



Harris Institute,

PRESTON.

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PROSPECTUS

1900-1901.

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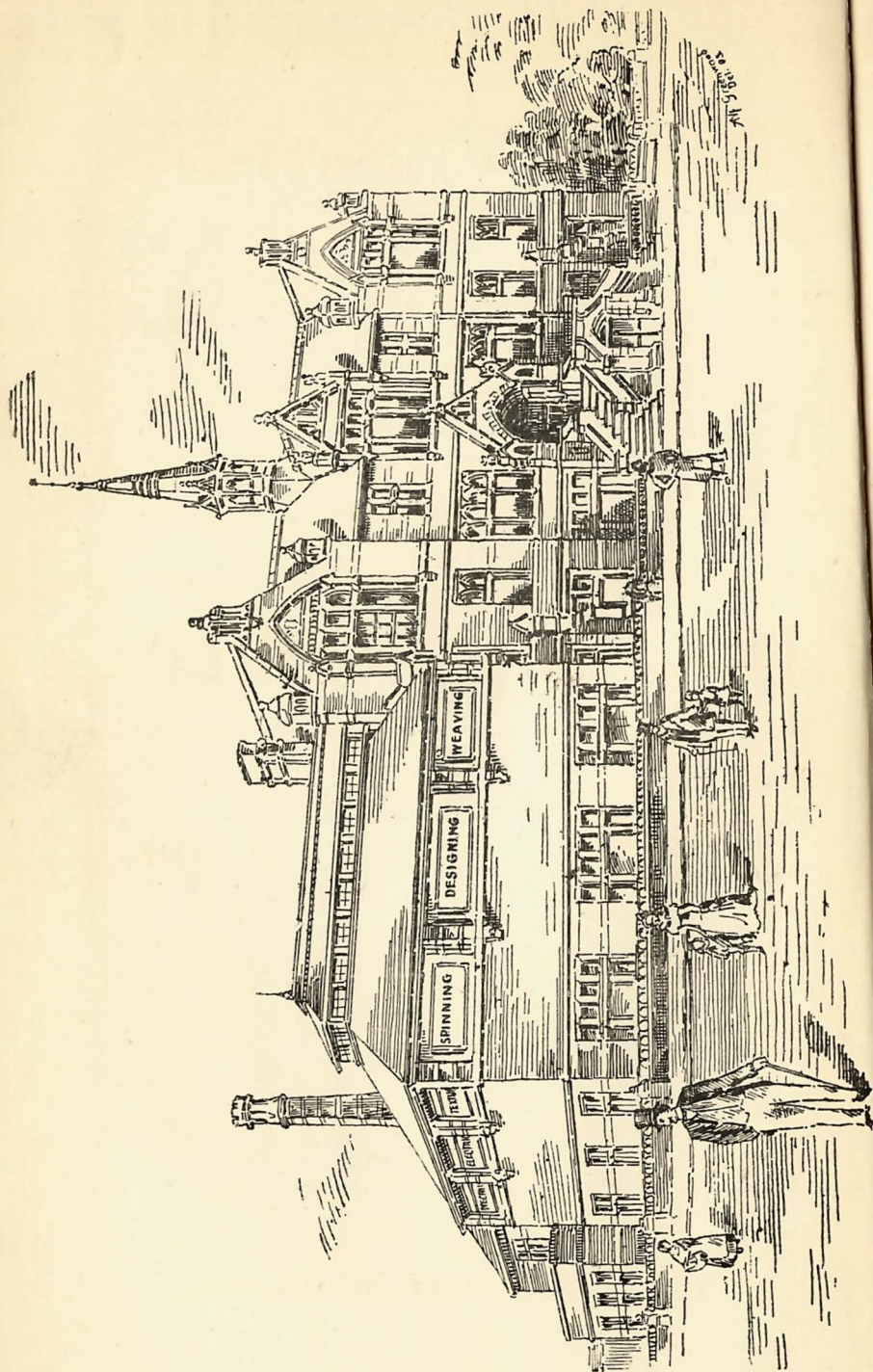


PRESTON:

T. SNAPE & Co., PRINTERS, &c., 141, CHURCH STREET.

1900.







# HARRIS INSTITUTE, PRESTON.

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President :

WILLIAM ASCROFT, ESQ., J.P.

Vice-President :

THE REV. GEORGE STEELE, M.A.

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## PROSPECTUS, 1900=1901.

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THE SESSION COMMENCES

MONDAY, SEPTEMBER 17th, 1900.

STUDENTS CAN BE ENROLLED ON FRIDAY EVENING, SEPTEMBER 14TH, FROM  
7 TO 9 P.M., AT THE INSTITUTE, AVENHAM, AND AT THE TECHNICAL  
SCHOOL, CORPORATION STREET.

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It is very important that all Students should join the Classes  
on the Opening Day.

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ALL FEES PAYABLE IN ADVANCE.

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## Council, 1901.

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### President.

Mr. WM. ASCROFT, J.P.

### Vice-President.

The Rev. GEO. STEELE, M.A.

### Treasurer.

Colonel OLIVER, J.P.

### Council.

Mr. W. Ascroft, J.P.  
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Mr. Y. W. Booth, J.P.  
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Mr. M. B. Copland, J.P.  
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Rev. R. C. Fletcher, M.A., C.A.  
Mr. J. Y. Foster.

Mr. E. Greenwood, J.P.  
Mr. J. H. Hammond, M.D., J.P.  
Mr. John Healey, J.P.  
Mr. H. P. Hornby, J.P., C.C.  
Mr. F. Hollins, J.P.  
Mr. J. C. Iles, M.A., H.M.I.  
Colonel Oliver, J.P.  
Mr. J. J. Sidgreaves, J.P.  
Mr. John Stanning, J.P.  
Rev. Geo. Steele, M.A.  
Rev. L. C. Wood, B.A., C.A.



# Officers and Committees, 1901.

## General Purposes Committee.

Chairman:—Mr. W. Ascroft      Vice-Chairmen:—The Rev. R. C. Fletcher and  
Mr. H. Calvert

*All Members of the Council are on this Committee.*

## Finance Committee.

Chairman:—Mr. Y. W. Booth      Vice-Chairman:—Mr. J. J. Sidgreaves  
Mr. R. F. Easterby      Rev. R. C. Fletcher      Mr. R. W. Ascroft  
Mr. J. Y. Foster      Colonel Oliver

## Agricultural Committee.

Chairman:—Rev. L. C. Wood      Vice-Chairman:—Mr. R. C. Assheton  
Rev. R. C. Fletcher      Mr. H. P. Hornby      Mr. H. F. Hibbert  
Mr. J. Y. Foster      Mr. R. A. L. Hutchinson      Mr. J. J. Sidgreaves  
Mr. J. H. Hammond      Mr. F. Hollins      Mr. Jno. Stanning

## Avenham Institute Committee.

Chairman:—The Rev. Geo. Steele      Vice-Chairman:—Mr. E. Dickson  
Mr. R. W. Ascroft      Mr. R. C. Assheton      Mr. Hy. Davies  
Mr. R. F. Easterby      Mr. Y. W. Booth      Mr. J. C. Iles  
Mr. H. P. Hornby      Mr. J. H. Hammond

## Technical School Committee.

Chairman:—Mr. F. Hollins      Vice-Chairman:—Mr. E. Greenwood  
Mr. Y. W. Booth      Mr. J. Y. Foster      Mr. R. C. Assheton  
Rev. R. C. Fletcher      Mr. J. Healey      Mr. Hy. Davies  
Mr. M. B. Copland      Mr. J. Stanning

## Domestic Economy School Committee.

Chairman:—Dr. Hammond      Vice-Chairman:—Colonel Oliver  
Mr. Y. W. Booth      Mr. R. F. Easterby      Mr. E. Greenwood  
Mr. E. Dickson      Rev. R. C. Fletcher      Mr. J. J. Sidgreaves

## Building Committee.

Chairman:—Mr. J. Stanning      Vice-Chairman:—Mr. J. Healey  
Mr. R. W. Ascroft      Mr. J. Y. Foster      Rev. R. C. Fletcher  
Mr. Y. W. Booth      Mr. M. B. Copland      Colonel Oliver  
Mr. E. Greenwood      Mr. F. Hollins

*The President and Vice-President are on all Committees.*

## Officers of Committee.

Vacant—Principal.

T. R. JOLLY, Secretary.

# HARRIS INSTITUTE, PRESTON,

**Session 1900-1901.**

## NOTICE TO STUDENTS.

1.—*The first Lecture in each Course will be free, and in it Teachers will give an outline of the work to be done.*

2.—All Fees must be paid in advance, and Students must obtain the official receipt in the Library, and the same must be shown to the Lecturer before their names can be entered on the Register.

3.—Students are expected to attend regularly and punctually through the Session, and to sit at all Examinations when required by the Principal.

4.—The Teachers of the various Classes report to the Principal regarding all Students who, in their opinion, are of insufficient attainments to benefit by the instruction given. The Principal is authorised to exclude such Students from the Classes or to transfer them to a more elementary course.

5.—*All Students must do the exercises set weekly in Class, and must use the regulation exercise book for the purpose. No Prizes will be given unless the weekly exercises are satisfactorily done.*

6.—Students must keep notes of lectures and practical work, and these must be written up neatly week by week.

7.—Students cannot take more than two Science Subjects unless a third is "Mathematics." *The Council advise all Students to limit the number of subjects, as success is greatly assisted by a limited choice.* All who wish to benefit to the greatest possible extent by the Institute Classes are strongly advised to take up one of the Organised Courses.

8.—Students are expected to find all necessary Text Books and Material. Apparatus for experiments is provided by the Council free of charge. Broken or damaged articles must be made good by the Students damaging the same. The Council will not be responsible for the loss of apparatus, material, or wearing apparel left by the Students in the Institute.



9.—All Students attending any Science or Technical Class are recommended simultaneously to attend a Class in Arithmetic or Mathematics according to their capacity. Facilities for such attendance will be provided without extra charge.

10.—Before joining the Classes in Mathematics, Students may be tested by or under the direction of the Principal as to their knowledge and capacity, and, if not sufficiently advanced, will be required to join the Class in Arithmetic.

11.—Candidates now attending Elementary Day Schools, desirous of joining the Classes at the Institute, must have passed the 5th Standard.

12.—The Principal will nominate for the consideration of the Council, a limited number of Students for Scholarships who may fail to pass the May Examinations, 1900, and who are considered especially deserving for their class work and attendance. In making his recommendations, the Principal will be guided, to a large extent, by the report of the various members of the staff.

13.—Students who receive a Scholarship in the Elementary Stage must attend the Advanced Class the following Session in that subject in which the Scholarship is awarded.

14.—All business communications relating to the Classes, Examinations, &c., must be addressed to T. R. Jolly, Registrar.



## LIST OF STAFF.

**Principal :**

Vacant.

**Mathematical Department :**

J. I. CANN, B.A., Lond.

P. F. GILLIES, B.Sc., Edin.

J. C. NEILL, B.A., Vict.

**Chemistry and Physics Department :**

THE PRINCIPAL.

P. F. GILLIES, B.Sc., Edin.

G. BROWNLEE, B.Sc., Edin.

**Engineering Department :**

F. J. PYE.

E. Y. TERRY, Wh. Sch.

J. BENTHAM.

**Building Trades Department :**

F. J. PYE.

R. SANDERSON.

A. BROCKLEHURST.

J. A. BERTWISTLE.

M RAWSTHORN.

**Natural History Department :**

J. HARRISON, A.R.C.Sc.

J. GARDNER, F.R.G.S.

**Spinning and Weaving Department :**

J. TASKER, Wh. Sch.

I. MOLINEAUX.

W. H. THOMAS.

Vacant.

Vacant.

**Commercial Department :**

Vacant.

E. H. SMIRK.

H. A. JUTZI.

J. C. NEILL, B.A., Vict.



**Miscellaneous Classes :**

J. TOMLINSON.  
JOS. SMITH.

**Domestic Economy Department :**

MRS. ARNOUX.  
MISS CLARKE.  
MISSES ATKINSON.  
MRS. BARTON.  
MISS MARSHALL.  
MISS HUNTLY.  
MRS. LAMB.  
MISS WESTWORTH.

**Art Department :**

A. BURT, A.R.C.A.  
W. H. THOMAS.  
MISS F. BENTHAM.  
MISS HOWARD.  
H. A. RIGBY.

**Pupil Teachers' Department :**

J. I. CANN, B.A., Lond.  
J. C. NEILL, B.A., Vict.  
MISS WARING, L.L.A.  
JOS. SMITH,  
and others.

**Manual Instruction Department :**

J. A. BERTWISTLE.

**Agricultural Department :**

THE PRINCIPAL.

Vacant

P. F. GILLIES, B.Sc., Edin.  
J. BROWNLEE, B.Sc., Edin.  
C. BLACKHURST, M.R.C.V.S.  
J. C. NEILL, B.A., Vict.  
F. E. DIXON, A.M.I.C.E.  
J. HARRISON, A.R.C.Sc., Lond.  
W. H. THOMAS.

**Secretary and Registrar :**

T. R. JOLLY.

**GENERAL TIME TABLE.**

*In the following Table A stands for Science and Art School, Avenham; C for Technical School, Corporation Street; G for Domestic Economy School, Glover Street.*

SUBJECT.	Place of Meeting.	Day of Meeting.	Time of Meeting.	LECTURER.
<b>CHEMISTRY AND PHYSICS DEPARTMENT:</b>				
<b>Inorganic Chemistry,</b>				
Theoretical, Elementary...	A	Thurs.	7 to 8	The Principal.
Do. Advanced .....	A	Tues.	7 to 8	P. F. Gillies, B.Sc.
Do. Ad. Practical...	A	Thurs.	7 to 10	(The Principal.
Do. E. Practical...	A	Thurs.	8 to 10	P. F. Gillies, B.Sc.
				(G. Brownlee, B.Sc.
Sound, Light, and Heat.....	A	Tues.	7 to 8	G. Brownlee, B.Sc.
				(The Principal.
Do. do. Practical.	A	Tues.	8 to 9-30	P. F. Gillies, B.Sc.
				(G. Brownlee, B.Sc.
<b>Electricity and Magnetism,</b>				
Advanced ...	A	Mon.	7-15 to 8-15	P. F. Gillies, B.Sc.
Do. Elementary ..	A	Mon.	7-15 to 8-15	G. Brownlee, B.Sc.
				(The Principal.
Do. Practical Ad.	A	Mon.	8-15 to 10	P. F. Gillies, B.Sc.
				(G. Brownlee, B.Sc.
<b>Theoretical Mechanics, Solids</b>				
Do. do. Fluids	A	Wed.	7 to 8	P. F. Gillies, B.Sc.
	A	Wed.	8-15 to 9-15	Do.
Classes in Honours Inorganic Chemistry, Organic Chemistry, and Advanced Heat will be arranged if required.				
<b>MATHEMATICAL DEPARTMENT:</b>				
Prelim. Mathematics .....	C	Thurs.	7 to 8	J. C. Neill, B.A.
Stage I. ....	A	Tues.	7-15 to 8-15	J. I. Cann, B.A.
		Wed.	7-15 to 8-15	Do.
Stage II., III., IV. ....	A	Tues.	8-30 to 9-30	Do.
		Wed.	8-30 to 9-30	Do.
<b>ENGINEERING DEPARTMENT:</b>				
Prelim. Draughtsmanship...	C	Fri.	7-15 to 8-45	J. A. Bertwistle
<b>Practical Plane and Solid Geometry, Elementary ...</b>				
Do. Advanced .....	C	Fri.	7-30 to 9	F. J. Pye
	C	Fri.	9 to 10	Do.
<b>Steam and the Steam Engine, Elementary .....</b>				
Do. Advanced .....	C	Thurs.	7 to 8	E. Y. Terry, Wh. Sch.
	C	Mon.	7 to 8	Do.
<b>Machine Construction, Elem.</b>				
Do. Adv...	C	Thurs.	8 to 9-30	Do.
	C	Wed.	8 to 9-30	Do.
<b>Applied Mechanics, Elem....</b>				
Do. Adv.....	C	Mon.	8 to 9-20	Do.
	C	Wed.	7 to 8	Do.
<b>BUILDING TRADES DEPARTMENT:</b>				
Prelim. Draughtsmanship...	C	Fri.	7-15 to 8-45	J. A. Bertwistle.
<b>Building Construction, Elem.</b>				
Do. Adv...	C	Thurs.	7-30 to 8-45	F. J. Pye.
	C	Tues.	7-30 to 9	Do.
Do. Honours	C	Mon.	7-30 to 9	Do.
		Tues.	7-30 to 9	Do.



SUBJECT.	Place of Meeting.	Day of Meeting.	Time of Meeting.	LECTURER.
<b>BUILDING TRADES DEPARTMENT—Continued.</b>				
Brickwork and Masonry.....	C	Thurs.	8-45 to 10	F. J. Pye.
Carpentry and Joinery .....	C	Wed.	7-30 to 9-15	Do.
Plumbers' Work—				
Ordinary Grade .....	C	Fri.	7 to 8-15	R. Sanderson.
Honours Grade.....	C	Fri.	8-30 to 9-30	Do.
Practical .....	C	Tues.	7-30 to 9-30	Do.
<b>NATURAL SCIENCE DEPARTMENT:</b>				
Botany, Advanced .....	A	Mon.	7 to 8	J. Harrison, A.R.C.Sc.
Do. Practical, E. & Ad..	A	Mon.	8-15 to 9-45	Do.
Do. Elementary .....	A	Tues.	7 to 8	Do.
General Biology, Elemen. ...	A	Tues.	8-15 to 9-15	Do.
Geology .....	A	Wed.	7 to 8	Do.
Physiology, Advanced.....	A	Wed.	8-15 to 9-15	Do.
Hygiene, Elementary .....	A	Thurs.	7 to 8	Do.
Do. Advanced .....	A	Thurs.	8-15 to 9-15	Do.
Physiology, Elementary.....	A	Fri.	7 to 8	Do.
Do. Practical, E. & A.	A	Fri.	8-15 to 9-45	Do.
Physiography, Section I. ...	A	Mon.	7 to 8-30	J. Gardner, F.R.G.S.
Do. Elementary..	A	Mon.	8-30 to 9-30	Do.
Do. Elemen., for				
P.T.'s & Certif. Students...	A	Wed.	7 to 8	Do.
			8 to 9	Do.
Do. Advanced ...	A	Mon.	8-30 to 9-30	Do.
<b>SPINNING AND WEAVING DEPARTMENT:</b>				
Cotton Spinning, Lancashire and Cheshire, Preliminary	C	Tues.	8-45 to 9-30	J. Tasker, Wh. Sch.
Cotton Spinning, Ordinary...	C	Tues.	7-30 to 9	Do.
Do. Honours Grade...	C	Fri.	7-30 to 9	Do.
Weaving and Designing,				
Ordinary Grade ...	C	Wed.	7-30 to 9	I. Molineaux.
Do. Practical .....	C	Fri.	7-30 to 9-15	Do.
Do. Honours .....	C	Fri.	7-30 to 9	Do.
Do. Practical .....	C	Mon.	7-30 to 9-15	Do.
Do. Design, Drawing ..	C	Tues.	7-30 to 9	W. H. Thomas.
<b>COMMERCIAL DEPARTMENT:</b>				
Bookkeeping, Elementary ...	C	Thurs.	7-15 to 8-30	Vacant.
Do. Intermediate..	C	Mon.	7-15 to 8-30	Do.
Do. Advanced .....	C	Thurs.	8-35 to 10	Do.
Shorthand, Elementary .....	C	Mon.	7 to 8	E. H. Smirk.
Do. Advanced .....	C	Mon.	8 to 9	Do.
Do. Speed Practice,				
50 to 100 words	C	Thurs.	7 to 8	Do.
100 to 140 words	C	Thurs.	8 to 9	Do.
Arithmetic, Elementary.....	C	Tues.	7 to 8	Vacant.
Do. do. ....	C	Wed.	7 to 8	Do.
Do. Intermediate ...	C	Tues.	8 to 9	Do.
Do. Advanced .....	C	Wed.	8 to 9	Do.



SUBJECT.	Place of Meeting.	Day of Meeting.	Time of Meeting.	LECTURER.
COMMERCIAL DEPARTMENT—				
<i>Continued.</i>				
French, Elementary .....	A	Fri.	7 to 8	H. A. Jutzi.
Do. Advanced .....	A	Fri.	8 to 9	Do.
English, Elementary .....	C	Thurs.	8 to 9	J. C. Neill, B.A.
Do. Advanced .....	C	Thurs.	9 to 10	Do.
MISCELLANEOUS CLASSES :				
Music—Harmony, Elemen...	A	Fri.	7 to 8	J. Tomlinson.
Do. Advanced	A	Wed.	8-15 to 9-15	Do.
Singing—Tonic Sol-fa, Elm.	C	Mon.	7-15 to 8-15	J. Smith.
Do. do. Inter.	C	Mon.	8-15 to 9-15	Do.
Do. Staff Notation.....	C	Tues.	7-30 to 9	Do.
Latin ... ..	C	Mon.	8-30 to 9-30	Vacant.
Manual Training .....	C	Daily		J. A. Bertwistle.
DOMESTIC ECONOMY SCHOOL :				
Cookery .....	G	<i>See</i>	<i>Special Time</i>	<i>Table</i>
Laundry Work .....				
Dressmaking .....				
Millinery.....				
Sick Nursing .....				
ART DEPARTMENT :				
(1) <i>Day Classes—</i>				
General .....	A	Mon.	{ 11 to 1 2-30 to 4-30	A. Burt, A.R.C.A.  W. H. Thomas.  F. Bentham.  H. A. Rigby.  E. Howard.
		Fri.	{ 11 to 1 2-30 to 4-30	
Modelling .....	A	Tues.	{ 11 to 1 2-30 to 4-30	
Design .....	A	Tues.	{ 2-30 to 4-30	
Life .....	A	Wed.	{ 11 to 1	
Wood Carving .....	A	Wed.	{ 11 to 1	
(2.) <i>Evening Classes—</i>				
General .....	A	Mon.	{ 7-15 to 9-15	H. A. Rigby.
		Wed.		
		Thurs.		
	A	Fri.	{ 7-15 to 9-15	E. Howard.
		Mon.		
		Wed.		
Modelling .....	A	Thurs.	{ 7-15 to 9-15	
	A	Fri.	{ 7-15 to 9-15	
		Tues.		
Life .....	A	Tues.	{ 7-15 to 9-15	
Wood Carving .....	A	Fri.	{ 7-15 to 9-15	
AGRICULTURAL DEPARTMENT...			<i>See</i>	<i>Special Time Table</i>
TEACHERS' CLASSES.....			<i>See</i>	<i>Special Time Table</i>

## Fees.

**Science.**—5/- per Session for the first Science subject.  
2/6 for one other Science subject.

Practical Classes in Chemistry or Physics, 10/6 per subject. *No student may take a Practical Class without taking the corresponding Theoretical one as well.*

An extra Fee of £1 1s. will be charged to all those Students who join the Classes without undertaking to sit for the Examinations conducted by the Board of Education; such Fee will, however, be returned if the Student subsequently makes the qualifying attendances and takes the Examinations.

