoon," "at sunset?"

III.

1. Decline together (a.) in the singular: *αὕτη ἡ θάλατται—τίς ἀνήρ*—(b.) in the plural: *τὸ ὄρος—καλὴ ἐλπίς.*

2. Compare: *δῆλος, σαφής, εὐδαίμων, μέγας, αἰσχρός.*

3. Write the augmented forms of initial vowels and dipthongs in verbs. Where is the augment used?

4. What are the reduplicated forms of verbs beginning with *φ, θ, στ, ῥ, αἰ, κρ*?

5. Form the aor. infin. act. in use of: *λείπω, τιμάω, ἀγγέλλω, ἔχω, δίδωμι.*

6. Write the modal conjugation of:

(a.) aor. act. of: *μένω.*
(b.) perf. pass. of: *τύπτω.*
(c.) 1 aor. pass. of: *ἀγγέλλω.*

C. Translate into Greek: The battle did not take place in our land but in the Thebans'.—For there was no grass, nor yet any tree.—He said that not they, but himself was general.—Thence he marched, one day's march, five parasangs, to the river Pyramus, a plethron in width.—And Cyrus asked what the watchword was. And Clearchus replied, "Zeus (the) Saviour and Victory."

HOMER: Iliad, Books I., II.

Time: Two Hours.

A. Translate:

ἦμος δ' ἠέλιος κατέδυ καὶ ἐπὶ κνέφας ἦλθεν,
δὴ τότε κοιμήσαντο παρὰ πρυμνήσια νηός.
ἦμος δ' ἠριγένεια φάνη ῥοδοδάκτυλος Ἠώς,
καὶ τότ' ἔπειτ' ἀνάγοντο μετὰ στρατὸν εὐρὺν Ἀχαιῶν.
τοῖσιν δ' ἴκμενον οὖρον ἵει ἑκάεργος Ἀπόλλων.
οἱ δ' ἱστὸν στήσαντ', ἀνά θ' ἱστία λευκὰ πέτασσαν·
ἐν δ' ἄνεμος πρῆσεν μέσον ἱστίον, ἀμφὶ δὲ κῦμα
στείρῃ πορφύρεον μεγάλ' ἴαχε νηὸς ἰούσης·
ἡ δ' ἔθεεν κατὰ κῦμα διαπρήσσουσα κέλευθον.
αὐτὰρ ἐπεί ῥ' ἵκοντο κατὰ στρατὸν εὐρὺν Ἀχαιῶν,
νῆα μὲν οἵ γε μέλαιναν ἐπ' ἠπείροιο ἔρυσσαν
ὑψοῦ ἐπὶ ψαμάθοις, ὑπὸ δ' ἔρματα μακρὰ τάνυσσαν,
αὐτοὶ δ' ἐσκίδναντο κατὰ κλισίας τε νέας τε.

1. Epic forms of nouns occur in this extract; write the corresponding Attic forms.

2. Scan first four lines, exhibiting quantities, when necessary.

3. Give the derivations of the following words: *ἠριγένεια, ῥοδοδάκτυλος, ἑκάεργος, ὠκυπόροισι.*

4. Sketch a figure of an Homeric ship, making the *ἱστός, ἱστίον, πρότονοι* and *ἱστοδόκη.*

B. Translate:

ἄλλοι μὲν ῥ' ἕζοντο, ἐρήτυθεν δὲ καθ' ἕδρας·
Θερσίτης δ' ἔτι μοῦνος ἀμετροεπὴς ἐκολῴα,
ὅς ῥ' ἔπεα φρεσὶν ᾗσιν ἄκοσμά τε πολλά τε ᾔδη,
μάψ, ἀτὰρ οὐ κατὰ κόσμον, ἐριζέμεναι Βασιλεῦσιν,
ἀλλ' ὅτι οἱ εἴσαιτο γελοίιον Ἀργείοισιν
ἔμμεναι. αἴσχιστος δὲ ἀνὴρ ὑπὸ Ἴλιον ἦλθεν·
φολκὸς ἔην, χωλὸς δ' ἕτερον πόδα· τὼ δέ οἱ ὤμω
κυρτώ, ἐπὶ στῆθος συνοχωκότε· αὐτὰρ ὕπερθεν
φοξὸς ἔην κεφαλήν, ψεδνὴ δ' ἐπενήνοθε λάχνη·
ἔχθιστος δ' Ἀχιλῆι μάλιστ' ἦν ἠδ' Ὀδυσῆι·
τὼ γὰρ νεικείεσκε. τότ' αὖτ' Ἀγαμέμνονι δίῳ
ὀξέα κεκληγὼς λέγ' ὀνείδεα. τῷ δ' ἄρ' Ἀχαιοὶ
ἐκπάγλως κοτέοντο, νεμέσσηθέν τ' ἐνὶ θυμῷ.

