THE

INSTITUTE OF CHEMISTRY

OF

GREAT BRITAIN AND IRELAND.

FOUNDED, 1877. INCORPORATED BY ROYAL CHARTER 1885.

PROCEEDINGS,

1908.

PART IV.

Issued under the supervision of the Proceedings Committee.

RICHARD B. PILCHER,

Registrar and Secretary,

30, BLOOMSBURY SQUARE, LONDON, W.C.,

November, 1908.

Proceedings Committee, 1908-9.

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OLIVER TRIGGER,

JOHN A. VOELCKER.

Proceedings of the Council.

Death of Sir Thomas Stevenson, M.D., F.R.C.P., Past-President.—The Council record with deep regret the death of Sir Thomas Stevenson, by which the Institute has lost not only a distinguished chemist, but one of its most enthusiastic workers, who, from its foundation, up to the time of his death, maintained a lively interest in its welfare and progress. The Council owe a special debt to Sir Thomas Stevenson, for his services as the first Examiner in Therapeutics, Pharmacology, and Microscopy, which he gave without remuneration from 1898 to 1901.

Sale of Food and Drugs Acts, 1875-1907.—The following letter, signed by the President of the Institute and the President of the Society of Public Analysts and other Analytical Chemists, has been addressed to the Right Hon. John Burns, M.P., President of the Local Government Board, and a copy of it has also been forwarded to the Secretary for Scotland.

15*th July*, 1908.

Sir,

In reply to a recent communication from the Council of the Society of Public Analysts and other Analytical Chemists, asking you to receive a deputation on the subject of the present unsatisfactory position of Public Analysts, you mentioned (27th April, 1908) that the matter had already received consideration, and that, while you did not think it necessary to trouble a deputation to attend at the Board, you would be prepared to consider suggestions submitted to you in writing.

The Council of the Institute of Chemistry have also had under consideration the same subject, which is of vital consequence to many members of the chemical profession, and now join with the Council of the Society of Public Analysts in this communication.

The Sale of Food and Drugs Act, 1875, in section 10, provides that the appointments and removals of Public Analysts by local authorities shall at all times be subject to the approval of the Local Government Board. This provision, so far as it relates to removals, was obviously intended for the protection of the Public Analyst against arbitrary or capricious

dismissal, and against attempts to alter unfairly the conditions of his appointment, and the Local Government Board has, in virtue of this, been able, on several occasions, to intervene on behalf of the Public Analyst.

Unfortunately, however, some local authorities have "contracted themselves out" of the Act by appointing their Public Analyst only from year to year, thus avoiding the necessity of seeking the consent of the Board to his removal, by refraining from renewing his appointment. This proceeding, if not contrary to the letter, is obviously contrary to the spirit and intention of the Act. In such cases the Board has hitherto held that it is unable to interfere.

Even in the case of permanent appointments, the security intended to be afforded to the analyst by the Act of 1875 has been in some cases rendered ineffective through the provision whereby local authorities may appoint more than one Public Analyst. This provision has been occasionally so abused that the local authority, although unable to dismiss its permanently-appointed Public Analyst without the consent of the Board, has, nevertheless, contrived to transfer practically the whole of his work and emoluments to another analyst. Further, a local authority having a Public Analyst whom it is unable to dismiss without the consent of the Board, may yet render his position untenable either by reducing his remuneration, or by enlarging his duties without equitably increasing his remuneration.

Attempts to decrease the remuneration of Public Analysts arise, no doubt, in most cases, from the natural difficulty on the part of those who are not possessed of the requisite special technical knowledge to appreciate the time and skill involved in the carrying out of analytical investigations, which, necessarily, tend to become more complex as the methods of food sophistication grow more subtle.

On the question of the remuneration of Public Analysts, the Local Government Board has hitherto taken the view that, under the Acts at present in force, it has no power to intervene. This is the more regrettable inasmuch as the Public Analyst is in effect an officer of the Board.