**Technology.**—5/- for each subject per Session.  
7/6 for Advanced and Honours Courses.

**Commercial & Miscellaneous.**—5/- for Elementary Courses.  
7/6 for Advanced Courses.

**Art.**—DAY CLASSES.—40/- per Session.  
30/- for 2 Terms.  
17/6 for 1 Term.

EVENING CLASSES.—10/- per Session.  
8/- for 2 Terms.  
5/- for 1 Term.

### Domestic Economy.

Cookery .....	} Various Fees. (See Special Syllabus.)
Laundry .....	
Dressmaking .....	
Millinery .....	
Plain Sewing.....	

**Practical Chemistry.**—Students may be admitted to the Laboratory for Special Work at times other than the usual class hours, at a Fee of £1 1s. per Session for each two hours per week. No such Student may attend less than four hours per week.

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NOTE.—Except by permission of the Principal, no Student will be allowed to take up more than two Science subjects together with Mathematics, or more than one Science subject, one Technical subject, and Mathematics. No Student may take up more than two Technical subjects without special permission, nor more than one Technical subject if a Science subject is taken in addition.

*In each Class Students will be expected to answer questions set weekly for home work, and to study their Text Books, as it is impossible to gain any adequate knowledge of a subject by simply attending weekly lectures.*





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**Science and Technical School.**

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Science and Technical School



## Object of the School.

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The Classes in this School are intended to meet the present day requirements of commercial competition. Their object is to benefit the workman and others by making them intelligent exponents of the work in which they are engaged, and to shew them the why and the wherefore of industrial processes.

The Classes are broadly divisible into Scientific and Technical. The former will follow closely the syllabus laid down by the Department of Science and Art, *but at the same time will furnish an adequate course for those who wish to read for University Scholarships or for a Degree.* The latter embrace more particularly the practical applications of the principles dealt with in the Theoretical Classes. They do not pretend to be a *substitute* for practical work or apprenticeship, but will render clear many points of doubt and difficulty which crop up in the mind of an intelligent and painstaking workman. They will at the same time provide him with the means of obtaining a certificate, which cannot but carry weight as evidence of a complete familiarity with the bearings of his trade.

Although there is no compulsory course of instruction laid down, students are *strongly advised* to take up one of the organised courses specified below, in order that a definite and continuous training may be ensured. These courses are carefully graded, and arranged so that each year's work leads up naturally to the work of the succeeding year.

On completion of the curriculum, the Council will grant a *Diploma*, setting forth the various successes gained during the course, to all those students who have obtained at least one first-class in the first year and two in each of the succeeding years, provided that they have also satisfied the Examiners in the remaining subjects of the course. A student may take a supplemental examination, should he fail to qualify in accordance with the above requirements.

Where time permits, with the permission of the Principal, a student will be allowed to include Drawing as part of his organised course, or to take it as an alternative to Practical Plane and Solid Geometry.

The courses are not absolutely fixed and unalterable, but may, with the consent of the Principal, be modified to suit particular cases.

Students who have completed one or more of the sub-joined courses will be encouraged to take a fourth course, in which they will be allowed to devote themselves more particularly to one branch, with a view to specialisation.

### ORGANISED COURSES.

*E stands for Elementary, A for Advanced.*

#### MECHANICAL ENGINEERING.

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geom. E.	Mathematics, Stage II.	Applied Mechanics A.
Mathematics, Stage I.	Machine Construc. E.	Machine Construc. A.
Heat A.	Applied Mechanics E.	Steam A.
Theoretical Mechanics E		Engineering Laboratory

#### ELECTRICAL ENGINEERING.

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geom. E.	Mathematics, Stage II.	Applied Mechanics E.
Mathematics, Stage I.	Electricity E.	Steam A.
Machine Construction E	Heat A.	Electricity A.
		Electrical Engineering

#### PATTERN-MAKING.

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geom. E.	Mathematics, Stage II.	Machine Construc. A.
Mathematics, Stage I.	Machine Construc. E.	Applied Mechanics A.
Freehand & Model	Applied Mechanics E.	Carpentry & Joinery
Drawing	Carpentry & Joinery	Drawing



*BUILDING TRADES.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geometry	Theoretical Mechncs. E	Brickwork & Masonry
Mathematics, Stage I.	Carpentry and Joinery	Carpentry and Joinery
Building Construction E.	Building Construc. A.	Hygiene A.
	Hygiene E.	

*PLUMBING TRADES.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geometry	Heat A.	Building Construc. A.
Theoretical Chemistry E	Theoretical Chemistry A	Plumbing
Theoretical Mechanics E	Plumbing	Hygiene A.
	Building Construc. E.	

*COTTON SPINNING.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Machine Construction E	Theoretical Mechncs. E	Applied Mechanics A.
Steam E.	Machine Construc. A.	Steam A.
Mathematics, Stage I.	Spinning E.	Spinning

*COTTON WEAVING.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Machine Construction E	Theoretical Mechncs. E	Machine Construc. A.
Mathematics, Stage I.	Applied Mechanics E.	Applied Mechanics A.
Drawing, Freehand and Model	Cotton Weaving	Theoretical Chemistry E
	Designing	Weaving

*TEACHERS, &c.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Mathematics, Stage I.	Mathematics, Stage II.	Agriculture A.
Physiography E.	or Hygiene A.	or Physiology A.
or Hygiene E.	Physiography A.	or Theoretical Chemistry A
Chemistry E.	Woodwork for Teachers or Agriculture E.	Woodwork for Teachers

*SHOPKEEPERS, CLERKS, &c.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Arithmetic	Bookkeeping A.	Shorthand A.
Bookkeeping E.	Shorthand E.	French Correspondence
French E.	French A.	German E.

*IRON AND BRASS FOUNDERS.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geom. E.	Mathematics, Stage I.	Applied Mechanics A.
Theoretical Chemistry E	Applied Mechanics E.	Electricity E,
Theoretical Mechanics E	Chemistry A.	Drawing and Designing

*CABINET MAKERS.*

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geom. E.	Plane & Solid Geom. A.	Designing
Carpentry	Applied Mechanic E.	Wood Carving
Arithmetic	Designing	Cabinet Making
Drawing	Cabinet Making	



## SOAPMAKERS.

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geom. E.	Machine Construc. A.	Organic Chemistry E.
Machine Construction E	Steam E.	Steam A.
Theoretical Chemistry E	Theoretical Mechncs. A	Soap Manufacture
	Soap Manufacture	

## MISCELLANEOUS TRADES.

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
Plane & Solid Geometry	Mathematics, Stage I.	Steam E.
Theoretical Chemistry E	Theoretical Mechncs. E	Heat A.
Electricity E.	Theoretical Chemistry A	or Agriculture A.
or	or	or
Botany E.	Electricity A.	Electricity A.
	or	or
	Botany A.	Botany A.



## **Mathematical Department.**

### **TIME TABLE.**

Preliminary Mathematics	C	Thursday	7 to 8	J. C. Neill, B.A.
Mathematics, Stage I.	A	Tuesday Wednesday	7-15 to 8-15 7-15 to 8-15	J. I. Cann, B.A. Do.
Mathematics, Stage II., III., IV.	A	Tuesday Wednesday	8-30 to 9-30 8-30 to 9-30	Do. Do.

### *PRELIMINARY MATHEMATICS.*

This Class is intended as introductory to Mathematics, Stage I. It will also provide a short course for those Students who only want a slight acquaintance with the subject for other purposes.

It will deal with Arithmetic, the elementary parts of Euclid, and Algebra up to simple equations.

### *MATHEMATICS, STAGE I.*

This course will cover the requirements of Students who need an elementary acquaintance with Mathematics in order to apply them to the Study of Mechanics or Physical Science. No Candidate will be allowed in this Class unless he has at least as much knowledge of Mathematics as can be obtained from the Preliminary Class.

*Euclid.*—Book I.

*Algebra.*—Definitions, simple rules, factors, H.C.F. and L.C.M. fractions, equations.

*Arithmetic.*—The more advanced parts—a knowledge of decimals and of proportion in Arithmetic will be assumed—interest, percentages, stocks, &c.

*Text Books* :—

Layng's Euclid (Blackie), Book I., 1s.

Hall & Knight's Algebra for Beginners (Macmillan),  
2s. 6d.



### MATHEMATICS, STAGE II.

Candidates for London Matriculation and Intermediate Examinations will find this course suitable to their requirements.

Students reading for Naval Cadetships in the Royal Military Academy will also find this course useful.

*Euclid*.—The properties of rectangles and circles.

*Algebra*.—Involution and evolution, surds, quadratics, ratio, proportion, variation.

*Trigonometry*.—The elements of, as far as the solution of plane triangles.

*Text Books* :—

Layng's Euclid (Blackie), Book II., 6d. ; Book III., 1s. ;  
Book IV., 6d.

Lock's Trigonometry for Beginners (Macmillan), 2s. 6d.  
Hall & Knight's Elementary Algebra, 4s. 6d.

### MATHEMATICS, STAGES III. & IV.

Students desirous of taking up these stages should attend the lectures on Stage II.

Their reading will be directed, and help will be given them in order that they may be adequately prepared for the examination.

No student will be allowed to take these stages who is not, in the opinion of the Principal, sufficiently advanced to benefit thereby.

STAGE III.—*Algebra*.—Permutations and combinations, theory of indices, binomial theorem.

*Trigonometry*.—Ratios of multiple and submultiple angles, polygons and circles in and about triangles and polygons ; area of circles.

*Text Books* :—

Euclid, as for Stage II., and Layng Book VI.  
Hall & Knight's Trigonometry (Macmillan),  
4s. 6d. ; or Lock's Trigonometry, 4s. 6d.  
Hall & Knight's Higher Algebra, 7s. 6d.

STAGE IV.—*Plane and Solid Geometry*.—Ratios of Rectilinear figures. Trihedral and polyhedral angles. Prisms and pyramids. The sphere, cylinder, and cone. The properties of the parabola, ellipse, and hyperbola.

*Text Books :—*

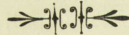
Layng's Euclid, Book IV., 6d. ; Books V. and VI., 1s. ; Book XI.

Wilson's Solid Geometry and Conics (Macmillan), 3s. 6d.

Geometrical Conic Sections, Cockshott & Walters (Macmillan & Co.).

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*Students taking Mathematics are requested to note that a considerable time must be devoted to home work between each lecture, and that without such application progress is impossible.*





## ***Chemistry and Physics Department.***

### **TIME TABLE.**

Inorganic Chemistry, Theoretical, Elementary...	A	Thursday	7 to 8	The Principal.
Do., do., Advanced.	A	Tuesday	7 to 8	P. F. Gillies, B.Sc.
Do., do., Ad. Practical.	A	Thursday	7 to 10	{ The Principal. P. F. Gillies, B.Sc.
Do., do., Elem. Practical	A	Thursday	8 to 10	{ G. Brownlee, B.Sc.
Sound, Light, and Heat .....	A	Tuesday	7 to 8	G. Brownlee, B.Sc.
Do., do., Practical.	A	Tuesday	8 to 9-30	{ The Principal. P. F. Gillies, B.Sc. G. Brownlee, B.Sc.
Electricity and Magnetism, Advanced.	A	Monday	7-15 to 8-15	P. F. Gillies, B.Sc.
Do., do., Elementary.	A	Monday	7-15 to 8-15	G. Brownlee, B.Sc.
Do., do., Practical Ad.	A	Monday	8-15 to 10	{ The Principal. P. F. Gillies, B.Sc. G. Brownlee, B.Sc.
Theoretical Mechanics, Solids	A	Wednes.	7 to 8	P. F. Gillies, B.Sc.
Do., do., Fluids	A	Wednes.	8-15 to 9-15	P. F. Gillies, B.Sc.

Classes in Honours Inorganic Chemistry, Organic Chemistry, and  
Advanced Heat will be arranged if required.

The Course in Chemistry will be found suitable both as a general introduction to scientific method, and also to those who intend to become Architects, Brewers, Builders, Engineers, Farmers, Manufacturers generally, and Medical and Pharmaceutical Students.

In the Elementary Course the properties of the most important gases and of typical elements, together with the fundamental Principles of Chemistry, will be taught. The Advanced Course will deal more fully with the subjects read in the Elementary Stage, and will, in addition, treat of the metals and their industrial applications, together with

a fairly complete *resumé* of Chemical Philosophy. In the Honours Stage, students will be encouraged to prepare papers dealing with subjects bearing upon the requirements of the Examination.

A Course in General Chemistry for those Students who require a general knowledge of the subjects with a view to its application in domestic, agricultural, or other work, is conducted in connection with the Agricultural School. A detailed Syllabus of the Course will be found on page 89.

The Elementary Course will cover the Syllabus of the London Matriculation Examination, while the Advanced will be found sufficient for Intermediate Science.

All students should make an effort to join the Practical as well as the Theoretical Course, and no student will be permitted to attend a Laboratory Class unless he takes a Theoretical Course as well.

Students desirous of taking up a Special Practical Course in the laboratories may do so on consultation with the Principal, and on paying a special fee.

#### *ELEMENTARY THEORETICAL COURSE.*

Distinction between chemical and physical change.

Action of heated iron, copper, or mercury on the air.

Composition of air, water, salt, chalk.

Physical properties of gases.

Systematic study of hydrogen, oxygen, nitrogen, chlorine. Hydrochloric acid and its allies. Sulphur and its most important compounds. Carbon. Nitric acid, and some of its derivatives. Symbols and formulæ. Equations. Calculations.

*Text Book.*—Newth's Elementary Practical Chemistry (Longmans), 2s. 6d.

#### *ELEMENTARY PRACTICAL CLASS.*

Methods of weighing and measuring.

Preparation of typical gases treated of in the Theoretical Course.

Experimental investigations of the effect of heat, water, or acids on different substances.

Quantitative investigation of simple chemical changes.

*Text Book.*—Cooper's Elementary Practical Chemistry (Whittaker), 2s.



## ADVANCED THEORETICAL COURSE.

The lectures will deal with the following :—

Principles of Chemical Philosophy and Laws of Chemical Combination.

Determination of the composition of water, air, hydrochloric acid, ammonia, oxides of nitrogen, oxides of carbon, sulphuretted hydrogen.

*Water*.—Hardness, suitability for domestic purposes.

*Hydrogen peroxide, ozone, air*.

*Chlorine*.—Bleaching powder, oxides and acids of chlorine.

*Bromine, Iodine, and Fluorine*.—Their preparation and properties.

*Phosphorus*.—Sources, allotropes, hydrides, chlorides, oxides, acids.

*Arsenic*.—Hydrides, chlorides, oxides, acids. Detection.

*Antimony and Bismuth*.—Hydrides, chlorides, oxides. Their place in a system of classification.

*Boron and Silicon*.—Their chief compounds.

The properties and chief compounds of the commoner metals with the methods of extraction from their ores, including—

Potassium and sodium.

Barium, strontium, and calcium.

Magnesium, zinc, and cadmium.

Mercury, lead, copper, silver, aluminium.

Iron, manganese, cobalt, nickel.

Tin, gold.

The manufacture of oxygen, chlorine, bromine, iodine, bleaching powder, sulphuric, hydrochloric, and nitric acids, washing soda and caustic soda, lime, iron and steel, copper, lead, mercury, gold, silver, zinc, aluminium, and sodium.

*Text Book*.—Chemistry for Advanced Students, Roscoe and Harden, 4s. 6d. (Macmillan.)

### ADVANCED PRACTICAL CLASS.

The principles of qualitative analysis.  
 Analysis of fairly complex mixtures.  
 Preparation of typical compounds of the metals.  
 Elementary quantitative analysis.

*Text Books.*—Cooper's Practical Chemistry (Whittaker), 2s., and Chapman Jones' Advanced Practical Chemistry (Macmillan), 2s. 6d.

*For Reference.*—Practical Chemistry—Valentin and Hodgkinson—(Churchill), 7s. 6d.

### HONOURS THEORETICAL COURSE.

A course of lectures and demonstrations in Honours, Theoretical Chemistry, Part I., will be conducted, provided that a sufficient number of students declare their intention of attending the same.

The course will include a discussion of the more advanced parts of chemical theory with the preparation and properties of substances not dealt with in the advanced course.

No student can take the course who has not already passed the advanced stage.

Students will be encouraged to read widely, and considerable time must be given to private study.

*Text Books.*—Various. Sources of information will be indicated at each lecture.

### HONOURS PRACTICAL COURSE.

Facilities for working in the Laboratories, with a view to taking Honours, will be afforded. It should be distinctly understood, however, that the Honours Examination is of a very searching character, and *at least* eight hours per week ought to be devoted to Laboratory work. Success in this stage depends very largely upon individual effort and exhaustive reading. Every help possible will be given to students desiring it.

*Text Book.*—Clowes and Coleman's Quantitative Analysis (Churchill), 9s.

### ORGANIC CHEMISTRY.

Students who take up this course must have some knowledge of Elementary Inorganic Chemistry.



The class will not be held unless at least eight students require instruction in this subject, and the time of meeting will be arranged to suit them.

Students wishing to take up the course should give in their names without delay to the Principal.

Practical Classes in Organic Chemistry will be arranged if sufficient Students apply.

Origin of Organic Chemistry. Organic analysis.

*Paraffins*.—Methane, ethane, propane, &c. Petroleum and its products. Haloid derivatives.

*Olefines*.—Ethylene and derivatives. Propylene. Butylene and pentylene.

*Alcohols*.—Methyl, ethyl, propyl, &c. Fousel oil. Primary, secondary, and tertiary alcohols. Glycols.

*Esters*.—Preparation and general properties.

*Aldehydes and Ketones*.—Preparation and general properties.

*Acids*.—Preparation and properties. Oxalic, succinic, tartaric and citric acids.

*Cyanogen derivatives*.—Cyanides, urea and uric acid, amines, amides, amido acids, &c.

*Acetylene* and its derivatives.

*Glycerine and allyl alcohol*.

*Glucoses, sucroses, and amyloses*.

*Text Book*.—Perkin and Kipping's Organic Chemistry, Part I. (Chambers).

### SOUND, LIGHT, AND HEAT.

This course will cover the requirements of Matriculation Candidates in Light and Heat. The classes in Magnetism and Electricity and in Mechanics will, together with this class, form a suitable elementary course in Physics.

*Sound*.—Vibratory motion. Waves. Velocity of Sound and how determined. Pitch and Loudness. Reflection of Sound. Echoes.

*Light*.—Its propagation. Shadows. Reflection and Refraction. Mirrors and Lenses.

*Heat*.—Heat and Temperature—their difference. Thermometers. Expansion of Solids, Liquids, and Gases. Specific and Latent Heat. Melting and Freezing. Boiling Points, and how determined. Conduction and Convection. Winds. Currents.

*Practical Class.*—In this class, which will be held after the Lecture Course, students will perform for themselves the fundamental experiments upon which the science is based.

Notes containing full instructions for the performance of these experiments will be given to each student in the Laboratory. A note-book of the work done must be kept, and no student will be allowed to pass on to a fresh section until his previous work has been approved and initialled by the teacher. This note-book must be compiled from the rough notes taken during the work in the Laboratory.

*Text Book.*—Jones's Sound, Light, and Heat (Longmans), 2s. 6d.

### ADVANCED HEAT.

This course will meet the requirements of students reading for the Intermediate Examination in Science of the University of London and for Scholarships in Natural Science.

Students wishing to join the class should give in their names to the Principal without delay.

*Thermometers.*—Different kinds of Thermometers. Measurement of high and low temperature.

*Expansion.*—Methods of measurement in solids, liquids, and gases.

*Calorimetry.*—Measurement of specific and latent heats. Laws of fusion and evaporation. Freezing mixtures.

*Transference of Heat.*—Conduction. Convection. Radiation.

*Thermo-dynamics.*—Transformation of heat energy. Mechanical equivalent of heat. Laws of Thermo-dynamics. Entropy. Thermo-electricity.

### Laboratory Work.

Selections from the following experiments will be performed by each student. Full directions will be given in the Laboratory :—

Comparison of thermometers and testing of their freezing and boiling points.

Determination of melting point of solids and liquids.

Determination of the effects of salts in solution upon the boiling point.

Depression of freezing point by saline impurities.

Co-efficient of expansion of solids (Matthiessen).

Co-efficient of expansion of liquids (weight thermometer).



Co-efficient of expansion of liquids (Sp. Gr. bottle).

Co-efficient of expansion of gases.

Specific heat experiments and calibration of calorimeter, etc.

Heat of fusion of ice and other solids.

Latent heat of steam.

Determination of vapour tension.

Hygrometry.

Newton's law of cooling.

Radiation experiments.

Determination of vapour density.

*Text Book.*—Stewart's Advanced Heat (Clive & Co.), 3s. 6d.

### *ELECTRICITY AND MAGNETISM—ELEMENTARY COURSE.*

This course will meet the requirements of the London Matriculation Examination in this subject.

*Magnetism.*—Properties of magnets. Inductions. Lines of force. Methods of making artificial magnets. Terrestrial magnetism. Declination. Inclination. Astatic combination.

*Electricity (Frictional).*—Two electrical states. Conductors and insulators. Electrosopes and electrophorus. Quantity. Potential. Capacity. Electrical machines. Condensers. Atmospheric electricity.

*Electricity (Voltaic).*—Batteries. Magnetic, thermal, and chemical effects of currents. Galvanometers.

*Practical Work.*—Students will have the opportunity of performing the more important experiments in the Physical Laboratory.

Notes containing full instructions for the performance of these experiments will be given to each student in the Laboratory. A note book of the work done must be kept, and no student will be allowed to pass on to a fresh section until his previous work has been approved and initialled by the Teacher. This note book must be compiled from the rough notes taken during the work in the Laboratory.

*Text Books.*—Elementary Magnetism and Electricity. Poyser (Longmans), 2s. 6d.; or Jamieson's Elementary Electricity and Magnetism (Griffin), 3s. 6d.