1. From what you have read of the Iliad, write a note on the social condition of the Greeks of the Homeric Age.

2. What is meant by the Wolfian theory in regard to these poems?

3. When we read Homer as boys, we imagine him to be essentially a lover of war: discuss this.

4. Homer's ideas in regard to a future state.

MATHEMATICS.

GEOMETRY.

Examiner.....GEO. E. ROBINSON, B.A.

CLASS "A."

Time.....$2\frac{1}{4}$ Hours.

I. The exterior angles of a *convex* rectilinear figure made by producing the sides successively are together equal to four right angles. Prove this, and investigate the proposition when the word *convex* is omitted.

II Prove II. 6 by the *line method.*
Write the algebraic equivalent of II. 7.
Enunciate geometrically $(a+b)^2-(a-b)^2=4ab$.
Show that the solution of the equation $x^2=a\ (a-x)$ suggests the construction in II. 11.
Explain the double sign.

III. In a given circle place a chord of given length, having its middle point on a given chord. When is this impossible? *Or*, describe a circle which shall touch a given circle and also touch a given straight line at a given point.

IV. What is Euclid's test of proportion? Employ this test to show that 4, 5, 7, 9 are not proportionals.
"The terms of an *analogy* are proportional by *conversion.*" Explain.
Define: *similar rectilinear figures, extreme and mean ratio harmonically divided.*

V. Parallelograms which are equiangular to one another have to, one another the ratio compounded of the ratios of their sides.

VI. To construct a rectilinear figure similar to one given recti linear figure and equal to another.

VII. Two circles touch externally in C; a point D is taken outside them, such that the radii AC, BC subtend equal angles at D, and DE, DF are tangents to the circles: if EF cut DC in G, prove that DE is to DF as EG to GF.

III. What is a parabola? How may it be described practically? If two chords of a parabola intersect one another, the rectangles contained by their segments are in the ratio of the parameters of the diameters which bisect the chords.

ALGEBRA.

Examiner.....GEO. E. ROBINSON, B.A.

CLASS "A."

Time: Two Hours.

I. Extract the fifth root of 3 to two places of decimals.

II. What is a *surd?* What is an *impossible quantity?* The equation $x^3 - 1 = 0$ has three roots; find them: show that each of these values when cubed is equal to unity.

III. Find the value of $(100)^{-\frac{5}{2}}$.

Multiply $a^{\frac{2}{3}} + b^{\frac{1}{3}} + c$ by $a^{\frac{2}{3}} - b^{\frac{1}{3}} + c$.

Divide $x^2 + y^2$ by $x^{\frac{2}{3}} + y^{\frac{2}{3}}$.

Write down the square root of $6 + \sqrt{20}$.

IV. Solve the equations:

(1) $\dfrac{x+1}{6} - \dfrac{2x-6}{7} = 6 - \dfrac{4x + 13\frac{2}{3}}{14}$

(2) $\sqrt{x(3-x)} = \sqrt{x+1} + \sqrt{2(x-1)}$

(3) $3x^3 - 3x^2 - x + 1 = 0$

(4) $\begin{cases} \dfrac{x^2}{y} + \dfrac{y^2}{x} = 4\frac{1}{2} \\ x + y = 3 \end{cases}$.

V. If the first term of a geometrical series is a and the constant factor f, find an expression for the sum of n terms. From this obtain the value of the sum of an infinite series in geometrical progression, f being less than unity.

VI. How many permutations can be made of the letters in the word *algebra* taken all together?

Show that ${}_nC_r = {}_nC_{n-r}$

VII. What is the Binomial Theorem? Find the *rth* terms of the following expansions: $(1+x)^7$, $(1-x)^{12}$, $(1-x)^{-\frac{1}{2}}$.

VIII. Express 23.125 in the nonary scale. Transform 3256 from the septenary to the duodenary scale. Prove that 441 is a square number in any scale whose radix is greater than 4.

TRIGONOMETRY,

Examiner.....GEO. E. ROBINSON, B.A.

CLASS "A."

Time: Two Hours.

I. Express the value of sine, cosine and cosecant in terms of the tangent of the angle.

Prove geometrically that $\tan\frac{A}{2} = \frac{\sin A}{1 + \cos A}$ when A is an angle between 90° and 180°.