It may be pointed out that the Board, recognising the special training required for the position of the Medical Officer of Health, has, on several occasions, felt able to intervene on the question of his remuneration. The position of the Public Analyst, though not in every respect analogous to that of the Medical Officer, demands a training equally severe, and it is suggested, therefore, that the Board should be able to take similar steps to safeguard his interests.

Quite apart from the point of view of the Analyst, there are public reasons for urging that the condition of insecurity which, at present, attaches to his appointment, should not longer continue. Public Analysts are placed in a position of trust in connection with the administration of Acts of Parliament, the contravention of which involves liability to criminal prosecution, and cases have not infrequently occurred in which the Public Analyst has had to issue certificates condemning goods sold by members of the local authority from whom he derives his appointments. It is of the utmost importance in public interests that an officer who is placed by the legislature in a judicial position should have security of tenure on his appointment, so that he may be enabled to perform his duties impartially and independently.

We venture to suggest that the Board should introduce into Parliament a Bill providing:—

(*a*) That not merely the appointment and removal, but also the terms and conditions of the appointment (including specifically the terms of remuneration) of a Public Analyst, shall be subject to the approval of the Local Government Board.

(*b*) That notwithstanding any provision relating to the duration of appointment under which any Public Analyst may have been heretofore, or shall be hereafter, appointed, his tenure of office shall not terminate nor be determinable, nor shall the terms of his remuneration be alterable, without the approval of the Local Government Board.

(*c*) That Public Analysts be entitled to appeal to the Local Government Board on all matters relating to their office : and

(*d*) That, when fresh legislation has the effect of increasing the work of the Public Analyst, some arrangement be made for the adequate readjustment of his emoluments.

A joint deputation from the Institute of Chemistry and the Society of Public Analysts has already been accorded an interview by Sir Thomas Elliott, on behalf of the President of the Board of Agriculture, and has made representation on the analogous position of Official Agricultural Analysts appointed under the Fertilisers and Feeding Stuffs Act, 1906. The suggestions of the deputation were very sympathetically received, and Sir Thomas Elliott, in the course of his remarks, said that the Board realised the advantages of continuity in the service of such officers ; that the analysts had to be trained, that they had to maintain expensive laboratories, and to keep their knowledge up to date for the benefit of the public If they held office only for a year or two, their experience was wasted ; whereas by continuous service they became every year more efficient and better acquainted with local conditions.

We venture to hope that by the joint action of yourself and the President of the Board of Agriculture. it may be possible to deal with the position of both Public Analysts and Official Agricultural Analysts in one measure, simultaneously amending both the Sale of Food and Drugs Act, 1875, and the Fertilisers and Feeding Stuffs Act, 1906, in the directions indicated.

We have the honour to remain, Sir,

Yours faithfully,

PERCY F. FRANKLAND,

President of the Institute of Chemistry of Great Britain and Ireland ;

R. R. TATLOCK,

President of the Society of Public Analysts and other Analytical Chemists.

The Board, in reply, promised that these representations would receive further consideration in connection with any fresh legislation that may be proposed for the amendment of the Sale of Food and Drugs Acts ; the Secretary for Scotland also replied that the proposals would receive careful consideration.

The Public Appointments Committee have continued to watch the proceedings of local authorities in connection with the appointments of Public Analysts, and, acting on the recommendation of this Committee, the Council have taken action in several cases, among which may be mentioned those of the appointments at Shoreditch and York, in which the Council felt it their duty to protest against the practice of offering these professional positions to tender. The following is a copy of the letter addressed to the Town Clerk of the Metropolitan Borough of Shoreditch.

19th September, 1908.

Dear Sir,

The attention of the Institute of Chemistry has been directed to the terms of an announcement to the effect that the Council of the Metropolitan Borough of Shoreditch are about to appoint a Public Analyst in the place of the late Sir Thomas Stevenson.