## *ELECTRICITY AND MAGNETISM—ADVANCED COURSE.*

This course will meet the requirements of students reading for the Intermediate Science Examinations of the University of London and for Natural Science Scholarships. It will also prove of great value to students taking up Electrical Engineering.

*Magnetism.* — Quantitative laws. Magnetic moment. Mutual action of magnets upon each other. Determination of the magnetic elements.

*Electricity (Frictional).*—Quantitative laws. Potential and capacity and their measurement. Specific inductive capacity. Energy of charge. Electrometers.

*Electricity (Voltaic).*—E. M. F., Current and resistance. Ohm's Law and its applications. Units. Measurement of current, resistance, and E. M. F. Galvanometers. Heating and lighting effects. Thermo-electricity. Laws of Electrolysis. Electro-dynamics. Magneto-electric induction. Electrolysis.

### **Laboratory Work.**

Magnetic distribution.

Effect of temperature on magnetism.

Determination of dip.

Proof of inverse square law.

Law of deflection and oscillation.

Comparison of magnetic moments.

Determination of H.

Law of sine and tangent galvanometers.

Calibration of galvanometers.

Proof of Ohm's Law.

Fall of potential along conductors.

Measurement of resistances by various methods.

Comparison of E. M. F.'s.

The experimental investigation of the theory of shunts.

Determination of galvanometer constant, &c.

*Text Books.*—Text Book of Electricity and Magnetism, Stewart (Clive & Co.), 3s. 6d.; Gunn's Arithmetic of Magnetism and Electricity (Blackie), 2s.



### *THEORETICAL MECHANICS (SOLIDS).*

This course, together with Theoretical Mechanics (Fluids), will cover the Syllabus of the London Matriculation Examinations. A knowledge of Mathematics, up to the requirements of Stage I., will be assumed.

Units of time and distance.

Velocity, acceleration, and their measurement. Gravity. Mass, force, density.

Parallelogram of forces. Momentum.

Parallel forces and centre of gravity.

States of matter. Work. Energy.

Mechanical powers. Circular motion. Pendulum.

#### *Text Books :—*

First Stage Mechanics (Solids), Rosenberg (Clive and Co.), 2s.

Loney's Mechanics and Hydrostatics (Camb. Press), 4s. 6d.

Advanced: Loney's Elements of Statics and Dynamics, (Camb. Press).

### *THEORETICAL MECHANICS (FLUIDS).*

Units of time and distance.

Velocity and acceleration and their measurement.

Gravity. Mass. Force.

Fluid pressure.

Floating bodies.

Determination of specific gravity.

Heat and temperature.

Hydrometer.

The air. Boyle's law. Pumps. Syphons, &c.

#### *Text Books :—*

First Stage Mechanics (Fluids), Rosenberg (Clive and Co.), 2s.

Loney's Mechanics and Hydrostatics (Camb. Press), 4s. 6d.

Advanced: Besant's Hydrostatics (Bell), 4s. 6d.

## **Engineering Department.**

### **TIME TABLE.**

Preliminary Draughtsmanship .....	C	Friday	7-15 to 8-45	J. A. Bertwistle.
Practical Plane and Solid Geometry, Elementary	C	Friday	7-30 to 9	F. J. Pye.
Do. Advanced...	C	Friday	9 to 10	Do.
Steam and the Steam Engine, Elementary...	C	Thursday	7 to 8	E. Y. Terry.
Do. Advanced...	C	Monday	7 to 8	Do.
Machine Construction, Ele.	C	Thursday	8 to 9-30	Do.
Do. Advan.	C	Wednes.	8 to 9-30	Do.
Applied Mechanics, Elem.	C	Monday	8 to 9-20	Do.
Do. Advan.	C	Wednes.	7 to 8	Do.

### *PRELIMINARY DRAUGHTSMANSHIP.*

This class has been formed to provide the preliminary training required before joining classes in Building Construction, Machine Construction, Plumbing, &c.

The use of mathematical instruments, the drawing of plans and elevations, and the reading of a drawing will be taught.

All students who do not possess this preliminary training should take this class.

*Facilities will be given to backward students in other classes to join this course for a limited period in order to improve their general attainments.*



*PRACTICAL PLANE AND SOLID GEOMETRY,  
ELEMENTARY.*

Construction of plane scales.

Proportional division of lines and construction of polygons and similar figures.

Principles of projections, plans, and elevations.

Elements of graphic arithmetic.

*Text Book.*—Low's Practical Plane and Solid Geometry, 2s.

*PRACTICAL PLANE AND SOLID GEOMETRY,  
ADVANCED.*

*Geometry.*—Lines, circles, ellipses, parabolas, &c. Projections, sections of solids and oblique planes. Tangent planes to sphere, cylinder, and cone. Horizontal and isometric projections. Intersection and development of surfaces.

*Graphic Statics.*—Areas and volumes. Forces: their composition and resolution.

Moments of a force.

Funicular polygon and its application.

Stress diagram.

*Text Book.*—Angel's Advanced Practical Plane and Solid Geometry, Text, 4s., Plates, 6s.

*STEAM AND THE STEAM ENGINE,  
ELEMENTARY.*

In the Elementary Course of this subject the student will be expected to have a fair knowledge of Arithmetic as far as decimals.

The instruction given will prepare the student to answer questions in the following subjects:—

The theory of heat. The effects of heat on matter—such as expansion, elasticity, vaporisation, the conversion of heat into work and work into heat, the boiling temperature of water, high pressure steam, the latent heat of steam, the quantity of water required to produce condensation.

Early Engines. Newcomen's atmospheric engine—its defects. The discoveries of Watt.

Single-acting condensing engine. Details connected with Watt's single-acting pumping engine.

Double-acting pumping engine. Details of various parts.

Non-condensing engines. Various types of direct acting engines.

The expansion of steam. Common and superheated steam; law of expansion, the object of expanding steam.

Expansion valves. The slide valve, back cut-off, double-beat valve.

Taking of indicator diagrams; calculating the horse-power from them, the consumption of fuel per horse-power per hour.

Stationary boilers. The Lancashire and Cornish boilers, appendages, safety valves, stop valves, pressure gauges.

The Marine engine. Various types of paddle-wheel engines, Penn's trunk engine, surface condensers.

Marine boilers. General forms and construction.

The locomotive engine. The general construction of a locomotive engine and tender.

*Text Book.*—Jamieson's Elementary Text Book (Griffin).

## *STEAM AND THE STEAM ENGINE, ADVANCED.*

The students in this course will be instructed in the following additional subjects, as well as in those set forth in the Elementary course, which will be treated more fully.

Condensation. Surface condensers, circulating pumps. The amount of water required for condensation.

Compound cylinder engines. Arrangement of cylinders, details of valves.

Practical working of engines. Priming, its causes and remedies. Expansive working. Management of fuel.

The Indicator. Method of taking diagrams. The general configuration of diagram to be expected under various circumstances. The indicator diagram in engines of various types.



Theoretical portion. Work done by conversion of water into steam; work done in the steam cylinder when the steam is expanded; work developed by the crank; meaning of absolute temperature; isothermal and adiabatic curves; entropy; dynamometer, its use in finding the horse-power of an engine; Zeuner's slide valve diagram.

The gas engine. The arrangement of the mechanism. The principle of its action, and the theoretical indicator diagram.

*Text Book.*—Advanced Steam and Steam Engines, Jamieson (Griffin).

### MACHINE CONSTRUCTION AND MECHANICAL DRAWING.

Machine Construction and Mechanical Drawing form one subject, which it is essential those students should take up who desire to qualify for the full Technological Certificate granted by the City and Guilds of London Institute.

A knowledge of this science is invaluable to students in the subjects of Cotton Manufacturing, Weaving and Pattern Designing, Electrical Engineering, Mechanical Engineering, Applied Mechanics, Steam, and Steam Engine.

After a course of training in Machine Construction and Mechanical Drawing, the student is enabled to quickly comprehend, copy, sketch, measure, or design the various details and proportions of any mechanical appliances. He can further place his ideas and impressions before others in the form of clear and graphic sketches or highly-finished drawings.

It is necessary that the Elementary student in this subject should have a fair knowledge of arithmetic.

The various sections of this subject, in which the student will be prepared for examination, are as follow :—

Riveted joints. Forms of rivets, and arrangement of rivets in lap and butt joints. Junction of plates by angle and T irons.

Bolts, studs, and set screws. Forms of these fastenings, pitch of screw. Whitworth and other threads. Modes of locking nuts.

Keys and cotters. Arrangement of key and cotter fastenings, taper of keys and cotters, knuckle joint, mode of fixing cotters.

Shafting. Shafts and axles, journals and pivots, collars and bosses, forms of couplings, fast, disengaging, and universal couplings.

Pedestals and plummer blocks. Forms of pedestals and hangers for shafts, footstep bearing, modes of lubricating bearings.

Toothed gearing. Forms of spur, bevel, mitre, worm and mortice wheels, proportions, shape, and strength of teeth.

Belt pulleys. Flat and round belt pulleys, speed cones, shapes of arms, velocity ratios of pulleys, use of guide pulleys, joints of belting.

Cranks and levers. Cast, wrought, and built-up cranks and levers, modes of fixing cranks and pins, forms of eccentrics.

Links and link-work. Connecting rod ends, steps in connecting rods, methods of tightening and taking up wear. Crossheads, coupling rods, &c.

Pistons. Types of modern pistons, piston rings and packings. Attaching piston to piston rods.

Stuffing boxes. Use of packing, mode of tightening glands, metallic packings for piston rods and valve spindles.

Valves. Slide valves, Cornish valves, piston valves, Corliss valves. Lap lead and travel of slide valve.

Boilers, Locomotive, marine, and stationary boiler construction.

Engines. Locomotive, marine, and stationary engine construction, &c., &c.

*Text Books :—*

Cryer & Jordan's Machine Construction, &c., &c.—  
(Elementary Students).

Unwin's Elements of Machine Design.—(Advanced Students).

*APPLIED MECHANICS, ELEMENTARY.*

The subjects of the first stage are necessarily comprehensive, but the questions at the examination are framed in such a manner that a student who has obtained a fair knowledge of a portion of the subject may hope to pass with some credit.



Easy questions, involving arithmetical results may arise, and in particular the student will be taught to solve simple mechanical problems by graphic construction.

The following subjects will be dealt with in the elementary lectures :—

The principles of work, and its application to simple machines ; levers, safety valves, inclined plane, screw threads, the screw and lever in combination, power gained by wheel-work.

Conversion of motion. Endless bands, fast and loose pulleys, crank and connecting rod, cams. Special contrivances, such as the wheel and compound axle, Weston's pulley block.

Energy : What it means. The fly wheel and fly presses.

The pressure of water. Estimation of water pressure on plane surfaces, such as sluice gates, the hydrostatic press.

Machines for raising water. Lift pump, force pump. Materials. The shrinkage of wood in drying. Iron, qualities required for different purposes, testing of iron for strength and ductility. Steel, hardening and tempering.

Strength of materials. Power of resistance of different materials to tensile and compressive strains, power of resistance to transverse strains, position of load and distribution of load.

Friction. The laws of friction. Contrivances for lessening the effect of friction.

*Text Book.*—Jamieson's Elementary Manual.

### APPLIED MECHANICS, ADVANCED.

The subjects of the elementary course, together with the following additional ones :—

Friction. Examples where friction is useful.

Rolling friction. Brakes. Friction dynamometer.

Strength of materials. Estimation of transverse strains on rectangular timber beams. Cast and wrought iron girders. Cantilevers.

Strain on framework. Examples of framework, with corresponding diagrams of stress.

Roofs, lattice girders, trussed beams.

Shearing and twisting strains. Cotters, rivets, joints of plates. Strength of shafting to resist torsion. Hollow or solid shafting.

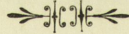
The conversion of motion. Quick return movements. Linkwork and parallel motion. Peucellier's invention. Trains of wheels for screw-cutting. Epicyclic trains.

Hydraulic machines. Hydraulic press. Hydraulic jack. Hydraulic crane.

Machine tools. Lathes. Planing, shaping, and slotting machines. Reversing motion.

Drilling and boring machines.

*Text Book.*—Jamieson's Advanced Mechanics, Vols. I. & II.





## **Building Trades Department.**

### **TIME TABLE.**

Preliminary Draughtsmanship.....	C	Friday	7-15 to 8-45	J. A. Bertwistle.
Building Construction, Elementary...	C	Thursday	7-30 to 8-45	F. J. Pye.
Do.      Advanced...	C	Tuesday	7-30 to 9	Do.
Do.      Honours ...	C	Monday Tuesday	7-30 to 9 7-30 to 9	Do. Do.
Brickwork and Masonry.	C	Thursday	8-45 to 10	Do.
Carpentry and Joinery...	C	Wednes.	7-30 to 9-15	Do.
Plumbers' Work— Ordinary Grade ...	C	Friday	7 to 8-15	R. Sanderson
Honours Grade ...	C	Friday	8-30 to 9-30	Do.
Practical .....	C	Tuesday	7-30 to 9-30	Do.

### *PRELIMINARY DRAUGHTSMANSHIP.*

This class has been formed to provide the preliminary training required before joining classes in Building Construction, Machine Construction, Plumbing, &c.

The use of mathematical instruments, the drawing of plans and elevations, and the reading of a drawing will be taught.

All students who do not possess this preliminary training should take this class.

*Facilities will be given to backward students in other classes to join this course for a limited period in order to improve their general attainments.*

## *BUILDING CONSTRUCTION, ELEMENTARY.*

The student will be taught the elementary principles and practice of building construction. The lessons will include:—

The drawing to scale of details in all branches of the building trades.

The object of bond in brickwork. English and Flemish bond, &c., in walls of various thicknesses. Footings with offsett. Angles of buildings, window and door openings with reveals and square jambs. Arches of various kinds, gauged, cut or rough, inverted arches, &c.

Corbelling, trimmer arches in fireplaces, &c.

Sections and elevations of the following kinds of Mason's work:—

Uncoursed and course drubble, block in course, ashlar, with their bond and proper dimensions, and the following dressings:—Window sills and heads, window and door jambs, door steps, string courses, copings, cornices, blocking courses, and the following methods of connecting stones—cramps, dowels of various kinds, lead plugs, joggles, &c.

Use of wood plugs, lintels, and discharging arches. The proper cross section of cast and rolled iron beams and cast-iron cantilevers. Elevation and section of lead work connected with chimneys, ridges, hips, valleys, gutters, and lead flats. Sections of slating lead on boards or battens.

Elevations and sections of panelled, ledged, and braced doors, &c., single and double hung sashes, window boxings, casement sashings with solid frames, solid door and window frames, door casings, &c. Angle beads, skirtings, grounds, &c.

Elevations and sections of collar beam, king post and queen post trusses, framed partitions, with ironwork used; single, double, and framed floors, showing modes of supporting, stiffening, and framing the timbers; trimming round hearths and wells of stairs. Joints in floor boards.

Joining timber by halving, lapping, notching, cogging, scarfing, fishing; mortice and tenon as applied to wall plates, roof timbers, floors, ceilings, &c. Dovetailing, crossgrooving, rabbetting, ploughgrooving, chamfering, housing.

Mouldings and headings of various kinds used in Joinery.

*Text Book.*—Burrell's Building Construction (Longmans), 2s. 6d.



### *BUILDING CONSTRUCTION, ADVANCED.*

The following, in addition to the subjects taught in the Elementary Course, in all of which more advanced and complicated questions will be considered:—

The nature of the stresses to which the different parts of simple structures are subjected as follows:—Roof trusses, framed partitions, large centres, girders, beams, &c. Strength of iron and wood beams. The best form for struts, ties, and beams. Joints for iron trusses, &c.

The nature, application, and characteristic peculiarities of the following materials in ordinary use for building purposes:—Bricks of different kinds, freestones, Bath or Caen (or stones of similar description), granite, limes of various kinds, cements, plasters, concretes, asphalte. Timber of different kinds. Lead.

Constructive details as follows:—Timbering, excavations, foundations, sewers, use of piles, hoop-iron bound in brickwork, diagonal and herring bone bond, damp courses, hollow walls, flues, fireplaces, chimneys, arches, mortar joints, setting of bricks and stones, stone stairs, stone walls, &c. Fireproof floors (circular and egg-shaped), drains, concretes, floors, roofs of iron or wood, roof coverings in slate, tiles, and zinc, plastering, &c. Wooden stairs and fixing skylights, architraves, linings, grounds, skirtings, &c.

*Text Book.*—Mitchell's Advanced Building Construction, 4s. 6d.

### *BUILDING CONSTRUCTION, HONOURS.*

The subjects of the course will include a fuller discussion of the subjects detailed in the preceding courses, together with additional matter required for the Honours Examination.

#### *BRICKWORK AND MASONRY.*

The course will include instruction in:—

Detail drawing, use of scale and drawing instruments.

Bricks:—The names, nature, and properties of various kinds in general use; the work for which each kind is best fitted; making, burning, and testing quality of bricks.

Excavations in various soils; timbering excavations; piling.

Laying drain pipes, brick sewers, ventilating drains, &c.



Nature and properties of limes and cements, modes of testing.

Mortars and concretes, ingredients used, with proportions and method of mixing. Sand of various kinds.

Foundations, height and width of footings, bonding, concreting.

Planking, damp-proof courses, position of and materials used.

Air bricks, dry areas, and general methods used for prevention of damp; ventilating floors, &c.

Bond in brickwork, angles of walls in English and Flemish bond. Raking and garden wall bond. Bond at acute and obtuse angles, in hollow walls of various kinds, in brick walls with stone facings. Arches, names and descriptions of the different kinds, cutting and setting arches.

Paving. Joints and pointing of various kinds. Chimney shafts, flues, fireplaces, &c.

Stone, description and testing of various classes of building stone.

Stone for use, under different conditions of climate, for external and internal work. Decaying of stone. Mode of ascertaining natural bed of stone.

Stone walls in rubble of various kinds, ashlar, flint work.

Stone dressings, heads and sills, cornices, copings, string courses, quoins, basses, &c. Mode of connecting stones, arches, draining, silling, and bonding.

Mouldings, names, descriptions, and drawing with intersections.

The general mechanical principles involved in brickwork and masonry.

### *CARPENTRY AND JOINERY.*

The following subjects will be treated of in the course of Lectures :—

Nature and properties of the various kinds of wood used in carpentry and joinery. Methods of seasoning and preserving timber. Strength of timber. Mode of converting timber so as to avoid waste and shrinkage, and obtain the maximum strength, &c. Drawings, full size, showing shoulder lines, &c., and the various joints used in carpentry and joinery.



Working drawings of panelled and framed and braced doors, door frames and casings, double hung sashes, sliding and hanging shutters, folding shutters, and boxings. French casements, rebates, or linings for swing doors. Architraves and skirtings, grounds, &c. Hinges of various kinds and mode of applying them. Proportion of styles, rails, mutins, &c., in doors and windows; kind and strength of materials used.

Mouldings, their forms and names, intersection of moulds, large and circular, enlarging and diminishing mouldings. Lines for determining the sections of moulded bars and hip-rafters in skylights and lanterns. True sections for raking moulds over square or oblique plans, &c. Bevels and lengths of hip-rafters, jack-rafters, purlins, splayed linings, raking mouldings, and oblique work generally.

Methods of strengthening beams and girders by flitching and trussing; how roof trusses are acted upon by cambering. Method of framing roof trusses, dimensions of timber, shapes of straps, and bolts used. Correct form of joints.

Single, double, and framed doors, dimensions of materials used, joints, trimming hearth, well holes, &c. Bridging, pugging joints of floor boards, &c.

The principles required in framing roof trusses, partitions, trussed gardens, bracing large doors, gates, &c. Fixing and striking large centres.

Knowledge of the use of weather boards, water bars, throating, joints for external work, as casements and skylights. Joints, mortice, and tenon of various kinds; proportion of tenons, proportion of parts of tusk tenon, joints for oblique timbers, position of shoulders, scarfing, position, size and shape of straps and bolts to secure joints, &c.

Preparing gutters, rolls, drips, cistern heads, tilting pieces flashing boards for plumber and slater, construction of flats for lead and zinc.

Newel and geometrical stairs, proportions of users and heads, planning stairs to obtain head room and clear obstacles, proportions of winders and diminished fliers, general construction and method of support.

*Text Book.*—Wilson's Carpentry and Joinery.



## PLUMBERS' WORK.

### Theory—Preliminary.

1. *Workshop Arithmetic, Geometry and Drawing.*—Duodecimals, square and cube root, mensuration of circle, square, cylinder, cone, pyramid, prism, &c. Methods of cutting out sheet lead in various forms for covering dormers, cesspools, dome and turret roofs. Making simple plans, elevations, and sections of various details in plumbers' work. The density of various materials used in plumbing, calculation of areas and volumes, &c.

2. *Elementary Physics for Plumbers.*—The effect of heat on solids, liquids, and gases. Cause of frost burst, and various methods of preventing it. The effect of heat in causing motion in liquid and gases. Ventilation of pipes. Thermometers. Measurement of quantity of heat. Relation of quantity of heat applied to rise of temperature. Properties and composition of air and water, &c.

3. *Alloys, Solders, &c.*—Properties and composition of various alloys, such as brass, gun-metal, &c., used for valves and cocks. Solders—their composition, preparation, and uses. Fluxes—their action and uses. Various methods of soldering. Advantages of lead burning.

4. *Workshop Appliances and the Principles of their Action.*—The lever, pulley block. Behaviour of lead under great pressure. Pressure due to action of liquids and gases. Construction and action of valves used by plumbers. Head of water. Nature of water seal. Action of the syphon. Principles of construction of the various traps used in plumbing work and their relative advantages.

5. *Tools used in Plumbing.*—Their forms, uses, &c. Fitting up and equipment of workshop. Varieties of pipes used in plumbing. Capacity of pipes of various diameters.

### Ordinary Grade.

1. *Properties and uses of Materials used in Plumbers' Work.*—Relative strengths, under various pressures, of lead, cast iron, wrought iron, and copper, &c., tubes. The nature and uses of seamless lead pipes, tin and tin-lined pipes, and sheet-lead pipes and methods of jointing same.

2. *Elementary Science for Plumbers.*—The physical and chemical properties of lead, zinc, tin, iron, and copper. Composition and properties of red lead, litharge, white lead, &c., and the cements made from these materials. Purposes for



which lead or zinc in construction can be more usefully employed. The action of various waters—such as hard, soft, sea, and mineral—on lead, solders, and other metals used by plumbers.