II. Two adjacent sides of a parallelogram are of lengths 15 and 24 and the angle between them is 60°; find the lengths of both diagonals.

In every triangle ABC cos A = (in terms of the sides).

Complete the equation and deduce the value of $\sin\frac{A}{2}$.

III. Use your mathematical tables to extract the fifth root of .003; also, to find a in the triangle ABC in which C = 90°, $c = 345.625$ and B = 45° 30′ 15″. How would you solve a triangle having given the three sides? Write the logarithmic equations.

IV. Prove $\sin(A + B) = \sin A \cos B + \cos A \sin B$. Write the three companion formulae and test the truth of that for $\cos(A - B)$ by making A = 120° and B = 30°. Obtain the value of cos 3A in terms of cos A.

V. Trace the changes in sign and magnitude of the value of the cosine as the angle increases from 180° to 360°. Draw "the curve of the cosine" (−90°.....450°).

VI. What is π? What is "the angle whose circular measure is π"? In a triangle ABC the angle A is 90 degrees and the angle B 33.3 grades; express the angle C in circular measure.

VII. What do you understand by $\cos^{-1}x$, $\tan \sin^{-1}x$ and $\sin^{-1} \tan x$?

Express in the inverse notation $\cot 2\theta = \frac{\cot^2\theta - 1}{2 \cot \theta}$ when $\cot \theta = a$.

VIII. Show that (a) $\cot^2 A - \tan^2 A = \dfrac{4 \cos 2A}{\sin^2 2A}$

(b) $OA = \dfrac{c \sin \frac{1}{2} B}{\cos \frac{1}{2} C}$ where O is the in-centre of the triangle ABC.

(c) $\text{Sin } 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$ if $A + B + C = 180°$.

WRITTEN ARITHMETIC.

Examiner.....JOHN H. KERR, B.A.

CLASS "A."

I. A man holds three notes—one for \$1000, due April 1st; the second, \$1600, due July 1st; the third, \$1200, due Sept. 1st; he has them exchanged for two others, one of which is for \$2000 due may 1st; find when the other note matures.

II. A person in London owes another in St. Petersburg 460 roubles which must be remitted through Paris. He pays the requisite sum to his brokers when exchange between London and Paris is 23 francs per £1, between Paris and St. Petersburg 2 francs per rouble. The remittance is delayed until the rates are 24 francs per £ and $1\frac{1}{2}$ francs per rouble; what did the broker gain or lose!

III. Bought stock at $197\frac{5}{8}$ and sold it at $194\frac{7}{8}$, having meanwhile received a dividend of 6% on it. My net gain by the transaction, after paying $\frac{1}{8}$% brokerage each way, is \$336. How much stock did I buy?

IV. A mixture of black and green tea is worth \$22.65. Another mixture with the proportions interchanged is worth \$24.60. 4 lbs. of black cost as much as 5 lbs. of green. Find cost of each per lb.

V. How much does a grocer who gives $15\frac{3}{8}$ oz. for a lb. cheat a customer who buys \$64 worth?

VI. The sides of a rectangle have to each other the ratio of $1 : \sqrt{3}$; a perpr. is let fall from one of the angles on the diagonal; find in what ratio the diagonal is divided.

VII. Find the volume of a cube the area of whose surface is 100.86 square in.

VIII. The volume of a prism is 6 cubic ft., its height is 9 inches, and its base is an isosceles right angled triangle; find its edges.

IX. The base of pyramid is a trapezoid whose parallel sides are 19.5 and 13.7 in., and perpr. dist. is 12.6 in., and altitude is 14 in. At what distance above the base must a parallel plane be drawn to bisect the pyramid?

X. The radius of the base of a right circular cone is 2 in., and its volume is that of a spherical shell of 4 in. external and 2 in. internal diameter. Find height of cone.

MENTAL ARITHETIC.

Examiner.....JOHN H. KERR, B.A.

CLASS "A."

I. Each side of a triangular flower bed is 25 yds. long; what is its area?

II. I had $50, and after spending some of it, what I had left was half of what I had spent. How much had I left?

III. A man wishing to sell a horse asked 25% more than cost, but finally took 15% less than his asking price and gained $5.75. How much did the horse cost?

IV. The discount on $556.50 for 9 months is $16.50; find rate of interest.

V. The amount of a sum at a certain rate for 2 years is $290, and for 4 years at the same rate is $330; find the sum and rates.

VI. In what proportion must water be mixed with milk to reduce it from 20c. to 16c. a gallon?

VII. A train goes from A to B in 6 honrs; if it increases its speed 10 miles an hour it will make the distance in 4 hours; find the distance.