The Council of the Institute, while feeling that they need not impress on the Borough Council the great importance of securing the services of a fully competent analyst, desire me to express their regret that the appointment should have been offered in terms which might suggest that it is to be given to the Candidate making the lowest tender.

My Council venture to express the opinion that, in the case of an appointment of this kind, the qualifications for which are of a purely personal character, the system of inviting professional men to tender for an appointment has the effect of lowering the status of their profession, to the detriment of the public service. It precludes, and in this case has precluded, many analysts of repute from becoming candidates for the appointment, and therefore limits the selection, while it is not likely that the Borough Council will secure the services of the best man by entrusting the position to the practitioner who places the least value on his skill, experience, and professional position.

I am desired to request you kindly to bring this letter to the notice of the Borough Council when the appointment in question is under consideration.

I beg to remain, dear Sir,

Yours faithfully,

(Signed) Richard B. Pilcher,

Registrar and Secretary.

The letter addressed to the Town Clerk of the City of York was in practically the same terms, and a similar communication was addressed to an Irish Board of Guardians who had also invited applications for an analytical appointment, referring to the Candidates as "the persons tendering."

The Council feel strongly that it is injurious to the profession of chemistry that chemists should be invited to tender against one another for such appointments. It is obvious that an extension of this system would lead to the degradation of the general status of persons holding such appointments, and the Council, therefore, consider it undesirable that Fellows and Associates should apply for positions advertised in this manner.

Fertilisers and Feeding Stuffs Act, 1906.—In the last issue of the Proceedings, an account was given of a deputation from the Institute to the Board of Agriculture and Fisheries, with reference to the unsatisfactory conditions under which professional chemists hold appointments under the above Act. The attention of the Fellows and Associates is now directed to the following paragraph recently appearing in a circular (A $\frac{172}{C}$) dated October 6th, 1908, issued by the Secretary of the Board to local authorities in Great Britain for the purposes of the Fertilisers and Feeding Stuffs Act, 1906:—

> In many cases appointments of Official Agricultural Analysts and Official Samplers are made for a year. The formalities connected with the making and approval of annual appointments involves the expenditure of an amount of time on the part of the clerical staff of the Board and local authorities which is, in the aggregate, considerable, and I am to suggest that in many cases it would be found more convenient to make these appointments "during the pleasure of the Council," with provision for reasonable notice to the official concerned of any proposed change, instead of for a specified period. The Board understand that the County Councils Association consider that in the case of an Official Agricultural Analyst six months' notice would be reasonable.

From this it appears that the Board have consulted the associations representing the municipal and county authorities upon the question of security of tenure for Agricultural Analysts, and there would seem some probability that provision may be made for giving at least six months' notice in the event of a local authority desiring to effect a change of officer. This would be far preferable to the system at present existing in some places, under which several analysts have, by lapse

of time and without receiving notice, ceased to hold their positions and have been replaced by others.

Agricultural Analyses.—In the Proceedings, Part IV., 1907, it was mentioned that the Council had forwarded to the Departmental Committee of the Board of Agriculture and Fisheries on Agricultural Education in England and Wales, a statement of their views on the performance of cheap analyses at agricultural colleges. The report of the Committee, which was published towards the end of July last (Cd. 4206), includes the following section :—

Analytical Work at Teaching Institutions.

101. In connection with experimental work the chemists at teaching institutions must frequently make analyses of manures and feeding stuffs. In some cases those responsible for this work have gone further and made analyses of manures and feeding stuffs for farmers at a cheap rate. These analyses have been undertaken in order to induce farmers to pay more attention to the character of the materials which they buy for fertilising the soil or for stock feeding, and the object of the institutions has primarily been educational. The educational value of this work in some districts is undoubted, and evidence was given of the appreciation shown by farmers of such assistance. On the other hand, it was argued by Dr. J. A. Voelcker in his evidence, and also in a communication received by the Committee from the Institute of Chemistry, that college teachers, by performing these analyses, were undertaking commercial work, and that colleges should not use money granted for educational purposes for work of this character.