3. *External Roof Work.*—Covering of flats, gutters, cess-pools, dormers, skylights, &c. Principles of jointing sheet-lead by rolls, welts, drops, and passings, to insure perfect weathering and prevent capillary attraction.

4. *Hot Water Apparatus.*—The principles of hot water circulation for domestic and other purposes, including cylinder and tank systems. Various kinds of boilers and taps, their advantages and disadvantages. Materials used in valve seatings, packing, &c. The systems in use for the prevention of furring of pipes and boilers in common use. General principles of conduction, convection, and radiation. Expansion of water by heating.

5. *Sanitary Appliances in common use and the principles of their action.*—Water closets, their fittings and supply; water-waste preventers, baths, lavatories, sinks, &c. Varieties of traps. Momentum. Washing out and syphonage of traps, and methods of preventing the same. House cisterns, their construction and fittings.

6. *Mechanical Appliances and the principles of their action.*—The multiplication of power by water pressure. Construction and uses of different kinds of pumps, hydraulic rams, &c.

7. *Drainage.*—Principles and description of traps, pipes, fittings, and other materials used in house drain construction.

#### Honours Grade.

1. *Water.*—Different qualities and properties of water from deep wells, shallow wells, springs, and other sources. Water storage. Filtration. General distribution and arrangement of services in buildings. Flow through pipes, loss of head, and retardation by bends and branch pipes.

2. *Drainage.*—Setting out and construction of house drainage, with disconnecting and inspection chambers, gullies, interceptors, and other traps. Ventilation of drains, fresh air inlets, cowls, &c. Drain testing, viz., by water, smoke, chemical substances, and air pressure. Disinfectants and their application; their corrosive action on fittings. Simple systems of sewage disposal for isolated country houses.

3. *Sanitary Appliances.*—Their arrangement and position in dwellings, hospitals, and public buildings. Principles of construction. Methods of automatically removing grease from traps, and flushing public conveniences and drains. Entry of tidal, storm, and other waters into basement of buildings, and the prevention of same.

4. *Ventilation.*—Inlet and exhaust ventilating apparatus for apartments in dwelling-houses in which sanitary fittings are fixed. Systems of mechanical ventilation and methods for washing and purifying air.

5. *The Warming of Buildings.*—Heating by hot water and steam, high and low pressure, and hot air. Amount of heating surface required for rooms and buildings of different sizes. Principles of heating hot water for domestic use by steam heaters, &c.

6. *External Roof Work.*—Details of covering domical and turret roofs, finials, mansard curbs. Making plain and ornamental rain water pipes and heads. Lead burning, &c.

7. *Specifications.*—Preparation of specifications and drawings, and taking out of quantities for plumbers' work.





## **Natural Science Department.**

### **TIME TABLE.**

Botany, Advanced .....	A	Monday	7 to 8	J. Harrison, A.R.C.Sc.
Do. Practical, E. and Ad. .....	A	Monday	8-15 to 9-45	Do.
Do. Elementary .....	A	Tuesday	7 to 8	Do.
General Biology, Elem....	A	Tuesday	8-15 to 9-15	Do.
Geology.....	A	Wednes.	7 to 8	Do.
Physiology, Advanced ...	A	Wednes.	8-15 to 9-15	Do.
Hygiene, Elementary ...	A	Thursday	7 to 8	Do.
Do. Advanced .....	A	Thursday	8-15 to 9-15	Do.
Physiology, Elementary..	A	Friday	7 to 8	Do.
Do. Practical, E. and Ad. ...	A	Friday	8-15 to 9-45	Do.
Physiography, Section I.	A	Monday	7 to 8-30	J. Gardner, F.R.G.S.
Do. Elem. ...	A	Monday	8-30 to 9-30	Do.
Do. Elem. ... for P.T.S. and Certifi.Students	A	Wednes.	7 to 8	Do.
		Wednes.	8 to 9	Do.
Physiography, Advanced	A	Monday	8-30 to 9-30	Do.

### **General.**

The classes in this department will be found helpful to students who are trying to gain a knowledge of the forms and workings displayed by the members of the animal and vegetable kingdoms. They will be found valuable to those who are about to enter upon a medical, agricultural, pharmaceutical, or a natural scientist's career. Hygiene and Physiology are of importance to everyone, in view of the necessity for a proper understanding of the underlying principles of sanitary science, but more especially to civil engineers, sanitary officers, and medical students; while Geology will aid the study of Physiography, which is required by all elementary teachers.

## BOTANY.

This course will cover the requirements of the London Matriculation Examination in this subject, and will also be a valuable aid to the botanical work of the London, &c., Intermediate Science and Preliminary Scientific Examinations.

Students who join the practical class *must* provide themselves with a *good* razor. They should also be furnished with a small camel-hair brush, a pocket lens or a watchmaker's glass, some needles, preferably with sharp edges; a thin exercise book with good unlined drawing paper, two books for homework, and a book for rough notes. It is advisable to get a small box of coloured pencils.

*Anatomy*.—The general facts about flowering plants so far as can be seen without a microscope. The root, stem, and leaf; the relations to one another and comparison of their various parts. Different kinds of roots, stems, and leaves.

*Histology*.—Study of the plant in greater detail will be afforded by the use of the microscope. Structure of the vegetable cell. Character of cell contents. Minute parts and their arrangement in stems, roots, leaves, and flowers.

*Physiology*.—Nutrition: foods used by plants; parts which are essential; their various sources; and the methods by which they are assimilated. Respiration: general interchange of gases between the plant and the atmosphere, and also intramolecular respiration. Transpiration: passage of water from roots to leaves and from them to the air. Movements of Protoplasm: rotation and revolution of the protoplasm in cells. (This is shown to the class which meets for practical work.)

*Systematic Botany*.—Outlines of classification. Methods of comparing plants. Characteristics of the following natural orders:—Liliaceæ, Amaryllidaceæ, Cupuliferæ, Ranunculaceæ, Cruciferæ, Caryophyllaceæ, Rosaceæ, Leguminosæ, Umbelliferæ, Labiatæ, Scrophulariaceæ, Boraginaceæ, Primulaceæ, and Compositæ.

*Text Book*.—Botany for Beginners, by Ernest Evans (Macmillan), 2s. 6d.; Edmond's Elementary Botany (Longmans), 2s. 6d.

*Other Books*.—Structural Botany, Vol. I., Dr. D. H. Scott (Blackie), 3s.; Elementary Botany, Percy Groom, M.A. (Bell & Sons); Oliver's Elementary Botany (Macmillan), 4s. 6d.; Potter's Agricultural Botany (Methuen), 3s. 6d.



### Advanced Botany Class.

In the Advanced Course the student is introduced to a study of several selected types of plants which serve to illustrate the anatomy, histology, physiology, and reproduction of the following groups of plants:—

*Gymnosperms*, as exemplified by *Pinus* ;

*Vascular Cryptogams*, by *Selaginella* and *Aspidium* ;

*Muscineae*, by a true moss, *Polytrichum*, and a liverwort, *Marchantia* ;

*Algae*, by *Fucus*, *Spirogyra* and *Protococcus* ;

*Fungi*, by *Agaricus*, *Eurotium*, *Mucor*, and *Yeast* ;

*Lichens*, by *Parmelia*.

Fuller knowledge of the subjects taught in the Elementary Course is required for this stage, and the students are expected to show a practical knowledge of the classification of the various British flowering plants.

*Text Book*.—Structural Botany, Vol. II. ; Flowerless Plants, Dr. D. H. Scott (Blackie), 3s.

*Other Books*.—Vine's Students' Text Book of Botany (Swan, Sonnenschein, & Co.), 15s. ; Strasburger's Text Book of Botany (Macmillan), 18s. nett ; Gray's Botanical Text Books, two volumes (Macmillan), 10s. 6d. each ; A Manual of Botany, J. Reynolds Green (Churchill), two volumes, Vol. I., 7s. ; Vol. II., 10s. ; Practical Botany for Beginners, by Dr. Bower (Macmillan), 3s. 6d. ; Physiology of Plants, Darwin and Acton (Cambridge University Press), 4s. 6d.

### GEOLOGY.

The objects of the science. Its application to other studies and to the industries of agriculture, engineering, mining, and metallurgy. Illustrations of past changes by reference to those now taking place in the earth's crust. The bearing of the science upon the question of the origin of forms of life

Explanations of geological terms. Classifications of rocks, animals, and vegetables.

Composition of the principal rocks and the common rock-forming minerals.

Denudation and disintegration. Action of heat, cold, rain, hail, snow, ice, and wind ; springs, rivers, and tides.

**Fossilization.** The identification of rocks by means of the fossils which they contain.

**Internal heat, volcanoes, earthquakes, landslips, sliding and crushing of rocks.**

**Metamorphism.** Change of clay into slate, common limestone into marble, &c.

The various deposits referred to their order of formation, or to their geological age. Economic products of the various formations, such as coal, slates, ironstone, salt, ores generally, building stones, and mineral manures.

*Text Book.*—Lapworth's Geology (Blackwood), 5s.

*Other Books.*—Watts' Elementary Geology (Macmillan), 2s. 6d.; Woodward's Geology of England and Wales.

## PHYSIOLOGY.

This course will be found suitable to teachers, agricultural students, students reading for the medical profession; and will cover all the physiology necessary for the examinations in hygiene.

### Elementary Course.

**General build of the human body.** Names and position of the internal organs.

**Nature and chemical composition of air, water, carbon, dioxide, and ammonia.**

**Blood:** Form, size, and structure of its corpuscles.

**Organs of circulation, respiration, and digestion;** their structure and functions.

**Excretory organs.** The skin.

**Heat of the body:** how derived, distributed, and regulated.

**Structure and functions of the organs of smell, taste, and sight.** General arrangement of the nervous system. Chief parts of the brain and their uses. Structure of the spinal cord. Evidence that the spinal cord is capable of effecting reflex action.



A Practical Class will be held immediately after the lecture, at which students will themselves have the opportunity of performing the experiments and handling the structures dealt with in the Lecture Course.

*Text Book.*—Physiology for Beginners, Foster and Shore (Macmillan), 2s. 6d.

*Other Books.*—Huxley's Elementary Physiology (Macmillan), 4s. 6d. Practical Physiology, Foster and Langley (Macmillan), 10s. 6d.

#### Advanced Course.

The microscopical character of the blood: its composition and distribution. Microscopic structures of the various tissues of the body.

The heart and circulatory system with the physical laws regulating circulation. The nervous mechanism of the heart.

Structure and function of lymphatic vessels and glands.

The structure and function of the alimentary tract and its appendages, with the processes of digestion taking place therein.

The respiratory system, with the chemistry and physics of respiration.

The excretory organs: their structure and functions.

The structure, functions, and distribution of the nervous system.

Circulation and nutrition of the fœtus. Changes in circulation at birth. Lacteal glands and lactation.

*Text Book.*—Kirke's Handbook of Physiology, edited by Halliburton (Murray), 9s.

*Other Books.*—Text Book of Physiology, M. Foster (Macmillan), 5 vols., 10s. 6d. each. Text Book of Human Physiology, Landois and Stirling (Griffin & Co.), 34s. Outlines of Practical Physiology, Stirling (Griffin & Co.), 8s. 6d. Manual for the Physiological Laboratory, Harris and Power (Baillière, Tindall, & Cox), 7s. 6d.

### HYGIENE.

This course will prove beneficial to sanitary engineers, builders, architects, and all connected with house construction. It will also meet the requirements of teachers in public elementary schools, while those who wish to have a general knowledge of "Health in the Home" are advised to avail themselves of the opportunity here offered. Candidates for Honours in Agriculture would also do well to attend the Elementary Course.

Students wishing to enter for the Advanced Course will have to give evidence of a satisfactory knowledge of Physiology.

#### Elementary Course.

1. *Elementary Physiology*.—Alimentary, respiratory, and circulatory organs and functions.

2. *Food, Diet, and Cooking*.—Classification and uses of food substances. Animal food, vegetable food, condiments. Diet, requisites for maintenance. Cooking, roasting, and boiling. Advantageous preparation of food. Cooking apparatus.

3. *Water and Beverages*.—Different kinds of water, sources of water, good drinking water. Sources of contamination of water and its deleterious effects. Cisterns and wells. Tea, coffee, and cocoa—preparation and effects. Fermented drinks—effects.

4. *Air*.—Amount of air necessary for each person. Natural ventilation. Movements of air brought about by changes of density, diffusion, &c. Composition of air. Impurities of air. Deleterious gases.

5. *Removal of Waste and Impurities*.—Principles of ventilation. Washing and soap. Removal of parasites. Danger of dirt. Removal of house refuse.

6. *Shelter and Warming*.—Materials of clothing. Sufficiency of clothing for infants and adults.

7. *Local Conditions*.—Soils and their drainage. Aspect. Elevation—hill, plain, and valley. Distance from the sea. Influence of surrounding objects. Winds.

8. *Personal Hygiene*.—Habits. Exercise, rest and sleep, cleanliness, attention to the action of the skin and bowels.

9. *Treatment of Slight Wounds and Accidents*.—Treatment of cuts, burns, scalds, bleeding, fits, drowning, suffocation, poisoning, bites, and stings.

*Text Books*.—Corfield's *Laws of Health* (Longmans), 1s. 6d.; *Domestic Hygiene*, Notter and Firth (Longmans), 2s. 6d.



### Advanced Course.

Including the topics enumerated under the Elementary course, and in addition the following :—

1. *Food and Adulterations*.—Economical and wasteful diets. Calculation of diets.
2. *Water and Beverages*.—Action of water filters. Constant and intermittent systems of service. Aërated waters and other beverages.
3. *Examination of Air*.—Chemical and Microscopical.
4. *Removal of Waste and Impurities*.—Artificial ventilation. Closets, sinks, and baths. Good and bad drains. Construction and ventilation of drains. Water-traps. Dry and wet methods of removal of sewage. Treatment and utilisation of sewage. Cesspools and main sewers. Sewer gas and septic organisms. Disinfectants, antiseptics, deodorisers.
5. *Shelter and Warming*.—Injurious clothing and modes of dressing. Poisonous dyes. Materials used in the construction of house walls and roofs and their properties. Foundations and basement floors, damp-proof courses. Floors, covering of walls, dangerous papers. Fire-places, stoves, and grates. Products of combustion. Radiation. Warming by hot air and water pipes. Introduction of warmed air.
6. *Local Conditions*.—Rainfall and moisture of the air.
7. *Personal Hygiene*.—Influence of sex, age, temperament, idiosyncrasy. Heredity. School hygiene. Care of the eyesight.
8. *Prevention of Disease*.—Prevention of endemic diseases, *e.g.*, consumption, scrofula, rickets, rheumatic fever, marsh diseases. Prevention of the spread of epidemic diseases, *e.g.*, small-pox, scarlet fever, diphtheria, measles, whooping cough, typhus and typhoid fever, cholera. Isolation and disinfection.

*Text Book*.—Hygiene, by Lane Nottter (Longmans), 3s. 6d.

*Other Books*.—Hygiene and Public Health, Blyth (Griffin & Co.), 28s.; Public Health and Demography, Willoughby (Macmillan), 4s. 6d.; Hygiene and Public Health, Parkes (Lewes), 10s. 6d.

## GENERAL BIOLOGY.

This class will, as far as possible, be a practical one. Each student will have the opportunity of personally examining the type dealt with, and performing the experiments necessary to elucidate the subject.

The following subjects among others will have attention:—

The fundamental difference between plants and animals.

The general anatomy of the frog and its life history.

The character of the tissues of which its body is built up.

The chief facts regarding the nutrition of animals.

The life history and structure of a mould, a fern, and a flowering plant.

The physiology of the flowering plant.

*Text Book.*—Elementary Biology, Chalmers Mitchell.

## PHYSIOGRAPHY.

Students who do not wish to take up in detail any particular branch of science, but who wish to have a general acquaintance with all the sciences, will do well to take this course of lectures.

### Section I.—Elementary Practical Class.

In this class the subjects will be dealt with by the students individually, under the direction of the Lecturer in the Physical Laboratory.

*Matter.*—Its forms, indestructibility, transition from one form to another.

*Mass.*—Its measurement and relation to weight.

*Specific Gravity.*—Law of Archimedes.

*Velocity and Force.*—Parallelogram of forces. Measurement of forces and velocities. Angular velocity.

*Centre of Gravity.*

*Energy* and its forms, and their conversion one into the other.

*Heat.*—Its nature. Distinction between heat and temperature. Expansion. Thermometer and its uses. Transmission of heat. Conduction, convection, and radiation.

*Elements of Chemistry.*—Mixtures and compounds. Air and water. Properties of oxygen, hydrogen, nitrogen, iron, mercury, water, carbon dioxide, lime, alkalies, silicon, and salt.



### Elementary Course.

Matter, force, motion, inertia, work.

Mechanical powers and the principles underlying their action.

Elementary facts connected with energy, heat, and radiation.

Chemical composition of the earth's crust.

Form of the earth, sun and moon, with the general astronomical relationships of these bodies.

The air, the sea, rivers, and glaciers.

Changes in the earth's crust.

Measurement of time.

*Text Book.* — Elementary Physiography, Simmons (Macmillan), 2s. 6d.

### Advanced Course.

*Matter.*—Rigidity, elasticity, compression, torsion.

*Wave Motion.*—Molecular vibration.

*Energy and Work.*—Law of the pendulum.

*Heat and Temperature.*—Thermometer. Specific heat. Mechanical equivalent of heat.

*The Atmosphere.*—Refraction. Absorption of radiant energy by the air. Climate and rainfall. Cyclonic and anti-cyclonic movements. Weather charts. Motion.

*Radiation.*—Spectrum.

*Seas and Lakes.*

*The Earth's Crust.*—Rock-forming minerals. Classification of rocks. Volcanoes and earthquakes. Earth Sculpture.

*The Universe.*—Methods of determining rotation and revolution, precession and nutation of the earth. The distance of the sun and how determined. Sun's rotation. The planets and their rotation and revolution.

Law of gravity in the solar system.

Discovery of Neptune.

Comets and meteors. Stars and their proper motions.

Variable stars. Double stars. Nebulæ.

*Text Book.*—Advanced Physiography, Simmon's (Macmillan), 4s. 6d.

## ***Spinning and Weaving Department.***

### TIME TABLE.

Cotton Spinning, Lancashire and Cheshire Preliminary .....	C	Tuesday	8-45 to 9-30	J. Tasker, Wh. Sch.
Cotton Spinning, Ordinary Grade .....	C	Tuesday	7-30 to 9	Do.
Cotton Spinning, Honours Grade .....	C	Friday	7-30 to 9	Do.
Weaving and Designing, Ordinary Grade .....	C	Wednes.	7-30 to 9	I. Mollineaux.
Do. Practical...	C	Friday	7-30 to 9-15	Do.
Do. Honours ...	C	Friday	7-30 to 9	Do.
Do. Practical...	C	Monday	7-30 to 9-15	Do.
Do. Drawing, Design...	C	Tuesday	7-30 to 9	W. H. Thomas.

### ***PRELIMINARY SPINNING AND WEAVING CLASS.***

This Class is intended to prepare Candidates in those preliminary subjects which must be understood before those involved in spinning and weaving proper can be taken up. It will enable Students to pass the Preliminary Examination in these subjects held by the Union of Lancashire and Cheshire Institutes. *By so doing Students will be able to obtain the full Technological Certificate in Spinning and Weaving without taking up several Science and Art Examinations as heretofore.*

The subjects treated will be as follows :—

1. *Arithmetic.*—Ratio, proportion, vulgar fractions, pure and recurring decimals, percentages, and square root, as applied to calculations peculiar to spinning and weaving machinery.



2. *Mechanics*.—Simple mechanical contrivances, such as levers, pulleys, wedge, and screw; problems illustrating their uses as exemplified in spinning and weaving machinery.

3. *Elementary Physics*.—The effect of heat on solids, liquids, and gases; ventilation. Thermometers and hydrometers; measurement of heat; relation of quantity of heat applied to rise of temperature in air and water, showing the relation of these phenomena and the application of these instruments to the circumstances of cotton spinning.

4. *Drawing*.—The construction to scale of the plan, elevation, and simple section of some elementary machine detail, such as a bolt or nut, coupling or screw thread, or other simple detail of spinning and weaving machinery.

## COTTON SPINNING.

### Ordinary Grade.

#### FIRST YEAR'S COURSE.

*The Examination will include questions founded on such subjects as the following :—*

The geographical position of the cotton fields of the world. The area within which cotton can be commercially cultivated. The physical conditions necessary to its growth and their influence upon the character of the fibre.

The general procedure of cultivating and harvesting cotton.

The preparation of cotton for the market. Ginning and packing. The construction of gins and their operation. The proportions of lint and seed. The influence upon the marketed fibre of faulty ginning and packing.

The physical properties of cotton: structure, length, diameter, colour of different varieties. Classes and counts of yarn for which each variety is suitable.

The objects of mixing cotton. The rules governing the operation. Methods of mixing. The construction and operation of the machines used for the purpose.

The principles of cleaning cotton. The construction and working of opening and scutching machinery. The functions of various parts. Accessory apparatus used in connection with the machines.

The principle of carding cotton. The characteristics of the machines used. The construction and operation of carding machines. The functions of different parts. The construction of the clothing used. Methods of grinding and stripping. Accessory appliances.

Calculation of speeds, drafts, &c., in connection with the above-named processes.

#### Ordinary Grade.

##### SECOND YEAR'S COURSE.

The principles of drawing slivers. The objects aimed at. The construction and operation of drawing machines. The preparation of drawing rollers for work and the accessory appliances used.

The preparation of slivers for combing. The machines used for that purpose. The objects of combing. The construction of combing machines and their action.

The mode of producing rovings. The construction and action of the machines used. The functions and operations of the various parts. Variations in the construction of the different machines in the series. Accessory appliances.

The methods of twisting rovings and the essential features of good yarn.

The construction and action of the mule. Definition of the stages of the entire operation. The function of the principal parts of the machine. The effect of each stage upon the material. The methods of driving mules.

The construction of ring and flyer spinning frames and their operation. The principals of their action. The variations in construction of different parts. The bobbins used.

Calculations of speeds, draft, twist, &c., in connection with the above machines.

#### Honours Grade.

##### THIRD YEAR'S COURSE.

*Candidates for Honours must hold a Certificate in the Ordinary Grade.*

The character and quantity of waste produced at each stage in the preparation and spinning of cotton, and its utilisation. The preparation of waste for spinning. Spinning waste. The machinery used for this purpose. The character of the yarns produced, and the purposes for which they are suitable.