VIII. When 1 guinea is the amount of £1, of what sum is 1 guinea the interest?

IX. $\frac{2}{3}$ of the time since 7.30 a.m. = $\frac{1}{2}$ time to 9.30 p.m.; what o'clock is it?

X. The difference between the interest and discount on a sum for $1\frac{1}{2}$ years at 8% is $18; find the sum.

BOOK-KEEPING.

Examiner.....JOHN H. KERR, B.A.

CLASS "A."

I. (a) Define partnership.
(b) Name four ways by which a partnership may be dissolved

II. Illustrate "private marking."

III. Define—Stock Company; Limited Liability; Solvent; Salvage.

IV. Journalize:—

(a) Renewed our note in favor of A. B. for $150. Gave a new note at 1 mo. for $151.

(b) Retired A. B.'s note for $200, receiving from him cash $100 and a new note for $101.

(c) Drew on A. B. at sight for $500. Had the draft discounted, and then sent the proceeds, $498, to C. D. on account.

(d) Received from A. B. for sale on their account, goods invoiced at $800. Paid freight in cash $20.

(e) Sold above for $1,000 cash. Rendered an account sales, charging 2% commission; $25 for storage and 1% insurance. Remitted A. B. check for amount due him.

V (a) Write the draft in (c).
(b) " " check in (e).

VI. Average the following:

Jan. 2. Sold Fullerton on 30 dys. credit mdse. $100.
Feb. 28. " " 20 " " " $50.
Feb. 17. Received from Fullerton cash $60.
Mar. 15. " " " " $70.

VII. Make out the account sales for 4 (e).

DYNAMICS.

Examiner.....J. K. HENRY, B.A.

Time: Two Hours.

I. Deduce the three fundamental equations of uniformly accelerated motion.

II. A body is thrown vertically upwards with vel. u; show that time of rising and time of falling are same.

A body is thrown horizontally, vel. 40 ft. per sec., from a cliff 150 ft. high. How far from the base of the cliff will it strike the ground?

III. Write the laws of motion, Law II. may be written in two ways. From law II. deduce (a) its algebraic equivalent, (b) the principle of PhIndependence ofrescaloysi Fc.

IV. A mass of 10 lbs. falls from a height of 1000 ft.; find its kinetic energy and its potential energy after $3\frac{1}{2}$ seconds. In the case of a falling body K.E. plus P.E. = a constant. Give a general proof.

V. How long will it take a body to move down a smooth inclined plane 5 ft. long and 4 ft. high?

VI. Describe Atwood's machine. What are its uses?

VII. A shot of 800 lbs. is projected from a 40-ton gun with a vel. of 2000 ft. per sec. Find the vel. with which the gun would commence to recoil, if free to move in the line of projection. If the recoil be resisted by a constant pressure equal to the weight of 17 tons, through how many feet will the gun recoil?

VIII. State the laws of the pendulum. Find the length of a pendulum to beat seconds where a body is observed to fall 16.125 ft. in the first second.

IX. If in V. the body weigh 10 lbs., and the coefficient of fraction $= \frac{1}{3}$, how long will it take the body to slide down the plane?

X. A bullet is projected with a vel. of 640 ft. per sec. at an angle of 30° with the horizon; find (1) the greatest height attained, (2) the range on a horizontal plane, (3) the time of flight.

PHYSICS.

Examiner.....J. K. Henry, B.A.

Time: Two Hours.

I. Describe the propagation (a) of the sound wave, (b) of the light wave.

II. Investigate the physical relation of the notes *do re, me,* etc of the musical scale.

III. A Centigrade and a Fahrenheit thermometer hang side by side. The sum of their readings is 60; find reading of each.

IV. Describe an artificial means of producing ice, carefully explaining the principles involved.

V. Explain the terms Absolute Zero, Critical Temperature, Convection, Specific Heat.

VI. Show, with aid of a diagram, how a double convex lens magnifies.

VII. Explain the following phenomena:

(a) A straight stick held obliquely in water appears bent at the surface.

(b) The rosy tint of the snows on the mountain tops at sunset.

(c) Red sealing-wax in yellow light is black.

VIII. Explain the principle of the lightning rod.

IX. Show by diagrams three ways of arranging a battery of 4 cells If the E.M.F. of each is 1 volt, its internal resistance $\frac{1}{2}$ an ohm, and the external resistance 10 ohms, find the current in each case.

X. What are the laws of induced currents. Describe an induction coil. Diagram.