The Committee, while of opinion that analysis for commercial or trade purposes forms no part of the function of an agricultural college in receipt of State aid, consider that when analytical work is distinctly of educational value it may properly be carried out by the chemist at such an institution

It would be difficult to determine when analyses are not of educational value, but it is evident that the Committee intended to convey the opinion that no agricultural college in receipt of State aid should control an analytical and consulting practice. The Council of the Institute therefore welcome an authoritative statement which recognises the need for protecting the rights and privileges of private practitioners.

The Minutes of Evidence taken before the Departmental Committee, which have also been published (Cd. 4207),

contain the evidence of Dr. J. A. Voelcker, M.A., F.I.C., who represented the views of the Council on this matter.

Appointments Register.—The Council have had under consideration, for some time past, a scheme for helping Fellows and Associates who are seeking appointments. Acting on the report of a special committee, consisting of the President, with Dr. M. O. Forster, Mr. Oscar Guttmann, Mr. Otto Hehner, Sir William Ramsay, K.C.B., and Dr. J. A. Voelcker, appointed to deal with this matter, the Council have made arrangements, of which particulars are given in the General Notices at the end of this Part of the Proceedings.

Alterations in the Regulations.—The Council have decided to allow any Candidate who has passed the Final Examination for the degree of B.Sc. in a recognised University, with First or Second Class Honours in Chemistry, to apply for admission to the Final Examination, provided he satisfies the Council as to his training in theoretical and practical Physics, Mathematics, and one of the approved optional subjects.

The University of Melbourne, Victoria, and the University of Toronto, Canada, have been added to the list of Universities, Colleges, and Institutions recognised for the training of Candidates for the Examinations of the Institute. Candidates who have taken the degree of B.Sc. (Melbourne) in Chemistry and Physics, will be entitled to apply for admission to the Intermediate Examination of the Institute, and those who have taken the degree of B.Sc. (Melbourne), with First or Second Class Honours in Chemistry, will be entitled to apply for admission to the Final Examination. Candidates who have passed the Final Examination for the degree of B.A. (Toronto), with First or Second Class Honours in Chemistry, in the Graduating Department of Chemistry and Mineralogy, are entitled to apply for admission to the Final (A.I.C.)

Examination, provided they satisfy the Council as to their training in theoretical and practical Physics, Mathematics, and one of the approved optional subjects.

The School of the Pharmaceutical Society of Great Britain has been recognised for training in the optional subject (IX.) Elementary Botany.

Examinations.—The Council have received the report of the Board of Examiners on examinations held from June 29th to July 10th in London, Birmingham, and Glasgow, particulars of which are given on pp. 11–23.

Particulars of an Examination in Biological Chemistry, which was held from October 19th to 23rd, will be published in Part I., 1909.

Arrangements will be made for holding an Examination in Chemical Technology in April, 1909. No Candidate presented himself for this Examination in April or October, this year.

Abstract of the

Report of the Board of Examiners

ON THE

INTERMEDIATE AND FINAL EXAMINATIONS

JUNE—JULY, 1908.

BOARD OF EXAMINERS.

Chairman: Percy Faraday Frankland, LL.D., F.R.S., *President.*

For the Intermediate Examination:

Bertram Blount, F.I.C. Herbert Jackson, F.I.C.

For the Final Examination:

(*a*) Mineral Chemistry ...	Bertram Blount, F.I.C.
(*b*) Metallurgical Chemistry	Frank William Harbord, A.R.S.M., F.I.C.
(*c*) Physical Chemistry ...	Thomas Slater Price, D.Sc. (Lond. and Birm.), Ph.D. (Leipzig), F.I.C.
(*d*) Organic Chemistry ...	William Henry Perkin, Ph.D. (Würzburg), F.R.S., F.I.C.
(*e*) The Chemistry of Food and Drugs, and of Water	Cecil Howard Cribb, B.Sc. (Lond.), F.I.C.
(*f*) Biological Chemistry ...	Arthur Harden, D.Sc. (Vict.), Ph.D. (Erlangen), F.I.C.
(*t.p.m.*) Therapeutics, Pharmacology, and Microscopy	Frederick Gowland Hopkins, D.Sc., M.B. (Lond.), M.A. (Cantab.), F.R.S., F.I.C.