The production of doubled yarns. The machinery used. The preparation of yarn for doubling. The characteristics of each variety. The modes of utilising doubled yarn for different purposes, and the machinery employed therein. Thread manufacture.

The terms and conditions on which raw cotton is bought. The method of selecting it when purchasing. The defects usually existing, and their effect upon the value. Tests for moisture and the permissible limit.

The various uses to which cotton yarn is put. The characteristics required for each purpose. The methods of making up yarn for various markets. Reeling and bundling machinery.

The methods of testing cotton yarn for strength, elasticity, twist, and moisture. Defects in yarn and their remedy. The conditioning of yarn. The terms and conditions of sale.

The manipulation of the cotton by the various machines. The defects occurring during work and the method of correcting them. The adjustment of the parts of each machine for ordinary and special work. The necessary changes in the construction of the various machines for different kinds of work. The steps necessary to keep machines in good working order.

The construction and planning of spinning and doubling mills. The arrangement and selection of machinery for economical production. Schemes of drafts, speeds, and production for various counts. The methods of lighting, heating, humidifying, ventilating, and fire protecting. The arrangement of motive power and power transmission machinery.

Costs of production. Wages. Labour charges. Insurance and other charges.

The special yarn required for fabricating velvets of fast and loose piles, gauze, and Lenos. Yarns for imitation embroidery—robes, mantles, shirtings, for India and China; longcloths, mediums, matelasses, muslins, sheetings, sateens, drills, and Croydens, most of which are woven in Preston; also weft yarns for the above fabrics.

Buying and selling of yarns, terms of purchase, &c.

The lectures are illustrated by samples of cotton and yarns analogous to the trade, and the necessary calculations in each process through which the cotton passes.

As Preston is mainly dependent on the cotton industry, the Council invite the attention of any who are engaged in



cotton spinning to the above class. Further particulars may be had from the Principal.

NOTE.—Since the answers in certain cases must be illustrated by sketches, facility in the rapid sketching of machinery and apparatus in plan, in vertical and horizontal sections should be acquired.

*The City and Guilds of London Institute will recognise the Union of Lancashire and Cheshire Institutes' Examination in Cotton Spinning as qualifying for the full Technological Certificate in lieu of Certificates of the Department of Science and Art.*

*Text Books.*—Students' Cotton Spinning, Nasmith, 6s. Cotton Spinning Calculations: Thos. Thornley, 1s. 6d.

Students are recommended to peruse either the "Textile Manufacturer" or "Textile Recorder," which are published monthly; and "Textile Mercury," published weekly.

## COTTON WEAVING AND DESIGNING.

### First Year's Course.

- 1.—Textiles and the materials used for manufacturing.
- 2.—System of counting or naming yarns.
- 3.—The different forms in which yarn is supplied.
- 4.—Grey goods. Preparatory processes. Twist winding frames.
- 5.—Grey goods. Preparatory processes. Beam warping frames.
- 6.—Calculations. Warp and weft.
- 7.—Preparatory process. Sizing and sizing machine.
- 8.—Preparatory process. Size mixing and hank sizing.
- 9.—Designing. Drafting of simple fabrics.
- 10.—Calculations. Yarn.
- 11.—Coloured goods. Preparatory processes. Mill warping.
- 12.—Designing. Honeycombs, fancy twills, crape, and other effects.
- 13.—Preparatory processes. Yorkshire dressing.
- 14.—Preparatory processes. Sectional warping.
- 15.—Calculations. Reeds, &c.



- 16.—Weft winding machinery.
- 17.—The hand loom and cording, &c.
- 18.—The power loom and primary motions.
- 19.—Shedding with tappets and top rollers.
- 20.—Drawing out a tappet.
- 21.—Picking. Cone, lever, and scroll.
- 22.—Cloth calculations.
- 23.—Beating-up, eccentricities of.
- 24.—Automatic stop motions. Weft fork, shuttle protector, &c.
- 25.—Take-up motions and calculations and let-off motions.
- 26.—Timing of the loom.
- 27.—Designing and drafting.

#### Second Year's Course.

- 1.—Shedding by revolving and oscillating tappets.
- 2.—Shedding by single and double lift dobbies.
- 3.—Designing for dress fabrics.
- 4.—Knowle's open shed dobby.
- 5.—Calculations :—cloth.
- 6.—Designing :—different effects.
- 7.—Analysis of cloth.
- 8.—Calculations. Cloth.
- 9.—Gauze. Plain and mock leno effects.
- 10.—Leno stripes.
- 11.—Leno stripes.
- 12.—Jacquard shedding. Single lift machine.
- 13.—Jacquard shedding. Double lift single cylinder machine.
- 14.—Jacquard shedding. Double lift double cylinder machine.
- 15.—Jacquard shedding. Cross border machine.
- 16.—Analysis of cloth.
- 17.—Jacquard harness, building, &c.
- 18.—Drawing out lifting cams for Jacquard machines.
- 19.—Piano cardcutting machine.

- 20.—Designing 2 and 3-ply fabrics.
- 21.—Picking motions. Pick and pick.
- 22.—Calculations. Healds and reeds.
- 23.—Terry motions and fabrics.
- 24.—Lappets.
- 25.—Shuttle box motions.
- 26.—Shuttle box motions.
- 27.—Double beat-up motion.

### Third Year's Course.

- 1.—Jacquard designing. Point paper.
- 2.—Jacquard designing. Sketching and transferring.
- 3.—Jacquard designs to enlarge by tie-up.
- 4.—Cloth structure. Cords, piques, etc.
- 5.—Cloth structure. Toilet, 2, 3, and 4 pick.
- 6.—Cloth structure. Toilet, 5 and 6 pick.
- 7.—Colour applied to textiles.
- 8.—Cloth structure. Kidderminster and Scotch ingrain carpets.
- 9.—Cloth structure. Patent satin.
- 10.—Cloth structure. Figured terry fabrics.
- 11.—Mill Planning.
- 12.—Mill Planning.
- 13.—Cloth structure. Figured velvet and plush fabrics.
- 14.—Cloth structure. Carpets.
- 15.—Cloth structure. Leno brocade.
- 16.—Cloth structure. Leno brocade and Indian curtains.
- 17.—Costing cloth in detail.
- 18.—Cloth structure. Tapestry.
- 19.—Swivel shuttles, etc., ornamenting by.
- 20.—Bessbrook Jacquard twilling machine.
- 21.—Open shed Jacquard machine.



22.—Cloth structure. Hose piping, skirt belting, ladder tape for venetian blinds and suspenders.

23.—  
24.—  
25.—  
26.—  
27.—

} Designing of the above fabrics.

Arrangements for practical work in connection with each of the above Courses will be made at early meetings of the different classes. For this work an extra fee will be charged.

### *DESIGNING FOR WEAVERS.*

This Class has been formed in order to teach practically the principles of Designing. It will comprise the following among other subjects :—

*Drawing Materials.*—Tracing. Geometrical construction. Interlacing, scroll and strap work. Borders in relation to centre filling.

*Principles of Ornament.*—Symmetry, contrast, repetition, variety, etc.

*Plant Forms.*—Leaves, flowers. Natural and conventional treatment.

*Painting.*

*Influence of material* and process on design.

*Historic Styles.*—Egyptian, Grecian, Byzantine, Persian, Chinese, etc.

*Modern pattern designing* and the application of historic examples to present day use. Working out original designs for the looms.

23.—Glass structure. Also piping, sheet piling, ladder  
taps for wooden blinds and repeaters.

- |      |   |                                |
|------|---|--------------------------------|
| 23.— | { | Designing of the above fabrics |
| 24.— |   |                                |
| 25.— |   |                                |
| 26.— |   |                                |
| 27.— |   |                                |

Arrangements for practical work in connection with each of the above courses will be made at early meetings of the different classes. For this work an extra fee will be charged.

## DESIGNING FOR WEAVING

This class has been formed in order to teach practically the principles of designing. It will comprise the following among other subjects:

Twining, ribbing, twill, etc., (geometrical construction).  
Interlacing, self and strip work. Borders in relation to center filling.  
Rhythmic or symmetrical, asymmetrical, contrast, repetition, variety, etc.

Plant forms.—Leaves, flowers. Natural and conventional treatment of plant forms. Geometric forms.  
Painting.

Influences of natural and process on design.  
Historic styles.—Egyptian, Greek, Etruscan, Persian, Chinese, etc.

Students pattern designing and the application of historic examples to present day use. Working out original designs for the loom.



# Art School.

1884-1885

1884-1885

1884-1885

1884-1885

1884-1885



## Art School.



Art School.



## **Art School.**

HELD AT THE HARRIS INSTITUTE, AVENHAM.

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### *TEACHING STAFF:—*

HEAD MASTER .....	A. BURT, A.R.C.A., Gold Medallist, &c.
SECOND MASTER .....	W. H. THOMAS.
ASSISTANT TEACHERS .....	(Miss F. BENTHAM. H. A. RIGBY. Miss E. HOWARD.

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The School provides instruction in the principles and practice of Art, as they are applied in the form of design to Manufactures, Handicrafts, and industrial occupations generally. It also deals with its decoration and pictorial branches, and thus furnishes a sound and methodical course of study for Art workmen and those desiring to follow Art professionally, while it encourages its study as a part of general education desirable for everyone.

Due consideration will be given to the special requirements of students depending on their daily occupations or their aims, in order that the course of instruction may be as helpful as possible to their positions and prospects in life.

### **Syllabus of Subjects of Instruction:—**

#### **Elementary.**

Geometry.	Light and Shade.
Perspective.	Brush drawing.
Freehand drawing.	Modelling in clay.
Model drawing.	Elementary principles of ornament and design.

#### **Advanced.**

Architectural drawing and design.  
 Drawing and shading in chalk, &c., or with the brush.  
 Painting in oil, water colour, tempera, &c., from casts of decorative art, flowers, fruit, still life, drapery, &c.

Drawing and painting heads and other details (hands and feet) from the antique figure and the living model.

Drawing and painting from the antique figure and the living model.

Drawing and painting drapery arranged on the figure.

Anatomical drawing.

Time and memory drawing.

Modelling in clay from casts and photographs of decorative art and from foliage, fruit, &c.

Modelling from the antique figure.

Modelling design (ornament and figure).

Moulding and casting.

Designing for art manufactures and decoration, both in the flat and in relief, and for printing and weaving textile fabrics, together with the analysis of ornament and of plant and of other forms which are employed in decoration.

Woodcarving as applied to architecture, furniture, and the decorative arts.

Examinations in the above-mentioned subjects are held annually by the Department of Science and Art (see page 130).

#### Class Lectures.

SUBJECTS.	DAYS.	HOURS.
Geometry .....	Monday.	7-15 to 9-15
Principles of Ornament .....	Wednesday.	7-15 to 9-15
Anatomy .....	Thursday.	7-15 to 9-15
Architecture .....	Thursday.	7-15 to 9-15
Perspective .....	Friday.	7-15 to 9-15

Lectures on historic ornament will be announced on the Notice Board.

Lectures will also be delivered to the Day Classes.

*Important Notice.*—The lectures will commence early in October. Students wishing to take any of these subjects should endeavour to be in their places from the commencement. Joining later will place them at a considerable disadvantage.



### Examples.

The School is completely supplied with Casts of Ornament and of the Figure, as well as Models and Copies, to which are periodically added valuable pictures and other objects of artistic excellence, lent by the Government Art Department.

### Library.

The Library contains a collection of works of reference relating to the various subjects of study, including many illustrated books, collections of etchings and photographs of the figure and ornamental art, &c. These are supplemented by periodical loans of rare books from the National Art Library at South Kensington.

### Scholarships and Prizes.

*Prizes offered by the Government Art Department, including Gold, Silver, and Bronze Medals, and Books, and also a number of Government Scholarships for Art Students, ranging in value from £11 to £150, may be competed for by students of the School.*

### Prizes given by the Institute.

PRIZES for the following Sets of Drawings will be awarded in the Art School each year:—

	1st Prize.		2nd Prize.	
	s.	d.	s.	d.
Set of Outline Drawings from the Cast or from Photographs of Cast ...	10	6	7	0
Set of Drawings from a Group of Models	10	6	7	0
Set of Drawings of Shaded Ornament from the Cast ... ..	10	6	7	0
Shaded drawing from the Antique figure, 24 in. high ... ..	10	6	7	0
Shaded drawing from the life, 24 in. high	10	6	7	0
Set of three Chalk Drawings of drapery..	10	6	7	0
Set of drawings of details of figure (hands and feet, etc.) ... ..	10	6	7	0
Two Designs for Textiles ... ..	10	6	7	0
Set of designs to fill simple shapes (circle, square, oblong, etc.) ... ..	10	6	7	0
Painting from Still Life ... ..	10	6	7	0
Modelled Ornament ... ..	10	6	7	0
Architectural Design or Measurement Drawing ... ..	10	6		

The School Year or Session is divided into  
**THREE TERMS OF ABOUT 13 WEEKS EACH.**

*Winter Term*—September 18th to December 22nd.

*Spring Term*—January 8th to April 6th.

*Summer Term*—April 6th to July 14th.

Half-terms may be commenced midway between these dates  
 for the Morning Classes.

**Vacations.**

*Winter*—About two weeks, commencing at Christmas.

*Spring*—About one week, at Whitsuntide.

*Summer*—About nine weeks, commencing in July and  
 terminating in September.

CLASSES.	CLASS HOURS.	WHERE HELD.	FEES.
Day Class for General Study	Monday and Friday, 11 a.m. to 1 p.m., and 2-30 to 4-30 p.m.	A	Session, 40s.  Two Terms, 30s.
Day Class for Modelling in Clay	Tuesday, 11 a.m. to 1 p.m., and 2-30 to 4-30 p.m.	A	
Day Class for Design	Tuesday and Thursday, 2-30 p.m. to 4-30 p.m.	A	
Day Class Study of Living Model	Wednesday, 11 a.m. to 1 p.m.	A	One Term, 17s. 6d.
Day Class for Wood Carving	Wednesday, 11 a.m. to 1 p.m.	A	
Evening Classes for General Study	Monday, Wednesday, Thursday, and Friday, 7-15 to 9-15 p.m.	A	Session, 10s.  Two Terms, 8s.
Special Evening Class for Model- ling in Clay	Thursday, 7-15 to 9-15 p.m. (The modelling room is also open every other evening— excepting Tuesday & Saturday)	A	
Special Evening Class for Draw- ing from Living Model	Tuesday, 7-15 to 9-15 p.m.	A	
Evening Class for Wood Carving	Friday, 7-15 to 9-15 p.m.	A	One Term, 5s.



Students may attend the Art Day Class one day per week for the following fees:—Session, 21s.; two terms, 17s. 6d.; one term, 10s. 6d.

Pupil teachers attending at the Elementary Day Schools, with the permission of the Managers of their School, if examined at the Harris Institute, 5s. per Session.

Ditto if not sitting for examination at the Institute, 12s. 6d.

*Requisite Materials.*

Each student requires a drawing board (not less than 23 inches by 16 inches), india rubber, drawing pins, good black lead pencil and a penknife.

For the convenience of the students, drawing materials are supplied in the School at ordinary prices, but it is entirely optional to students whether or not they shall avail themselves of this arrangement.



Students may attend the Art Day Class one day per week for the following fees: Session, \$1.00; two terms, \$1.50; one term, .50.

Each student attending at the Elementary Day School, with the permission of the directors of their school, is examined at the district building, at the Session.

It is the aim of the examination at the building, to

#### Physical Education

Each student receives a physical card (not less than 22 inches by 18 inches) which is to be filled out by the black lead pencil and a compass.

For the convenience of the students, the physical card is supplied in the school at ordinary prices, but it is entirely optional to students whether or not they fill out themselves of this arrangement.





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**Commercial and Miscellaneous School.**

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Commercial and Miscellaneous School.



## Commercial Department.

### TIME TABLE.

Bookkeeping, Elementary	C	Thursday	7-15 to 8-30	Vacant.
Do. Intermediate	C	Monday	7-15 to 8-30	Do.
Do. Advanced ...	C	Thursday	8-35 to 10	Do.
Shorthand, Elementary...	C	Monday	7 to 8	E. H. Smirk.
Do. Advanced.....	C	Monday	8 to 9	Do.
Do. Speed Practice, 50 to 100 words 100 to 140 words	C	Thursday	7 to 8	Do.
	C	Thursday	8 to 9	Do.
Arithmetic, Elementary..	C	Tuesday	7 to 8	Vacant.
Do. Elementary..	C	Wednes.	7 to 8	Do.
Do. Intermediate	C	Tuesday	8 to 9	Do.
Do. Advanced ...	C	Wednes.	8 to 9	Do.
French, Elementary .....	A	Friday	7 to 8	H. A. Jutzi.
Do. Advanced .....	A	Friday	8 to 9	Do.
English, Elementary.....	C	Thursday	8 to 9	J. C. Neill, B.A.
Do. Advanced.....	C	Thursday	9 to 10	Do.

### BOOKKEEPING.

The Student will be instructed in the principles of book-keeping by double entry system, partly by lectures and partly by exercises to be worked out by the Students.

The course of lectures will embrace the meaning of mercantile terms and phrases, and the nature and use of the books usually kept by a merchant.

*Text Books.*—Hamilton & Ball's Treatise on Bookkeeping. Examination Questions in Bookkeeping by Double Entry, by the Rev. J. Hunter, M.A.

### SHORTHAND.

The Elementary Class is for students beginning the study of Shorthand.

The Advanced Class is for students who have gone through the "Phonographic Teacher," and will commence with the study of the "Manual."

The Speed Practice Classes on Thursday, from 7 to 9 p.m., will begin with the study of the "Reporter's Companion," and intending members should have *thoroughly* mastered the contents of the "Manual." The Speed Dictation matter will range from 50 to 140 words per minute, divided as follows:—From 7 to 8 p.m., the speeds will be from 50 to 100 words per minute, and from 8 to 9 p.m. from 100 to 140 words per minute.

This latter Class is arranged specially for the benefit of candidates competing for the First Class Certificate of the Society of Arts, and will also be useful to those competing for the First Class Certificate of the Union of Lancashire and Cheshire Institutes.

Members of the Advanced and Speed Practice Classes have the free use of a Circulating Library, comprising the following periodicals:—

- "The Reporter's Magazine,"
- "Reporter's Journal,"
- "Shorthand Magazine,"
- "Phonetic Journal,"
- "The Phonographer," and
- "Pitman's Shorthand Weekly."

They are strongly recommended to make the fullest use of this opportunity of making themselves familiar with the best outlines.

Correct English and punctuation are points upon which the Shorthand Examiners lay great stress. Those whose grammar is at all uncertain would do well to join one of the Classes in English.

- Text Books.*—Elementary: "Phonographic Teacher," 6d.  
 Advanced: "Manual," 1s. 6d.  
 Speed Practice: "Reporter's Companion,"  
 2s. 6d.; "Reporting Exercises," 6d.;  
 "Key to Reporter's Exercises," 1s.



*FRENCH.***Elementary Course.**

The elements of French Grammar.

Translation and re-translation of all the exercises of the text book.

Verbs—Regular and a few irregular.

*Text Book.*—H. Bué's Conversational French Course. First French Book (Hachette).

**Advanced Course.**

In this class the advanced portions of the French Grammar will be dealt with, including the conjugation of all the irregular verbs.

The rules of Syntax will also be studied, and French composition will be taught.

In addition a thorough study of the book prescribed by the Union of Lancashire and Cheshire Institutes will be made.

*Text Book.*—H. Bué's Conversational French Course. Second French Book.—H. Bué's First Steps in French Idioms. V. Kastner's Elements of French Composition (Hachette).

A French Conversational Class will be held if there is sufficient number of students. The object of learning a foreign language is to know how to speak it. Students will derive great help in this respect from this class. A special fee of one guinea will be charged for the term of 20 weeks. For time apply at the Institute.

*Text Books for the Conversational Classes.*—F. Julien—"Voyage à Paris," (Hachette). T. Prendergast's "The Mastery Series," French (Longmans).

*ENGLISH.*

These classes will be especially useful to pupil teachers; the Elementary to the first and second years, and the Advanced to the third and fourth years. The latter will also meet the requirements of Candidates for the London University Matriculation Examination.

**Elementary Course.**

The work of the Elementary Class will include the rudiments of English Grammar, with special regard to the

rules of Syntax, and their application to every day speech. Parsing and analysis of sentences.

Paraphrasing of short passages of poetry.

Essay writing.

*Text Book.*—Meiklejohn's "New Grammar of the English Tongue" (Holden), 2s. 6d.

#### Advanced Course.

In the Advanced Class particular attention will be paid to analysis of sentences, punctuation, paraphrasing, and the rules relating to accuracy and clearness of expression.

The course will also include a careful study of the outlines of the history of the English language and literature, the formation of English words and the meaning of the more common prefixes and affixes, prosody and poetic diction.

All members of the Advanced Class are expected to sit if required by the Principal at the Society of Arts Examination.

*Text Book.*—Nesfield's "Manual of English Grammar," 2s. 6d.



## Miscellaneous Classes.

### TIME TABLE.

Music—Harmony, Elem.	A	Friday	7 to 8	J. Tomlinson.
Do.      Advanced	A	Wednes.	8-15 to 9-15	Do.
Singing—Tonic Sol-fa Elem.....	C	Monday	7-15 to 8-15	J. Smith.
Do.    do.      Inter.	C	Monday	8-15 to 9-15	Do.
Do.—Staff Notation ...	C	Tuesday	7-30 to 9	Do.
Latin.....	C	Monday	8-30 to 9-30	Vacant.
Manual Training .....	C	Daily		J. A. Bertwistle

### MUSIC—HARMONY.

The Classes in Harmony will consist of 20 lessons in each Class, and will deal with harmony, rudiments, and counterpoint.

*They will not be held unless, in the opinion of the Council, a sufficient number of students enter their names.*

### VOCAL MUSIC.

A.—TONIC SOL-FA.—Two Classes will be opened for the study of the theory and practice of the Tonic Sol-fa method. The course will consist of twenty-four lessons for each Class, and the instruction will be based on the requirements of the Elementary and Intermediate Certificates of the Tonic Sol-fa College, which include the following:—Musical theory, memory of time and tune, modulator practice, sight-reading, voice cultivation, expression, and pronunciation.

*Text Books.*—Elementary : “Voices in Song,” price 6d. ;  
and “Elementary Studies,” price 6d.