The Intermediate Examination was held in London and in Glasgow from June 30th to July 3rd. The Final Examination in Branch (*b*) was held in London from June 29th to July 3rd, the practical work being conducted at the Royal School of Mines. The Examination in Branch (*c*) was held at the Municipal Technical School, Birmingham, during the same period. The

Examinations in Branches (*a*) and (*d*), in London and in Glasgow, and the Examination in Branch (*e*), in London, were held from the 6th to the 10th July.

There being 15 Candidates in Branch (*a*) who presented themselves at the Glasgow and West of Scotland Technical College, and only 5 in London, it was arranged that Mr. Blount should attend the local Examination, but, as he was prevented from doing so, Professor Jackson was appointed in his place, and attended the Examination for three days.

Sixty-five Candidates presented themselves; the number in each branch and the number of those who passed are shown in the following table :—

	Number Examined.	Number Passed.
Intermediate Examination	24 ...	15
Final Examination for A.I.C. :—		
Branch (*a*) : Mineral Chemistry ...	20 ...	14
Branch (*b*) : Metallurgical Chemistry	2 ...	1
Branch (*c*) : Physical Chemistry ...	1 ...	0
Branch (*d*) : Organic Chemistry ...	9 ...	4
Branch (*e*) : Chemistry of Food and Drugs, &c.	6 ...	5
Final Examination for F.I.C. :—		
Branch (*e*) : Chemistry of Food and Drugs, &c.	3 ...	2
	65	41

Intermediate Examination.—The Examiners found a number of Candidates lacking in knowledge of inorganic chemistry, both in the paper and in the practical exercises.

Final Examination.—In addition to the usual four days' practical work, all Candidates for the Final Examination were required to answer a paper of questions dealing mainly with their respective branches. This was the first occasion on which the Examiners had exercised their right of setting written papers, and the answers were somewhat disappointing. The Board, however, intend that, in future, a written paper

shall form an essential portion of the Final Examination, and Candidates will be expected to obtain a high standard of marks in it.

In Branch (*a*) the practical work was unequal. There was evidence of considerable manipulative skill and acquaintance with modern methods, but some of the work was done without proper thought of the end to be attained, and it indicated a belief in recipes, rather than a knowledge of chemistry. Few Candidates were able to express the significance of their results in the form of a report—an important matter for them in their professional future.

In Branch (*b*) one Candidate passed.

In Branch (*c*) the Candidate did not satisfy the Board.

In Branch (*d*) several of the Candidates showed an insufficient acquaintance with the methods of practical organic work, and the average standard was below that of previous examinations.

In the practical part of the Examination in Branch (*e*), it was obvious that biological methods had been but little studied or employed, and several Candidates showed no real familiarity with the use of the polarimeter, whilst most had only vague ideas as to the correct method of drawing up certificates under the Sale of Food and Drugs Acts in proper legal form. The Candidates did well in Pharmacology and Therapeutics. The microscopical work showed some improvement upon that of previous occasions, and was very well done by several Candidates.

The thanks of the Council have been accorded to the Governors of the Glasgow and West of Scotland Technical College for the use of laboratories for the Intermediate and Final Examinations, and to Professor G. G. Henderson, M.A., D.Sc., F.I.C., for his help in making arrangements and in superintending the examinations; to the Governors of the

Imperial College of Science and Technology for the use of the Metallurgical Laboratory of the Royal School of Mines, and to Professor W. Gowland, F.R.S., F.I.C., for his courtesy in this connection; to the Governors of the Municipal Technical School, Birmingham, and to Dr. T. Slater Price, F.I.C., for the use of a laboratory for an Examination in Physical Chemistry; to Professor Frank Clowes, D.Sc., F.I.C., chief chemist to the London County Council, for the use of a Mahler calorimeter; and to Mr. A. C. Chapman, F.I.C., for lending six microscopes.

The following candidates passed the Intermediate Examination.

Allen, Harry Leonard	University College, Dundee.
Evans, Bernard Scott	B.Sc. (Lond.). Under Leo Taylor, F.I.C.
Ferrey, Cuthbert Edmund Caulfeild	Under the late James Baynes, F.I.C.; and University of Leeds.
Goldsbrough, Harold Albert ...	Under A. C. Chapman, F.I.C.; and Finsbury Technical College, London.
Goodban, Leonard	University College, London: and under M. Wynter Blyth, B.A., B.Sc., F.I.C.
Greenough, Thomas Rigby ...	B.A. (Cantab.). Caius College, Cambridge; Municipal School of Technology, Manchester; and King's College, London.
Henville, Douglas	Under R. A. Cripps, F.I.C.; and University College, Nottingham.
Hogan, George	University College, Nottingham.
Imrie, Arthur Peter	Glasgow and West of Scotland Technical College.
Johnson, George Edward ...	B.Sc. (Lond.). Hull Municipal Technical School.
Jones, Osman	Finsbury Technical College, London; and under J. Kear Colwell, F.I.C.
Reeve, Howard Teesdale ...	University of Birmingham.
Shepherd, Evelyn Henry ...	B.Sc. (Lond.). Merchant Venturers' Technical College; and under A. C. Chapman, F.I.C.
Warrick, Robert Walter ...	Finsbury Technical College, London.
Young, John	Glasgow and West of Scotland Technical College.

The following candidates passed the Final Examination for the Associateship (A.I.C.):

In Branch (a), Mineral Chemistry.

Boyd, James	Glasgow and West of Scotland Technical College.
Brebner, John	M.A., B.Sc. (Aberdeen). University of Aberdeen; under James Hendrick, B.Sc., F.I.C.; and Glasgow and West of Scotland Technical College.
Bruce, Robert	Heriot-Watt College, Edinburgh.
Butler, Gerald Snowden ...	B.A. (Oxon.). Keble College, Oxford.
Cameron, Alec Munro	B.Sc. (Edin.). University of Edinburgh; and under J. Kerr, B.Sc., F.I.C.
Cameron, William	Glasgow and West of Scotland Technical College.
Cunningham, George Alexander Main	
Fletcher, Matthew Cunningham	
Freak, Gilbert Arthur... ...	B.Sc. (Lond.). Under J. B. Coleman, F.I.C., S.W. Polytechnic.
Hayman, Jack Vernon Johnson	A.C.G.I. City and Guilds Technical College; and under Arthur Marshall, F.I.C.
Hepburn, Andrew	Glasgow and West of Scotland Technical College.
Pattison, James William Henry	
Petrie, Alexander Swanston ...	
Sutherland, Maggie Millen Jeffs	Glasgow and West of Scotland Technical College; and University of Glasgow.

In Branch (b), Metallurgical Chemistry.

Rolfe, Robert Thatcher ...	King's College, London; and under Edward Riley, F.I.C.

In Branch (d), Organic Chemistry.

Akers, Noel Charles	Finsbury Technical College, London.
Kenyon, Joseph	B.Sc. (Lond.). Under R. H. Pickard, D.Sc., Ph.D., F.I.C., Municipal Technical School, Blackburn.
Norton, Harold Richard ...	B.Sc. (Lond.). University of Birmingham.
Russell, William Fraser ...	Glasgow and West of Scotland Technical College.

In Branch (e), The Chemistry of Food and Drugs, and of Water.