Intermediate : “Intermediate Studies,”  
price 6d. ; “Intermediate Class Book,”  
price 6d.

B.—STAFF NOTATION.—A Class will be opened for the study of sight-singing from the staff notation. The course will consist of twenty-four lessons, and the instruction will include theory of music, exercises in time and tune, sight tests (major and minor), ear exercises, voice production, pronunciation, knowledge of common musical terms, and the practice of part-song music.

It is hoped to make the Class specially useful to members of Choirs and Musical Societies.

At the end of the Session an Examination will be conducted by H. Fisher, Esq., Mus. Doc. (Cantab). Certificates will be issued to successful students.

*Text Book*.—"Sight-singing Studies," Staff Notation, Book 91 (published by Novello), price 6d.

Various part-songs will be needed. These will be supplied by the Teacher at the beginning of the Session. Price, per set, 2s.

### LATIN.

This Course is suitable to beginners. It will deal with the accidence of the language, and the elementary rules of syntax. The translation of short and easy stories from Latin into English will also be attempted.

An elementary knowledge of English Grammar is desirable, and in order to make progress work at home is necessary.

Assistance will be given in the language to those intending to take the London Matriculation, Institute of Chartered Accountants' Preliminary and similar Examinations.

*Text Book*.—Elementary Stage: Macmillan's Shorter Latin Course, by A. W. Cook, M.A., 1s. 6d.

### MANUAL TRAINING—WOODWORK.

Provision has been made for the conduct of Manual Training Classes in connection with the Elementary Schools of the District. Application for such instruction on behalf of the Scholars of Elementary Schools should be made to Mr. T. R. Jolly, Secretary.



## Manual Training Class for Teachers.

### SYLLABUS—FIRST YEAR.

*Drawing.*—Plan, elevation and section of simple solids, and some of the simpler joints, also very simple frames or combinations of joints. Isometric and oblique projection. Freehand sketches of familiar wood-working tools, sketches of familiar tree leaves.

*Woodworking.*—The reduction of sawn pieces of wood by the saw, plane, or chisel, to any simple form. The construction of the simpler joints, or any simple combination of such joints.

### SECOND YEAR.

*Drawing.*—As in First Year, together with a knowledge of Solid Geometry so far as relates to simple sections of work and projections in easy positions on fresh ground lines. Hand sketches of simple joints and frames.

*Woodworking.*—Exercises similar to those for the first year, but more difficult, also simple frames, &c.

*Written—Woods.*—Places from which some of the commoner woods are obtained. Their characteristic properties and uses. The general structure of cone bearing and leafy timber trees. The meaning of seasoning timber. Effects of shrinkage and warping. Identification of specimens of wood, tools, &c. Description of the construction and mode of using ordinary wood-working tools. Methods of using nails, screws, and glue.

*School Management.*—Fittings and cost of equipment of school workshop. Arrangement of pupils. Character of instruction and sequence of lessons. Correction of pupils' notes. The special characteristics of Slöjd and of other systems of teaching.

Manual Training Class for Teachers

1910-1911

The purpose of this class was to provide teachers with a practical knowledge of the principles and methods of manual training. The course was designed to be of direct benefit to the classroom, and to give teachers a first-hand experience in the various trades and occupations which are taught in the manual training department. The course was divided into two parts, the first dealing with the general principles of manual training, and the second dealing with the specific methods of instruction in the various trades.

The first part of the course was devoted to a study of the history and development of manual training, and to a consideration of the various factors which influence its growth and progress. The second part of the course was devoted to a study of the various trades and occupations which are taught in the manual training department, and to a consideration of the specific methods of instruction in each of these trades.

The course was conducted in a practical manner, and the teachers were given the opportunity to observe the various trades and occupations which are taught in the manual training department, and to participate in the instruction of the pupils.

The course was very successful, and the teachers were given a practical knowledge of the principles and methods of manual training. The course was of direct benefit to the classroom, and gave the teachers a first-hand experience in the various trades and occupations which are taught in the manual training department.

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## **Agricultural School.**

IN CONNECTION WITH THE LANCASHIRE COUNTY COUNCIL.



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Agricultural School.

IN CONNECTION WITH THE LANARSHIRE COUNTY COUNCIL.

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# HARRIS INSTITUTE, PRESTON.

## **School of Agriculture.**

HELD AT AVENHAM.

### PRINCIPAL :

Vacant.

AGRICULTURAL CHEMISTRY .....	Vacant.
SENIOR LECTURER IN CHEMISTRY AND PHYSICS .....	P. F. GILLIES, B.Sc. (Edin.)
JUNIOR LECTURER IN CHEMISTRY AND PHYSICS .....	G. BROWNLEE, B.Sc. (Edin.)
AGRICULTURE.....	Vacant.
VETERINARY SCIENCE.....	C. BLACKHURST, M.R.C.V.S.
BOOKKEEPING.....	Vacant.
MECHANICS.....	F. E. DIXON, Assoc. M.I.C.E.
BOTANY .....	J. HARRISON, A.R.C.Sc.
MATHEMATICS AND ENGLISH.....	J. C. NEILL, B.A.
SURVEYING .....	F. E. DIXON, Assoc. M.I.C.E.
DRAWING .....	W. H. THOMAS.

THE SESSION WILL CONSIST OF THREE TERMS :

- I.—October 1st—December 21st, 1900 (12 weeks).
- II.—January 7th—March 8th, 1901 (9 weeks).
- III.—April 2nd—May 4th, 1901 (5 weeks).

### TIME TABLE.

FIRST YEAR.

<i>Time.</i>	<i>Monday.</i>	<i>Tuesday.</i>	<i>Wednesday.</i>	<i>Thursday.</i>	<i>Friday.</i>
a.m. a.m. 9-15 to 10-15		ENGLISH	CHEMISTRY	ARITHMETIC	
a.m. a.m. 10-15 to 11-15	ARITHMETIC	AGRICULTURE	AGRICULTURE	ALGEBRA	LABORATORY
a.m. a.m. 11-30 to 12-30	GEOMETRICAL DRAWING	CHEMISTRY	BOTANY	PHYSICS	LABORATORY
p.m. p.m. 2-30 to 4-0	*FARM	FREEHAND DRAWING	*FARM	PREPARATION	GEOMETRICAL DRAWING
†Evening	Euclid 4 to 5		ARITHMETIC 7 to 8		

## SECOND YEAR.

<i>Time.</i>	<i>Monday.</i>	<i>Tuesday.</i>	<i>Wednesday.</i>	<i>Thursday.</i>	<i>Friday.</i>
a.m. a.m. 9-15 to 10-15		LABORATORY	BOOKKEEPING	CHEMISTRY	AGRICULTURE
a.m. a.m. 10-15 to 11-15	MECHANICS	LABORATORY	BOOKKEEPING	AGRICULTURE	VETERINARY SCIENCE
a.m. p.m. 11-30 to 12-30	CHEMISTRY	AGRICULTURE	AGRICULTURAL CHEMISTRY	BOTANY	VETERINARY SCIENCE
p.m. p.m. 2-30 to 4-30	* FARM	PREPARATION OR SURVEYING	* FARM	FREEHAND AND MODEL DRAWING	LABORATORY
†Evening		MATHEMATICS 7-30 to 8-30	GEOLOGY 7 to 8		

## THIRD YEAR.

<i>Time.</i>	<i>Monday.</i>	<i>Tuesday.</i>	<i>Wednesday.</i>	<i>Thursday.</i>	<i>Friday.</i>
a.m. a.m. 9-15 to 10-15	AGRICULTURE	CHEMISTRY	VETERINARY SCIENCE	BOTANY	BOOKKEEPING
a.m. a.m. 10-15 to 11-15	MECHANICS	LABORATORY	VETERINARY SCIENCE	BOTANY	BOOKKEEPING
a.m. p.m. 11-30 to 12-30	MECHANICS	LABORATORY	AGRICULTURAL CHEMISTRY	AGRICULTURE	CHEMISTRY
p.m. p.m. 2-30 to 4-30	* FARM	SURVEYING OR PREPARATION	* FARM	PREPARATION	LABORATORY
†Evening			THEORETICAL MECHANICS 7 to 8		

\* The pupils will be taken to the Farm at Hutton on the afternoons of Monday and Wednesday, and there receive instruction in Practical and Experimental work.

† The form of instruction involves preparation work to be done by the students in the evenings.

In addition to the courses indicated in the Time Table special ones will also be arranged as occasion requires.

The instruction will be free, and, in addition, the County Council will allow a sum, not exceeding Ten Shillings per



week, either for board and lodging, or for travelling expenses, to each student in full attendance who fulfils the conditions laid down. No student will be received under 14 years of age.

*Students who are not residents in the Administrative County of Lancaster will be admitted to the School at the following fees :—Juniors, £15 15s. ; Seniors, £21.*

*External students are also admitted to any one or more Classes at Special Fees.*

Attention is drawn to the consideration that, whilst the primary object of the School is to prepare youths for the practical work of a farmer's life, it will at the same time greatly aid students in preparing for the valuable Scholarships and Exhibitions offered by the Lancashire County Council.

Students will be expected to write up their notes daily, and to devote their evenings to careful preparation. The note books will be inspected periodically by the Principal.

For further information apply to THE PRINCIPAL or to T. R. JOLLY, Registrar, Harris Institute, Preston.

## SYLLABUS OF SUBJECTS.

### CHEMISTRY.

#### Junior Course.

The Chemistry of air and water.

Carbon, sulphur, phosphorus, chlorine, silicon, and their simple compounds.

Acids and alkalies, lime and clay, potash.

The metallurgy of lead, iron, copper, zinc. Welding, galvanizing, soldering ; alloys.

Vinegar, spirits, fats, oils, glycerine, starch, sugar, gluten, &c.

Wind, snow, hail, rain.

The Barometer. Use of the Thermometer. Simple calculations.

### Intermediate Course.

Systematic Chemistry of the more important metallic and non-metallic elements and their compounds. Considerable attention will be given to manufacturing processes, especially those of Agricultural interest.

### Senior Course—(Agricultural Chemistry).

The relations between air, soil, plant, and animal. Sources from which plants and animals obtain their food.

*Manures.*—The elementary constituents of plants. Composition of various kinds of litter and dung. Chemical changes in farmyard manure. Fermentation and nitrification. Artificial manures: their classification, nature, and use. The principles of manuring.

*Soils.*—The chemical composition of soils. The water in soils and its movements. The air in soils. Fertility. Chemical changes. Fixation of manures.

*Crops.*—The proximate constituents of plants. Chemical changes during germination and growth. Symbiosis and the fixation of nitrogen.

*Food.*—Albuminoid ratio. The composition of various foods. Digestibility. Feeding standards: the principles of economical feeding.

*Dairy Produce.*—The composition and structure of milk, butter, and cheese. The chemistry and bacteriology of dairy work. Adulteration and its detection. Preservatives and their action.

## PRACTICAL CHEMISTRY.

### Junior Course.

Experiments with the various constituents of air, water, soils, manures, foods, and dairy produce, together with other experiments arranged to illustrate the work done in the lectures.

### Intermediate Course.

Each student will work separately, and will continue to perform experiments illustrating the class work, together with elementary analysis.

### Senior Course.

Agricultural analysis.



## AGRICULTURE.

### Junior Course.

*Soils.*—Origin, formation, distribution, classification, &c. Properties of sand, clay, humus, and calcareous matter. Heavy and light soils. Capillary action. Evaporation. Sources of heat.

*Tillage.*—Implements. Effect of tillage. Cultivation of light and heavy soils. Autumn cultivation. Steam cultivation.

*Drainage.*—Various systems. Materials. Deep and shallow drains. Effects, &c.

*Manures.*—Farmyard manure. Composition: circumstances which determine its value. Fermentation. Bones. Superphosphate. Basic slag. Kainit. Sulphate of ammonia. Nitrate of soda. Chalk. Marl. Lime.

*Plant Life.*—Elements obtained from the air and from the soil. Action of roots and leaves. Annuals, biennials, and perennials. Germination. Formation of seed.

*Composition of Plants.*—Water, combustible matter, and ash. Chemical elements. Essential constituents. Composition of farm crops.

*Crops.*—Composition per acre of average farm crops. Exhaustion of land by sale of farm crops. Special characteristics of different crops.

Experimental work in connection with the above Course will be undertaken in the laboratory, such as the examination of plant ash, effect of lime water on clays, removal of nitrates from the soil, &c.

### Intermediate Course.

*Atmosphere.*—Composition. Rain, dew, condensation of water on plants and soils.

*Soils.*—Mechanical analysis and hygroscopicity. Absorption of ammonia from the air. Movements of salts in soils. Pans. Infertility. Steam tillage. Drainage, various systems, advantages and effects.

*Manures.*—Green manuring. Manurial value of ordinary foods. Liquid manure. Sea weed. Guano. Fish manure. Sulphate of ammonia. Nitrate of soda. Soot. Basic slag. Gypsum. Common salt. Soil and climate, and the selection of manures. Composition of drainage waters from manured land.



*Seeds.*—Percentage of fertility. Change of seed. Impurities and adulterations. Quantities of seed per acre.

*Crops.*—Botanical position of British crops. New varieties, and how produced. Chemical changes in the ripening of grain, root, and fodder crops. Production of malting barley. Exhaustive and restorative crops. Rotations, good and bad. Examples of rotations. Catch crops.

*Meadow and Pasture Land.*—Laying down land to grass. Seed most suitable for permanent and temporary grass land. Accumulation of nitrogen in the soil. Common grasses. Leguminous plants and weeds in meadow and pasture. Effect on the botanical character of the herbage of mowing and pasture land by the application of various manures. Chemical composition of produce. Manuring of meadows and pastures.

*Haymaking and Ensilage.*—Gramineous and leguminous hay crops, best time for cutting. Composition of hay and grass. Crops for silage. Process for making silage.

*Diseases of Plants.*—Growth and nutrition of fungi. Rust. Smut. Bunt. Ergot. Potato disease. Club root, &c. Preventive and remedial measures. Insect pests.

*Live Stock.*—Principal breeds of horses, cattle, sheep, and pigs in the British Isles. Distinguishing characters: suitability for various purposes. Principles of breeding. Variation. Heredity. Prepotency. Reversion.

*Animal Composition.*—Analysis of whole bodies of animals. Chemical elements in animals. Combustible constituents: I. Nitrogenous:—Albuminoids, gelatinoids, keratin; II. Non-nitrogenous:—Fats. Ash constituents of blood, muscle, and bone, alterations in composition from youth to full age.

*Animal Nutrition.*—Differences between the nutrition of plants and animals. Production of heat and work. Principal constituents of cattle foods. Function of albuminoids of foods. Production of fat. Function of amides, fats, carbohydrates, and ash constituents. Relative value of albuminoids, amides, fats, and carbo-hydrates. Digestion and assimilation. Difference between ruminants and non-ruminants. Necessity for ventilation.

*Foods.*—Percentage composition of foods used on the farm. Oil cakes. Composition and adulteration. Albuminoid ratio.

*Diets.*—Diet for young animals. Diet for old animals. Maintenance diets. Labour diet. Diet for fattening animals. Composition of animal increase while fattening. Influence of



manure value of foods on their selection. Influence of food on the quantity and composition of milk and upon the quality of butter.

*Dairy.*—Quantity and composition of milk from various breeds. Variations in composition. Composition of skim and separated milk. Composition of butter and cheese. Yield of butter from milk. Fat globules in milk. Composition of whey. Loss to the farm by sale of milk, butter, or cheese.

#### Senior Course.

The instruction during this course will be based chiefly on the Intermediate Syllabus. Any important recent additions to agricultural science will be considered, and students will be encouraged to read and discuss current literature on the subject.

#### BOTANY.

The course will be introduced in the first year by a general study of Botany, divested as much as possible of technicalities. In succeeding years the course will follow upon the lines laid down on pp. 50-51, with special reference to subjects of agricultural interest.

#### GEOLOGY.

This course will include the general study of Geology, with its special bearings upon Agricultural science.

#### VETERINARY SCIENCE.

Classification of the animal kingdom as applied to domesticated animals.

Comparative osteology of the animals of the farm, inclusive of the arrangement of the bones in the formation of the skeleton.

Composition, structure, and use of bone, cartilage, ligament, and tendon. The formation and classification of joints.

Structure and function of muscle, voluntary and involuntary.

General anatomy of the brain and nervous system. Voluntary and involuntary motion.

Structure and function of the circulatory organs in mammals. Heart, arteries, capillaries, veins.

Composition and properties of the blood, chyle, chyme, and lymph.

Structure and function of the several organs of respiration. Animal heat. Normal and abnormal temperature.

General structure of the reproductive organs—male and female.

Impregnation, pregnancy, and parturition of domesticated animals.

Leading peculiarities in digestive organs of different classes of animals.

Development and structure of teeth. Dentition as indicating the age of animals of the farm.

Appropriation of food and water by the processes of digestion, assimilation, absorption, and nutrition. Secretory and excretory organs.

Disposal of excess of nutritive matter; waste of body, how effected and how repaired.

Structure and functions of the integumental parts of the body. Skin, mucous membrane, and horny substance.

Structure and functions of the organs of sight and hearing.

### *BOOKKEEPING.*

Principles of bookkeeping, description and uses of books. Cash-book, journal, ledger. Assets and liabilities, profit and loss, valuation, balance sheet, &c.

The keeping of accounts on a farm.

### *SURVEYING.*

Explanation of the general principles of surveying and land measurement, and of the instruments used.

Explanation as to fences, watercourses, boundaries of land.

Explanation of estate plans.

Surveying with the chain. Measurement of haystacks, marlpits, &c.

Surveying over obstacles and hilly ground.

The Field Book—method of entering measurements.

Making a plan, from measurements taken, of any enclosure of land.

Mensuration as supplied to surveying. Calculating from plans the area of a field or enclosure.



*MECHANICS.*

Force, standard units, composition and resolution of forces.

Simple machines, laws of motion, work of agents or machines.

Fluid pressure, specific gravity.

Pressure of atmosphere, hydraulic appliances, pumps, &c.

Mechanical energy, friction.

Steady flow of water, loss of energy by flow of water in pipes.

Fly wheels, measurement of power, hydraulic transmission of power. Steam, hot air, gas, and petroleum engines. Steam boilers.

Nature and strength of materials used in structures. The mode of action and general principles involved in the construction of farm implements.

*ARITHMETIC.*

The compound rules applied to simple commercial calculations.

Simple proportion.

Vulgar and decimal fractions (the latter preparatory to an acquaintance with the metric system).

The metric system and its applications.

*ENGLISH.*

The elements of English grammar as bearing upon correct English composition.

Correction of grammatical errors.

Writing plain prose upon a simple subject. Spelling.

**PRIZES.**

A Prize, value 7s. 6d., will be given to the best student of the year in the First Year's Course.

A Prize, value 10s., will be given to the best student of the year in the Second Year's Course; and a second one, value 7s. 6d., to the second best student.

Prizes, value 12s. 6d., will be given to all students in the third year who gain more than 65 per cent. of the marks at the Sessional Examination.

Prizes will be awarded on the results of the Science and Art Examinations in accordance with the regulations laid down on pages 124 and 125.



## ANALYTICAL DEPARTMENT.

### Special Fees for Analysis payable by Farmers.

The following fees for analysis will be payable by farmers residing in the County of Lancaster, provided that such analysis and reports be required for *bonâ fide* agricultural purposes, and for the private information only of the farmer applying for them; and they are, moreover, in no sense for the information or use of manufacturers or other persons.

In the event of any analysis or report showing a manure or feeding stuff to be either impure or below the guarantee given to the purchaser, the latter is at liberty to show such report and analysis to the vendor; but if the material proves to be up to the guarantee given, the analysis and report may *not* be communicated to either vendor or manufacturer.

No money value of a manure or feeding stuff will be assessed, but if the farmer names the price charged, the cost of carriage, and any other items which influence the cost, the Analyst will say whether the material be worth the sum charged.

In the event of any report being misused, the farmer shall be called upon to pay the ordinary Analyst's fee of one or two guineas.

*All fees must be paid at the time of sending the sample.*

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### LIST OF FEES.

	£	s.	d.
1. Determination of the percentage of Nitrogen in a Sample of Sulphate of Ammonia, Shoddy, Horn Dust, Dried Blood, or other Nitrogenous Manure... ..	0	2	6
2. An Analysis of a Sample of Nitrate of Soda ...	0	2	6
3. Determination of the percentage of Soluble Phosphates in a Sample of Mineral Superphosphate or in any other Manure... ..	0	2	6



	£	s.	d.
4. Determination of the percentage of Insoluble Phosphates in a Sample of Basic Slag (Thomas' Phosphate Powder), or in any other Manure... ..	0	2	6
5. Determination of the percentage of Soluble and Insoluble Phosphates in any Manure...	0	3	6
6. Determination of the percentage of Nitrogen, together with the Soluble <i>or</i> Insoluble Phosphates in any Manure (such as Bone, Meal, &c.) ... ..	0	3	6
7. Determination of the percentage of Nitrogen, together with the Soluble <i>and</i> Insoluble Phosphates in any Manure (such as dissolved Bones, Compound Manures, &c.) ... ..	0	5	0
8. Determination of the percentage of Potash in Sulphate or Muriate of Potash, &c. ...	0	2	6
9. Determination of the percentage of Lime in a Limestone or Marl ... ..	0	3	6
10. Determination of the percentage of Lime, Magnesia, and Phosphoric Acid in a Limestone or Marl... ..	0	5	0
11. Determination of the percentage of the essential constituents in a Feeding Stuff (Oil-cakes, Meals, &c.) ... ..	0	5	0
12. A <i>Complete</i> Analysis of any Manure or Feeding Stuff ... .. 10/- to	1	0	0
13. A <i>Partial</i> Analysis of a Sample of Soil ...	0	10	0
14. A <i>Complete</i> Analysis of a Sample of Soil ...	1	10	0
15. Determination of the Hardness of a Sample of Water ... ..	0	3	6
16. An Analysis of a Sample of Water to determine its suitability for domestic purposes ...	0	10	6
17. Analysis of a Sample of Milk, Butter, or Cheese	0	5	0

*All communications referring to Analysis to be addressed to the Harris Institute, Preston.*



## INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

*Please read this carefully.*

### Artificial Manures.

Take a large handful from each dozen bags, break down any lumps with the hand, and mix the whole well together on a large sheet of paper. From the heap select six small portions of about 4oz. each, and after mixing these thoroughly together, divide the whole into three equal parts, and put each into a clean, dry, wide-necked bottle, with a well-fitting cork or stopper, or into a well-fitting clean tin box. All these samples should then be labelled, dated, and sealed. One of them is to be retained by the purchaser, the other by the vendor, and the third sent to the Analyst. *Samples for analysis should upon no account be merely put up in paper.*

*N.B.—Samples, both of manure and feeding stuffs, should always be taken by the purchaser or his agent, in the presence of the seller or his agent (or in the presence of two independent witnesses), to whom due notice of the time of sampling should be given.*

### Soils.

Dig a little trench about two feet deep, exposing the soil and sub-soil. Cut from the side of this trench horizontal scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner about one pound weight of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist that he may examine them individually before mixing in the laboratory.