*Caldwell, Kenneth Somerville	B.Sc. (Wales). Ph.D. (Leipzig). University College, Bangor; and University of Leipzig.
Caulkin, Howard Alfred ...	B.Sc. (Lond.). University of Birmingham.
Heap, Harri	M.Sc. (Manc.). University of Manchester; under R. St. G. Ross, F.I.C.; and under G. J. Fowler, D.Sc., F.I.C.
Joy, Arthur Stanley	Assoc.R.C.Sc. (Lond.). Royal College of Science, London; and under C. H. Cribb, B.Sc., F.I.C.

Stock, Cyril Joseph Heath	...	B.Sc. (Dun.). Armstrong College, Newcastle-on-Tyne: under W. F. K. Stock, F.I.C.; and under H. E. Watt, B.Sc., F.I.C.
*Tankard, Arnold Rowsby	...	Under the late A. H. Allen, F.I.C.; at Firth College (now the University), Sheffield; with G. E. Scott-Smith, F.I.C.; and with G. Rudd Thomson, F.I.C.
Warner, Charles Horne	...	School of the Pharmaceutical Society; and King's College, London.

* *For the Fellowship.*

PAPERS AND EXERCISES SET AT THE JUNE–JULY EXAMINATIONS, 1908.

Intermediate Examination.

(London and Glasgow.)

GENERAL AND THEORETICAL CHEMISTRY.

TUESDAY, JUNE 30th, 1908: 10 *a.m. to* 1 *p.m.*

(*The candidate is expected to attempt all of the questions.*)

1. State what you know of the Stassfurt deposits, and give an account of their probable origin, mode of formation and composition.

2. Fused silica is now made into laboratory apparatus such as dishes, crucibles and tubes. State its advantages and drawbacks for this purpose. Give a list of classes of substances for which its use is and is not suitable, and discuss its suitability for combustion tubes, having regard to the substances generally used in filling such tubes and the temperatures commonly employed. Set out the reasons which lead to your opinion, in each case.

3. Compare the oxides of iron and manganese. Describe the methods of preparing them; discuss their nature and properties, and give a short account of the chief compounds which they form.

4. Describe as many methods as you can for the preparation of hydrogen, and state the impurities which you would expect to be present in each case. How would you prepare a specimen of pure hydrogen for the investigation of its spectrum?

5. How do you account for the formation of H_2O_2 in the following:—(1) the electrolysis of diluted H_2SO_4; (2) the oxidation of ether in presence of water; (3) the passage of oxygen into water in which palladium hydride is suspended: (4) the distillation of ammonium persulphate with dilute H_2SO_4?

6. Give a detailed account of the method you would employ to determine the silica, alkalies and lead in a sample of flint glass, and indicate the principles on which the separations depend, giving equations where possible.

2 *p.m. to* 5 *p.m.*

(*The candidate is expected to attempt all of the questions.*)

1. Two compounds having the molecular formula $C_2H_4Br_2$ are known. Describe their preparation and give a full account of all the experiments you would make to distinguish between them and to prove their structural composition.

2. Write an account of the various methods which have been employed for preparing potassium cyanide. Discuss the reactions involved and in a general way compare the efficiencies of the different processes you deal with.

3. Fully describe the preparation of ethyl aceto-acetate. Discuss its formula, and explain what is meant by saying that this substance offers an example of tautomerism.

4. Write a short essay on any one of the following : (*a*) valency; (*b*) the phase rule; (*c*) methods of measuring chemical affinity; (*d*) electrons and their chemical significance.

5. Describe the general character of ketoses and aldoses. Give an account of the properties and reactions of any of these sugars in which they closely resemble one another, and also those in which they differ and by which they may be distinguished from one another.

6. Describe two methods of synthesising pyridine. What properties and reactions of this substance indicate its ring structure? Write the structural formulæ of the mono-hydroxy pyridines.

PRACTICAL CHEMISTRY.