### Waters.

The water should be sent in a *perfectly clean* Winchester quart bottle, made of clear glass, and with a well-fitting glass stopper, which is readily obtained at any chemist's shop. This bottle will be supplied, ready for use, on application to the Harris Institute, the carriage to be paid by the sender of the water. The sample bottle should be rinsed out twice with the water to be analysed before being filled. Well-water should



be allowed to run for some time before the sample is drawn. Standing water from cisterns, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, about four inches below the surface. Spring or stream water should be sampled in dry weather, by immersion, if possible; but if not deep enough for that a perfectly clean cup or glass should be used for transferring the water to the bottle. When the bottle has been filled, the stopper should be rinsed in the water before being replaced, after which it is to be securely tied down and sealed. For the determination of the degree of hardness only, one quart wine bottle of the water is required; this bottle must also, of course, be perfectly clean.

N.B.—Samples should be dated and despatched to the laboratory *immediately* after being taken.

It ought to be unnecessary to add that the water supply of every farm should be above suspicion.

#### **Limestones, Marls, Ironstones, and other Minerals.**

Whole pieces, weighing from 4 to 8 oz., should be sent. These may be enclosed in small linen bags, or wrapped in paper if there is no tin at hand.

#### **Oilcakes.**

Take three strips (of the entire breadth of the cake) from the middle of three whole cakes, breaking the latter into two halves for the purpose. The three strips should then be packed in a tin, and the latter dated, labelled, and sealed down as above. Three duplicate pieces, similarly dated, labelled, and sealed, should be retained by the purchaser.

#### **Feeding Meals.**

Samples of these should be taken in the same manner as samples of manure, and put into tins. About 4 to 6 oz. are sufficient for an analysis.

On forwarding samples *separate* letters should be sent to the Institute, addressed to the Harris Institute, specifying the nature of the information required, and, if possible, the object in view.

be allowed to rise for some time before the sample is drawn. Bleeding water from distant ponds, etc., should be avoided by immersing the bottle entirely under the water and holding it back gently about four inches below the surface. Drawing or straining water should be avoided in any event, by immersing the bottle in the water and holding it steady. If possible, the bottle should be used for measuring the water clean cup or glass should be used for measuring the water to the bottle. When the bottle has been filled, the stopper should be placed in the water before being removed, after which it is to be removed and sealed. When the bottle is removed from the water, it should be sealed immediately, and the bottle must also be sealed by the water.

N.B. - Samples should be dated and dispatched to the laboratory immediately after being taken.

It ought to be remembered that the water supply of every town should be above suspicion.

The following are the instructions for the collection of samples.

Whole glass bottles from 1 to 100, should be used. These may be used in small quantities, or grouped in paper if there is more than one sample.

The following are the instructions for the collection of samples.

Take the sample of the water from the source from the middle of the water, making the bottle into two halves for the purpose. The three steps should then be packed from the water, sealed, sealed, and sealed down in a box. These duplicate bottles, similarly dated, sealed, and sealed, should be retained by the purchaser.

The following are the instructions for the collection of samples.

Samples of these should be taken in the same manner as samples of running water, and this time about 1 to 10 or two sufficient for analysis.

Outstanding samples always taken should be sent to the Institute, addressed to the Institute, specifying the nature of the information required, and if possible, the object in view.



## Teachers' Classes.

HELD AT THE NEW YORK PUBLIC LIBRARY

FRIDAY, MARCH 17, 1917.

COMPREHENSIVE COURSE OF STUDY FOR

THE MIDDLE GRADES

BY MISS MARY W. B. HARRIS, D. D.



## Teachers' Classes.



Teachers' Classes



## **Teachers' Classes.**

HELD AT THE HARRIS INSTITUTE, AVENHAM.

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### *TEACHING STAFF:—*

CHIEF INSTRUCTOR.....	J. I. CANN, B.A.
ASSISTANT TEACHERS .....	Miss WARING, L.L.A.
	J. C. NEILL, B.A.
	J. SMITH.
	E. FITTON.
	Etc.

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### **I.—CLASSES FOR PUPIL TEACHERS.**

1.—These Classes provide a four years' course of instruction in all the subjects of Schedule V. of the Education Code, and are open to Pupil Teachers of Preston and District, with the following restriction:—

Except under special circumstances, no Teacher can be admitted later than four weeks after the commencement of the Session, or allowed to join the Scholarship Class without having previously attended the Junior Classes. In the latter case they will be required to pay a somewhat higher fee.

2.—The Classes for Candidate 1st and 2nd year Teachers run from October to October. Pupil Teachers are prepared for the Autumn Examination only, and it is recommended by the Education Department that the indentures of Teachers who attend the Classes date from January 1st.

3.—The Class to prepare candidates for the Queen's Scholarship Examination (December, 1901) will commence January 11th, 1901.

4.—*It is hoped that considerable care will be exercised in the choice of boys and girls as candidates for the office of Pupil Teacher. In many towns such candidates are drawn from Higher Grade and Secondary Schools, where they have laid a foundation (in Mathematics, Science, Languages, and Drawing) for their studies as Pupil Teachers. To overcome the lack of such tuition it is suggested that probable candidates be sent to the Probationers' Classes, where they will be*



taught subjects more advanced than those covered by their standard work. Probationers are not allowed to teach more than *five half days* weekly, and must be under suitable instruction during the remainder of the week.

A PROBATIONERS' CLASS has therefore been formed which all intending teachers are recommended to join. They will thus get, at the Centre, *continuous* preparation for their work up to the Scholarship Examination, and will be in a better position to secure a good class. Students joining as Probationers will be allowed to continue the course at a lower fee than would otherwise be the case. *This class may be utilized by non-probationers who wish to continue their education after leaving the elementary school.*

5.—FEES.—For Probationers or Candidates, £2 10s.

For those who have attended the Probationers' or Candidates' Course, £2 10s. per annum during remainder of apprenticeship.

For others, £3.

These fees admit to all the Classes (Day and Evening), and *are not reduced for a portion of the Session.*

6.—The Syllabus of Subjects for the Pupil Teachers' Examinations is found in Schedule V. of the Day School Code. The "Queen's Scholarship Examination" Syllabus may be obtained (post free) on application to the Secretary, Board of Education, Whitehall, London, S.W.

7.—Head Teachers are earnestly requested to aid the endeavours of the "Centre" Teachers—

- (a) By impressing upon the Pupil Teachers the necessity for adequate private study ( $3\frac{1}{2}$  hours daily), and taking care that this is done;
- (b) *By inspecting the exercise books;*
- (c) By attaching great importance to the reports of progress (made twice each Session), *and carefully investigating all cases in which the percentage of marks falls below 50.*
- (d) By reporting at once in case of absence from the Centre, the reason for such absence.



**TIME TABLE.**

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
<b>MORNING</b>	1ST YEAR (9-0—12-0)	—	—	PROBS. and CANDIDATES (9-0—12-0)	2ND YEAR	ALL STUDENTS (9-15—12-30)
<b>AFTERNOON</b>	PROBS. and CANDIDATES (2-0—5-0)	PROBS. and 2ND YEAR (1-45—5-15)	PROBS. and 1ST YEAR (2-0—5-0)	—	SCHOLARSHIP STUDENTS (1-45—5-30)	—
<b>EVENING</b>	—	SCHOLARSHIP AND CERTIFICATE STUDENTS (6-30—9-0)	SCHOLARSHIP BOYS	—	—	—

**PRIZES.**

A PRIZE, value 5s. 0d., will be given to all students who obtain a first class in either the Candidate's 1st or 2nd year's class.

A SPECIAL PRIZE, value 10s., will be given to the *best* student in each of those classes.

A PRIZE of 7s. 6d. will be given to all students who get a first class in the Scholarship Examination.

**II.—CLASSES FOR CERTIFICATE STUDENTS.**

1.—These classes will prepare women students for the 1st and 2nd Year Certificate Examination.

2.—The classes will meet at the Harris Institute, on Tuesday evenings (6-30 to 9-0) and on Saturday mornings (9-15 to 12-30).

3.—The Sessions will commence on September 18th, 1900, and will consist of three terms:—

1st Term—Sept. 18th, 1900, to Dec. 18th, 1900.

2nd „ —Jan. 8th, 1901, to April 9th, 1901.

3rd „ —April 23rd, 1901, to June 23rd, 1901.

4.—*Fee for the Session, £3, payable in one sum or in instalments of £1 at the beginning of each term. This fee*

*covers attendance at certain Science, Art, and Language Classes, to which a student may be admitted by permission of the Principal.*

5.—Detailed Time Table, List of Text Books, and other particulars may be obtained from the Principal, or from Mr. Cann.

*It must be distinctly understood that students cannot be admitted to these Classes for a single term, but must complete the Session when they have once entered.*







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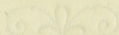
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**Domestic Economy School.**

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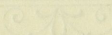




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## Domestic Economy School.

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## **Domestic Economy School.**

HELD AT GLOVER STREET.

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### *TEACHING STAFF:—*

SUPERINTENDENT.....Mrs. ARNOUX.

#### ASSISTANTS:

Miss CLARKE.

Miss HUNTLY.

Misses ATKINSON.

Mrs. LAMB.

Mrs. BARTON.

Miss WESTWORTH.

Miss MARSHALL.

Etc.

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### *FEES.—DIPLOMAS.*

**Cookery** (Full Diploma), £25.

This Course, which consists of 1,000 hours' tuition, requires two years to complete.

**Cookery** (Teacher's Diploma), £18.

For particulars see "Code."

**Laundry** (Full Diploma), £15 15s.

This Course lasts 12 months, and includes full tuition for the Diploma.

**Dressmaking.**—Elementary Certificate, £10 10s.  
Advanced Certificate, £10 10s.  
Elementary Plain Sewing, £10 10s.  
Advanced Plain Sewing, £10 10s.

Each of these Courses requires 12 months' attendance.

**Millinery** (Certificate Course), £5 5s.

These fees are payable in three equal instalments—the first on entering, the second before the first examination, and the third before the second examination.

Any Student failing to obtain her diploma in any of the above subjects by the specified time will be required to pay a proportionate fee for further training.

### *FEES.—TECHNICAL.*

**Cookery.**—Morning Classes, £1 1s. for a Course of 10 lessons.  
Evening Classes, 7s. 6d.

**Laundry.**—Afternoon Classes, 15s. for a Course of 10 lessons.  
Evening Classes, 6s.

**Dressmaking.**—Afternoon Classes: Elementary 10s., Advanced  
£1 1s. for a Course of 10 lessons.  
Evening Classes: Elementary 5s., Advanced  
7s. 6d., for a Course of 10 lessons.

**Millinery.**—Afternoon Classes: Elementary 10s., Advanced 15s., for a Course of 10 lessons.  
Evening Classes: Elementary 5s., Advanced 7s. 6d., for a Course of 10 lessons.

*Evening Continuation School.*—3d. per week.

*Elementary Schools.*—3s. 6d. per pupil in attendance.

*External Lectures.*—10s. 6d. when one Lecture daily is given; 15s. when two Lectures daily are given (*this is exclusive of railway and cab fares*); 4s. per lesson for a teacher sent to Elementary Schools.

### RULES FOR COOKERY CLASSES.

All materials used in the preparation of the dishes must be paid for by the pupils, whether the dish is taken home or not. Pupils may, however, bring their own materials if they wish.

Lessons missed cannot be made up unless charged as a private lesson.

Each pupil must bring with her a tea towel and oven cloth each marked with her name.

A deposit must be paid on the crockery taken from the school, and any that is broken must be replaced.

### COOKERY.

Practical and Demonstration Classes in Household and High-class work.

The "Household" Cookery Course includes meat cookery (roasting, boiling, baking, stewing, grilling, and frying). Fish dishes, soups, vegetables, bread, cakes, pastry, puddings, and sickroom cookery.

The "High-class" Course includes any of the above dishes the student wishes to practice; also braizing, entrées, clear soups, jellies and creams, puff and fancy pastries, Vienna and water icing.

Ices and Royal Icing are not included in the above course, they are charged 5s. a lesson.

### LAUNDRY.

Demonstrations and practice on the washing of white and coloured flannels, Jæger's garments, stockings and socks.



Demonstrations and practice on washing and ironing of table and body linen and coloured prints, including hot starching.

Demonstrations and practice on cold starching, ironing of collars, cuffs, gentlemen's shirts, and a lady's blouse.

Pupils are expected to bring the various articles required for washing and ironing and to provide themselves with an iron-holder.

A course consists of ten lessons.

### *DRESSMAKING.*

The Elementary Course includes drafting and cutting from measures in various sizes and making up the following articles:—Women's and children's plain bodices, sleeves, collars, skirts, and blouses. It also includes the re-making of old dresses.

The Advanced Course includes tailor-made costumes, fancy bodices, boys' suits, and baby clothing.

### *PLAIN SEWING.*

Courses of lessons in the above will be given:—

Cutting out and making of ladies' and children's under-clothing.

Darning, patching, and mending of bed and table linen.

Swiss darning, and re-soling of socks and stockings.

### *MILLINERY.*

#### **Elementary Course.**

Making, covering, and trimming buckram and wire shapes.

Trimming straw hats, bonnets, &c. Renovating old hats, ribbons, laces, &c.

#### **Advanced Course.**

Making lace hats and bonnets, making children's drawn silk hats and bonnets, making ladies' caps, &c.

## **TRAINING SCHOOL.**

The above School trains for the Government Diplomas in Cookery and Laundry and the National Union Certificates for Dressmaking, Needlework, and Millinery.



Each student in training for Cookery or Laundry must go through the Science and Art Course in Elementary Chemistry and Hygiene, and hold First-class Certificates for both subjects. No extra fee is charged for this, the pupils having the privilege of attending these Classes free.

1. *Age Limit and Medical Certificates.*—Candidates must be 19 years of age, and have forwarded a satisfactory Medical Certificate before they will receive permission to be examined for a Cookery Teacher's Diploma.

2. *Division of School Year.*—For the purpose of Examination my Lords have decided to divide the year into three terms, *i.e.*, winter, summer, and autumn—

Winter Term.....January to Easter.

Summer Term .....Easter to end of July.

Autumn Term .....August to end of December.

3. *Theoretical Examinations.*—In accordance with the desire of the Training School Authorities two papers will be set on the Theory of Cookery and on Food.

4. *Nature of Paper A.*—Paper A will contain Questions on Scullery Work, Kitchen Economics, Artisan and Household Cookery.

*Nature of Paper B.*—Paper B will contain Questions on Superior Household Cookery and on Food. Part I. on Superior Household Cookery to be omitted by Candidates for the Limited Diploma.

5. *Paper C.*—A Paper (*called Paper C*) will be set on Theory and Practice of Education, and will contain a Question on Notes of Lessons, and the time will, therefore, be lengthened to three hours, instead of the one and a half hours mentioned in Circular 409.

6. *Provisional Diploma.*—(a) No candidate will be granted a First Class Cookery Diploma unless she holds these two Certificates. If any Candidate passes First Class in all other sections of the training, she will receive a Provisional Diploma, which will be raised to a First Class, if within two years she satisfies the Department that she has passed both the above Science Examinations. (b) Candidates failing to obtain these Certificates within two years will receive a Second Class Diploma at the end of that time.

7. *First Class Diploma.*—Candidates will receive a First Class Diploma if they obtain three-fourths of the possible number of marks at each Theoretical and Practical Examination, provided they have fulfilled the regulations and conditions.



as to the number of hours, &c., laid down by the Department, and hold also the Science and Art Certificates for Hygiene and Chemistry (*Alternative Course*). (*See Paragraph 6*).

8. *Second Class Diploma*.—A Second Class Diploma will be awarded to those Candidates who have obtained at each Theoretical and Practical Examination not less than one-half of the possible number of marks, but have failed to reach the standard required for a First Class Diploma.

9. *Publication of Results*.—A list arranged in order of merit of Candidates who obtain First and Second Class Diplomas will be forwarded to the Training Schools at the earliest possible date.

10. *Improved Diploma, &c.*—Students who have failed in their Practical Examination, or who have obtained a Second Class Diploma, may present themselves again for examination after a further course of three months' training. They may not, however, present themselves more than three times for re-examination in either theoretical or practical knowledge. These candidates will be charged a proportionate fee of 3s. 6d. for each Theoretical Paper and 9s. for each Practical Examination.

11. *Divisions A, B, C*.—A. Dinner Test. Time 3 hours. B. Children's Class Teaching. Time 2 hours:  $\frac{3}{4}$  hour Demonstration,  $1\frac{1}{4}$  hour Practice. C. Adult Demonstration. Time 1 hour. (*See Paragraph 14*.)

12. *Practical Examination A*.—Candidates will not be informed which dishes they will be expected to cook and serve until the commencement of the Examination in Division A, but due notice will be given to the Superintendent of the dishes on which the Candidates will be examined.

13.—*Practical Examination B*.—Candidates will be informed the day before the Examination in Division B. which dishes they will be required to teach a Class of Children. Due notice will be given to the Superintendent as under Paragraph 12.

14. *Practical Examination C*.—Candidates will be allowed to choose their own dishes for the Adult Demonstration in the Examination Division C.

15. *Time allowed for Practical Examination*.—As the time allowed for each Candidate in the Examination C will only be one hour, it will be arranged that two Candidates should be examined together, thus lengthening the time to two hours, in order to allow time for the cooking of two dishes.



16. *Notes of the Lesson.*—Notes on the Demonstration Lesson to be given by Candidates to either adults or children must be handed to the Examiner before the commencement of the Lesson.

17. *Laundry Diploma.*—The Department will allow the hours spent in training in (1) Science, and (2) Theory of Teaching to count towards the Laundry Diploma when the same Student trains for the two subjects within a reasonable number of years.

18. *School Marks.*—School Marks should be given for punctuality, tidiness, method, and result of each day's practical work. The Examiner or the Education Department may desire to see the School Mark Book and take it into consideration before awarding a First or Second Class Diploma.

19. *Syllabus.*—Candidates will be examined on their knowledge of the subjects detailed in the annexed Syllabus.

**Syllabus of Knowledge, both Theoretical and Practical, required of Candidates for the Recognised Diploma.**

Construction and working of coal stoves (open and closed ranges), gas and oil stoves. The cleaning, lighting, and management of the same.

The care and cleaning of kitchen, furniture, utensils, sinks, pipes, and traps. The polishing and removing of stains from tin, brass, copper, enamel, and steel.

The management and care of a larder and storeroom. The price and choice of food. Marketing. Seasons for drying herbs, pickling of vegetables, and preserving of fruit. The various methods of preserving milk, meat, fruit, fish, or vegetables. Economy of time and fuel. The calculation of cheap dinners for an artisan family. Lists and prices of utensils used in the kitchen.

A thorough theoretical and practical knowledge of Artisan, Household, and Superior Household Cookery. This will comprise examples of stocks, broths, soups, sauces, seasonings, liaisons, bouquets, panadas, roux, &c., &c. Roasting, broiling, boiling, baking, braising, stewing, steaming, sautéing, frying, &c. A knowledge of the meanings of the French terms used in cookery. The candidate must be able to explain the "whys" and "wherefores" of the various processes in cookery. She will be judged according to her knowledge, both practical and theoretical, of the different principles of cookery and not according to the costly materials



or elaborate preparation of the dish. It must be remembered that the same principles hold good throughout all classes of cookery. Expensive dishes, suitable for weddings and banquets, and elaborate French dishes will not be approved.

The elements and compounds found in food. The dietary value of food; mixed foods; model foods; national diets; beverages; diets suitable for children, adults, invalids. Effects of heat on albumen, starch, &c. Water, hard and soft; sources of water. Elementary Physiology in relation to the nutrition of the body. Digestion, absorption, and assimilation of food in the human body.

A general knowledge of the Principles and Practice of Teaching in its relation to the teaching of domestic sciences. The cultivation of the general intelligence of the child. Class management, teaching devices, questions, exposition, illustrations, use of the blackboard. Outlines or notes of lessons on cookery and subjects in connection with it. Organisation and management of cookery classes. The requirements of the Elementary Day School and Evening Continuation School Codes in relation to Cookery Classes and Centres.

School hygiene, ventilation, sanitation, lighting, warming, furniture, utensils, apparatus suitable for cookery class rooms. The treatment of scalds, burns, cuts, &c., &c.

Two Science and Art Certificates will be required of Candidates for the First-class Diploma, *i.e.*, Elementary Hygiene and Chemistry (Alternative Course).

#### **Rules and Conditions to be observed by Students in Training.**

- 1.—No student can be admitted under 18 years of age.
- 2.—Candidates must be sufficiently educated to be able to perform the duties of an Instructress after the special training is finished.
- 3.—Students can be admitted at any time.
- 4.—Students must attend daily (except Saturday) at the hours specified in the Time Table, which may be had on application.
- 5.—Students will be expected to wear the uniform of the School. This consists of a black dress, with plain white linen sleeves, apron, and collar. Cotton blouses may be worn with the black skirt during the months of May, June, and September.

6.—Students must provide themselves with six tea towels and three oven cloths. These must be marked with the owner's name. A clean apron must be put on each morning.

7.—Marks are given for excellence of work in all departments, and these will be taken into account in determining the class of the Diploma.

#### *NEEDLEWORK AND DRESSMAKING DIPLOMAS.*

- |                                     |   |     |               |
|-------------------------------------|---|-----|---------------|
| 1. Needlework Certificate           | } | = { | Needlework    |
| 2. Advanced Needlework Certificate  |   |     | Full Diploma. |
| 3. Dressmaking Certificate          | } | = { | Dressmaking   |
| 4. Advanced Dressmaking Certificate |   |     | Full Diploma. |

#### *NEEDLEWORK.*

Course of Instruction :—

- (a) A course of lessons in making samplers in canvas, linen, calico, and flannel.
- (b) A course of making patterns of undergarments for children and adults to measure, by drafting and paperfolding (the latter optional) and drawing to scale.
- (c) A course of modelling undergarments in paper or muslin.
- (d) A course of making-up underlinen by hand entirely, by machine entirely, and by hand and machine partially.
- (e) A course of mending, patching, and altering worn garments and household linen; re-footing and darning stockings; and medium damask darning, plain knitting.

All these courses include Demonstration and Practice.

- (f) A course of lessons in theory and practice of education.
- (g) Practice in teaching classes of children and adults.
- (h) A course of freehand and blackboard drawing.

#### **Advanced Needlework.**

Minimum time of training 425 hours.

This Certificate can only be taken after gaining the Needlework Certificate.



The course of instruction follows upon that for the Needlework Certificate with further demonstration and practice, and progresses to samplers of fine linen, drawn thread and fancy stitches, smocking, satin stitch, marking, &c. Drafting or drawing to scale infants' and children's fine garments, adults' underclothing of more elaborate cut and finish. Modelling garments in paper or muslin. Lace mending. Fine damask darning. Further practice in demonstrating and in class teaching (children and adults).

### *DRESSMAKING.*

Course of Instruction :—

- (a) Drafting to Measure.—Full-size and reduced scale. Plain, tight-fitting bodice for the four chief types of figure. Basques, round waists, blouses, sleeves, skirts, collars, &c.
- (b) Modelling in Muslin.—Two plain garments {
  - 1. By eye.
  - 2. By measure.
- (c) Sampler.—Parts of dress and stitches used in dress-making. (For teacher's equipment).
- (d) Making-up.—Housemaid's dress, full size. Manikin  $\frac{1}{2}$ -size (for equipment). Stuff walking dress, full size. Blouse (optional).
- (e) Sundry Practical Work.—Renovating, re-modelling, cleaning and repairing worn garments.
- (f) Freehand Drawing (paper and blackboard).—Drawing to scale.
- (g) Education.—Lessons on theory and practice of education. Demonstration and practice in class teaching.

### **Advanced Dressmaking.**

This Certificate may be taken after gaining the Dress-making Certificate.

Course of Instruction :—

- (a) Course of cutting patterns to measure by dressmakers' and tailors' systems for tailor-made or other garments, for all types of figure, including deformities.
- (b) Course of advanced practice in modelling more elaborate garments in muslin, including varieties of trimming and combinations of material.

- (c) Course of preparation of tailor-made and advanced samplers of processes and stitches, including smocking, &c. (For teacher's equipment).
- (d) Course of making up tailor-made and more elaborate dressmaker's garments.
- (e) Drawing and design.
- (f) Practice in demonstrating and in practical class teaching.

All these courses include Demonstration and Practice.

#### EXAMINATIONS.

Two Examinations are required in each division of the subject, viz. :—

- |   |                                      |                          |
|---|--------------------------------------|--------------------------|
| 1. For the Needlework Certificate           | { (a) Theoretical<br>(b) Practical } | = { Needlework Diploma.  |
| 2. For the Advanced Needlework Certificate  | { (a) Theoretical<br>(b) Practical } |                          |
| 3. For the Dressmaking Certificate          | { (a) Theoretical<br>(b) Practical } | = { Dressmaking Diploma. |
| 4. For the Advanced Dressmaking Certificate | { (a) Theoretical<br>(b) Practical } |                          |

#### SYLLABUS OF EXAMINATION.

- |                  |                   |   |
|------------------|-------------------|---|
| (a) Theoretical. | Written papers on | 1. Theory of Dresscutting or Needlework.  |
|                  |                   | 2. Theory and Practice of Education.  |
| (b) Practical    | {                 | Demonstration to a Class :—<br>Theory $\frac{1}{2}$ hour, Practical $\frac{1}{2}$ hour.                 |
|                  |                   | Practical Lesson to a Class, $\frac{1}{2}$ hour, on making up some part of a garment.                   |
|                  |                   | Practical Work (set by Examiner) done in the presence of an appointed Vigilator. Four or five hours.    |
|                  |                   | Inspection of the practical work done during training. Fit, finish, and style of garments, and drawing. |



*MILLINERY.*

This Certificate does not qualify for teaching Millinery unless it is held in conjunction with a Diploma in another subject :—

Course of Instruction :—

(a) Drafting and cutting Hat and Bonnet Shapes.

(b) Demonstration by Teacher. { 1. Theoretical,  
2. Practical.

(c) Demonstration and Teaching by Student. { 1. Theoretical,  
2. Practical.

(d) Making. { 1. Samplers of stitches,  
models, and parts  
of head-gear.  
2. Models of Bows, &c.  
3. Full-sized Articles.

(e) Renovating old Hats, Bonnets, and Trimmings, Ribbons, Feathers, &c.

*EXAMINATION.*

1. Theoretical; Written papers on Millinery.

2. Practical { (a) Work done in the presence of a Vigilator  
or Examiner.  
(b) Inspection of specimens made during  
training.  
(c) Demonstration and Practical Lesson to  
a Class.









**Scholarships and Prizes.**



Scholarships and Prizes



## SCHOLARSHIPS.

ONE SCHOLARSHIP, value £45, tenable for One Year, at any place of higher education at the discretion of the Council, to be competed for at an Examination, to be held for that purpose, open to all students who may obtain a First-class Certificate in any subject of SCIENCE at the May Examinations, 1901, and who have attended the classes at the Harris Institute for two years preceding that Examination.

### SCIENCE, TECHNICAL, AND COMMERCIAL CLASSES.

SCHOLARSHIPS from the Elementary Classes to Advanced ones will be awarded on the following conditions:—

- (a) A Scholarship in an advanced Class will only be tenable in the subject for which it is awarded in the Elementary Stage.
- (b) A Scholarship will only be awarded provided that the student has—
  - (1.) Made 22 attendances in the Elementary Stage.
  - (2.) Done at least two-thirds of the home exercises.
  - (3.) Scored at least half marks for the home exercises.
  - (4.) Passed the Elementary Examination of the Science and Art Department or its equivalent.

Scholarships from Advanced Classes to Honours Classes or their equivalent will be awarded upon similar conditions to those mentioned above, but no such Scholarship can be given unless the student gains a *First-class* in the Advanced Stage or its equivalent.

### Scholarships for Students attending Elementary Schools.

SCIENCE SCHOLARSHIPS are offered to scholars who are about leaving, or have left Elementary Schools within seven miles of the Town Hall. A Test Examination will be held in Arithmetic and Composition. These Scholarships cannot be competed for by anyone who is, or has been, a student of the Institute.

### ART.

ONE SCHOLARSHIP, value £45, tenable for One Year, at the National Art Training School, South Kensington, to be



competed for at an Examination held during the fortnight preceding the summer vacation, 1901, open to all Art students who have sat for the Government Examinations connected with the Art Class Teacher's Certificate. Credit will be given for successes gained in these and the Government 3rd Grade Examinations generally.

SCHOLARSHIPS will be awarded to all students in the Art School who obtain an "Excellent."

#### **Scholarships for Students attending Elementary Schools.**

ART SCHOLARSHIPS are offered to scholars who attend Elementary Schools within seven miles of the Town Hall, and who hold the full First Grade Certificate in Drawing; and preference will be given to those who are about to leave School. A Test Examination will be held in Freehand Drawing. These Scholarships cannot be competed for by anyone who is or has been a student at the Institute.

### **PRIZES.**

#### **General Regulations for Prizes.**

- (a) No Prizes will be awarded unless the student obtaining it uses the Regulation Exercise Book, and writes up his notes systematically.
- (b) Where Practical Classes are held no prize will be awarded unless the student obtaining it attends both the Theoretical and Practical Course.
- (c) No second Special Prize will be awarded unless the class numbers at least 10 students.
- (d) No Prize will be awarded unless a high standard of excellence is attained. The Council will in all cases have the sole power of deciding whether or not a prize shall be awarded.

IN THE ELEMENTARY STAGE A PRIZE of 10s. 6d. will be given to the first student of the year; a prize of 7s. 6d. to the second; and one of 5s. to the third.

Such Prize will be awarded provided that the student has—

- (1) Made 22 attendances in the Elementary Stage.
- (2) Done at least two-thirds of the home exercises.
- (3) Scored at least half marks for the home exercises.



- (4) That the student has obtained at least 50 per cent. of the marks in each of the two test examinations conducted by the Institute.
- (5) That the student passes the elementary examination of the Science and Art Department.

IN THE ADVANCED STAGE PRIZES, value 7s. 6d., will be awarded to all students who

- (a) Make 22 attendances ;
- (b) Do at least two-thirds of the exercises set for home work ;
- (c) Obtain a first-class in the Science and Art Department Examination.

A Special Prize of 10s. 6d. will be given to the best student of the year in each of the Advanced Classes, provided that the class comprises at least six students.

For Prizes in the Agricultural and Pupil Teachers' Departments see pages 95 and 105 respectively.

For Prizes in the Art Department see page 71.



## CITY AND GUILDS OF LONDON INSTITUTE.

## TECHNOLOGICAL EXAMINATIONS.

Session 1900-1901.

*Examinations will be held in any of the following Subjects :—*

Salt Manufacture	Framework Knitting and Hosiery
Alkali Manufacture	Hat Manufacture
Soap Manufacture	Telegraphy and Telephony
Bread Baking	Electric Lighting and Power
Brewing	Distribution
Spirit Manufacture	Electro-plating and Deposition
Coal-tar Products	Metal-plate Work
Sugar Manufacture	Plumbers' Work
Painters' Colours, Oils, and Var-	Silversmiths' Work and Plated
nishes	Wares
Oils and Fats, including Candle	Goldsmiths' Work and Manufac-
Manufacture	ture of Personal Ornaments
Gas Manufacture	Watch and Clock Making
Iron and Steel Manufacture	Mechanical Engineering
Paper Manufacture	Road Carriage Building
Photography	Rail Carriage Building
Pottery and Porcelain	Typography
Glassmaking	Lithography
Dressing of Skins	Raising and Preparation of Ores
Leather Tanning	Mine Surveying
Boot and Shoe Manufacture	Milling (Flour Manufacture)
Silk Dyeing	Slate Quarrying
Wool Dyeing	Carpentry and Joinery
Cotton Dyeing	Ship Carpentry
Cotton and Linen Bleaching	Ship Joinery
Calico and Linen Printing	Brickwork
Wool and Worsted Spinning	Masonry
Wool and Worsted Weaving and	Plasterers' Work
Designing	Painters' and Decorators' Work
Cloth Weaving	Cabinet Making
Cotton Spinning	Bookbinding
Flax Spinning	Millinery
Linen Weaving	Dressmaking
Silk Throwing and Spinning	Plain Needlework
Silk (including Ribbon) Weaving	Plain Cooking
Jute Spinning	Manual Training
Jute Weaving	Woodwork
Lace Manufacture	Metalwork

*The Time Table of the above Examinations may be had on application.*



# UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.

## 1901.

### Subjects and Dates of Examinations.

	P.M.	P.M.	
Monday, March 11th	7-30 to 9-30	7-30 to 9-30	Music (Rudiments of)
	7-30 to 9-30	7-30 to 9-30	Sick Nursing
Tuesday, " 12th	7-30 to 10-0	7-30 to 10-0	History (Elementary and Advanced)
	7-30 to 8-30	7-30 to 8-30	Typewriting
Wednesday, " 13th...	7-30 to 9-30	7-30 to 9-30	Cookery (Principles of)
	7-30 to 10-0	7-30 to 10-0	Arithmetic (Elementary, Commercial, &c.)
Thursday, " 14th	7-30 to 10-0	7-30 to 10-0	Commercial Correspondence and Handwriting
	7-30 to 10-0	7-30 to 10-0	Business Routine and Office Work
Saturday, " 16th...	2-0 to 5-30	2-0 to 5-30	Woodwork (Theoretical and Practical)
	7-30 to 10-0	7-30 to 10-0	Geography (Elementary and Advanced)
Monday, " 18th	7-30 to 9-30	7-30 to 9-30	Domestic Economy (Elementary and Advanced)
	7-30 to 9-30	7-30 to 9-30	Life and Duties of the Citizen
Tuesday, " 19th	7-30 to 9-30	7-30 to 9-30	Mechanics (Elementary)
	7-30 to 9-30	7-30 to 9-30	Laundry Work (Principles of). See Syllabus No. 40 for Practical Examination
	7-0 to 10-0	7-0 to 10-0	Portuguese (Elementary and Advanced)
	7-0 to 10-0	7-0 to 10-0	Cotton Spinning (Preliminary)
Wednesday, " 20th	7-0 to 10-0	7-0 to 10-0	Cotton Weaving (Preliminary)
	7-0 to 10-0	7-0 to 10-0	Mechanical Engineering Calculations
	7-0 to 10-0	7-0 to 10-0	Electrical Engineering Calculations
	7-0 to 10-0	7-0 to 10-0	German (Elementary and Advanced)
Thursday, " 21st	7-30 to 10-0	7-30 to 10-0	Latin (Elementary and Advanced)
	7-30 to 9-30	7-30 to 9-30	Hygiene (Elementary)
	3-0 to 6-30	3-0 to 6-30	Needlework (Elementary, Intermediate, and Advanced)
Saturday, " 23rd	3-0 to 6-30	3-0 to 6-30	Dressmaking
Monday, " 25th...	7-30 to 8-45	7-30 to 8-45	Shorthand (Theoretical and Speed)
Tuesday, " 26th...	7-0 to 10-0	7-0 to 10-0	French (Elementary and Advanced)
Wednesday, " 27th...	7-0 to 10-0	7-0 to 10-0	Bookkeeping (Preliminary, Intermediate, and Advanced)

*Union of Lancashire and Cheshire Institutes—Continued.*

		P.M.	P.M.	
Thursday, March 28th...		7-30 to 10-0	10-0	English (Elementary and Advanced)
		7-0 to 10-0		Spanish (Elementary and Advanced)
Friday, „ 29th	{	7-30 to 10-0		Commercial Law
		7-30 to 10-0		Theory of Music (Elementary and Advanced)
Saturday, „ 30th	{	2-30 to 6-30		Woodcarving (Elementary and Advanced)
		2-30 to 5-30		Millinery

## SOCIETY OF ARTS EXAMINATIONS, 1901.

## TIME TABLE.

MONDAY, MAR. 18 (7 to 10 p.m.)	TUESDAY, MAR. 19 (7 to 10 p.m.)	WED., MAR. 20 (7 to 10 p.m.)	THURS., MAR. 21 (7 to 10 p.m.)
Arithmetic	Bookkeeping	English	Economics
German	Italian	French	Shorthand (from 7-30 to 10 p.m.)
Elementary German	Spanish	Elementary French	
Portuguese	Elementary Spanish	Commercial Geography	
Précis writing	Domestic Economy	Rudiments of Music (from 7 to 9 p.m.)	
Russian	Harmony	Typewriting (from 7-30 to 10 p.m.)	
Danish			
Chinese			
Japanese			

In choosing the subjects in which they desire to be examined, candidates must take notice of the arrangements of the Time Table, as they cannot be examined in more than *one* subject on each evening. The days and hours of Examination must be *strictly* adhered to.



## SCIENCE &amp; ART DEPARTMENT EXAMINATIONS.

1901.

## SCIENCE.

SUBJECT.	No.	DATE.
Agriculture, Principles of .....	XXIV.	8th May
Botany .....	XVII.	17th May
Building Construction .....	III.	11th May
Chemistry, Inorganic, Theoretical .....	X.	13th May
Chemistry, Inorganic, Practical .....	Xp.	20th May
(Elementary).....		
Chemistry, Inorganic, Practical .....	Xp.	18th May
(Advanced and Honours) .....	XI.	14th May
Chemistry, Organic.....	XIp.	16th May
Do. Organic, Practical .....	XII.	2nd May
Geology .....	I.	27th April
Geometry, Practical, Plane, and Solid ...	XV.	22nd May
General Biology .....	VIIIc.	3rd May
Heat, Advanced Stage and Honours .....	XIV.	30th April
Human Physiology .....	XXV.	15th May
Hygiene .....	VIIIb.	22nd May
Light, Advanced Stage and Honours .....	II.	4th May
Machine Construction and Drawing .....	IX.	9th May
Magnetism and Electricity .....		
Mathematics, Stages, 1, 2, 3, and 4, and	V.	7th May
Honours in Elementary.....		
Mathematics, Stages 5, 6, and 7, and	V.	15th May
Honours in Advanced.....	VII.	30th April
Mechanics, Applied.....		
Do. Theoretical Solids (Elementary	Via.	29th April
and Advanced Stages only) .....		
Mechanics, Theoretical, Fluids, including	VIIb.	2nd May
Honours in Solids and Fluids .....	XIX.	6th May
Metallurgy, Theoretical .....	XIXp.	21st May
Do. Practical, Elementary .....		
Do. do. Advanced and	XIXp.	21st May
Honours.....	XIII.	1st May
Mineralogy .....	XVIII.	8th May
Mining, Principles of .....	XXI.	1st May
Nautical Astronomy .....	IV.	11th May
Naval Architecture .....	XX.	2nd May
Navigation.....	XXIII.	6th May
Physiography .....		
Sound, Light, and Heat, Elementary	VIII.	10th May
Stage .....	VIIIa.	10th May
Sound, Advanced Stage and Honours.....	XXII.	14th May
Steam .....	XVI.	3rd May
Zoology .....		

## ART.

DATE.	SUBJECT.
27th April ...	Geometrical Drawing (Art) Subject 1a
„ „ ...	Perspective Subjects 1c and 1e (Elementary and Advanced Stages)
29th „ ...	Principles of Ornament, Subject 22 (Elementary and Advanced Stages)
30th „ ...	Painting from Still Life, Subject 15
30th „ ...	Drawing the Antique from Memory, Subject 8f
1st May ...	Freehand Drawing of Ornament in Outline
2nd „ ...	Drawing in Light and Shade from a Cast
3rd „ ...	Model Drawing
4th „ ...	Drawing from Life, Subject 8c2
6th „ ...	Drawing from the Antique, Subject 8b2
7th „ ...	Architecture, Subject 1d
8th „ ...	Design, Subjects 23c and 23d (Elementary and Advanced Stages and Honours)
9th „ ...	Historic Ornament, Subject 22d
10th „ ...	Painting Ornament, Subject 11-23
11th „ ...	Anatomy, Subject 9
13th „ ...	Architectural Design, Subject 23b
to	
15th „ ...	
16th „ ...	Modelling. Design, Subject 23e (Advanced Stage only)
and	
17th „ ...	
18th „ ...	For Candidates to Cast their Clay Models, Subject 23e
20th „ ...	Modelling from the Antique, Subject 19b
to	
23rd „ ...	
24th „ ...	For Candidates to Cast their Clay Models, Subject 19b
3rd June ...	Modelling from Life, Subject 19h
to	
7th „ ...	
8th „ ...	For Candidates to Cast their Clay Models, Subject 19
10th „ ...	Modelling. Design, Subject 23f (Honours)
to	
13th „ ...	
14th „ ...	For Candidates to Cast their Clay Models, Subject 23f

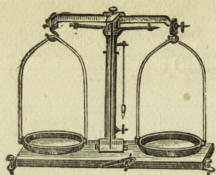


## LOCAL EXAMINATIONS, 1901.

SUBJECT.	DATE.	TIME.
Latin .....	19th March, 1901	7 to 9-30 p.m.
Bookkeeping .....	20th March, 1901	7 to 9-30 p.m.
Elements of Physics, Mechanics, Science, etc. ....	21st March, 1901	7 to 9 p.m.
Elements of Physiography (Girls) ...	21st March, 1901	7 to 8-30 p.m.

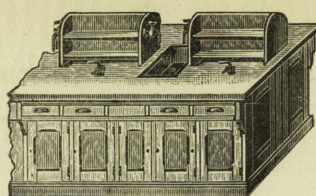


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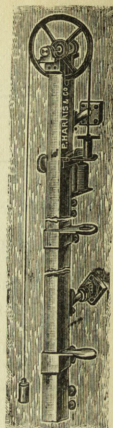
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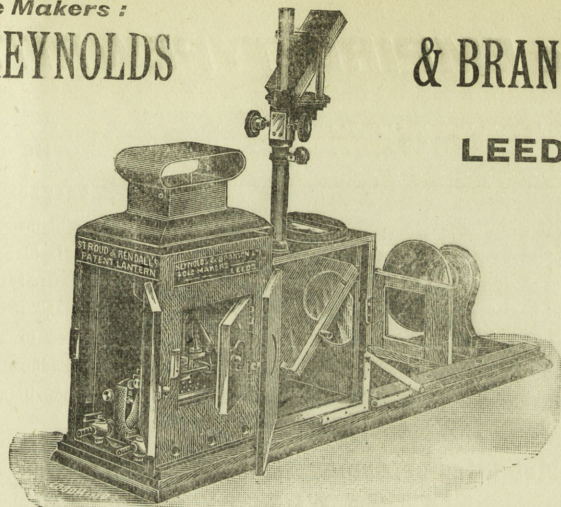


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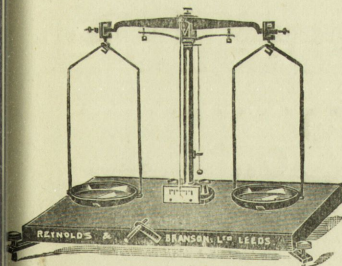
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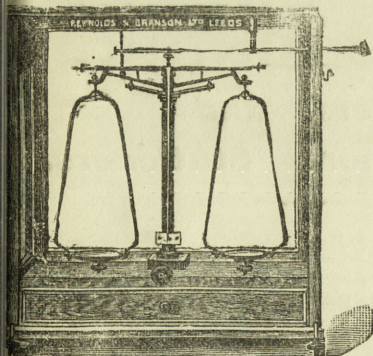
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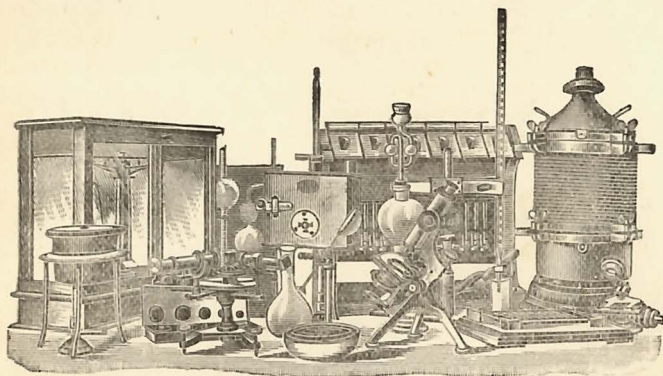
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