WEDNESDAY, JULY 1*st*, 1908 : 10 *a.m. to* 4.30 *p.m.*

1. Prepare pure sulphur from the sample of crude sulphur, and determine the melting point and boiling point of your preparation.

2. Identify the alcohol and base in the mixture and determine the percentage amount of the base. (Urea and methyl alcohol.)

THURSDAY, JULY 2*nd*, 1908 : 10 *a.m. to* 4.30 *p.m.*

1. Determine the silicon and phosphorus in the sample. (Cast iron.)

2. Hydrolyse the ester; prepare a specimen of the acid and determine its equivalent. (Ethyl phthalate.)

FRIDAY, JULY 3*rd*, 1908 : 10 *a.m. to* 4.30 *p.m.*

1. Identify spectroscopically the two metals in the aqueous solution of their hydroxides. Determine the amount of each present in 1 litre. (Lithium hydroxide and barium hydroxide.)

2. Prepare about 100 c.c. of ethyl acetate. Determine its boiling point and solubility in water, at the temperature of the water supply.

Final Examinations for the Associateship.

Branch (*a*).—Mineral Chemistry.

MONDAY, JULY 6th, 1908: 2.30 *to* 5.30 *p.m.*

(LONDON AND GLASGOW.)

1. State a scheme for the proximate analysis of an ordinary clay produced by the decomposition of granite and containing other minerals than kaolin.

2. Give an account of the history of the allotropic theory of metals, *i.e.*, the view which has led to a belief in the existence of modifications of the metal iron, extending your description to any similar belief in the existence of modifications of other metals, such as copper and gold. State the influence on these three metals of small quantities of foreign elements, and give your opinion of the present position of the allotropic theory, with the reasons on which your views are based.

3. What substance is used in modern manufacture as the source of phosphorus, and how is the manufacture at present conducted?

4. Write a short essay on dissociation by heat, with an account of recent work on the influence of moisture on the dissociation.

5. Give an account of the effect on the boiling point of a liquid of:

(*a*) The addition of a soluble non-volatile solid to the liquid.
(*b*) The addition of another liquid having a different boiling point from that of the first, and perfectly miscible with it.
(*c*) The addition of a liquid of different boiling point and partially miscible.
(*d*) The addition of a liquid of different boiling point and completely immiscible.

TUESDAY, JULY 7th, 1908: 10 *a.m. to* 4.30 *p.m.*

1. Determine the percentage of manganese and of CO_2 in the sample of native manganese carbonate. (Rhodocroisite.)

2. Fractionate the sample of mineral oil, and determine the specific gravity of the fractions. (Kerosine.)

WEDNESDAY, JULY 8th, 1908: 10 *a.m. to* 4.30 *p.m.*

The sample of coal is to be used as an industrial source of power. Examine it so as to determine its value for this purpose, and state for what method of power production it is best fitted. (Tasmanian coal.)

THURSDAY and FRIDAY, JULY 9th and 10th, 1908:
10 *a.m. to* 4.30 *p.m. each day.*

Identify the substance and make a quantitative analysis of it. (Green ultramarine.)

(*The identification is to be reported to the examiner as soon as complete, and in any case before the end of the fourth day; the analysis to be completed on the fifth day.*)

Branch (*b*).—Metallurgical Chemistry.

MONDAY, JUNE 29th, 1908: 2.30 *to* 5.30 *p.m.*

1. Give the approximate analysis of pig iron you would select for the manufacture of steel, by the (1) acid Bessemer process, (2) basic Bessemer, (3) acid open hearth, (4) basic open hearth.

2. You are asked to report on the efficiency of a gas producer plant. Describe in detail what experimental tests you would make and the object of each test.

3. Describe the process of pyritic smelting, with a brief description of the plant employed. What process would you suggest for obtaining refined copper from the crude product obtained from the smelter.

4. Give some account of the different types of electric furnaces used for metallurgical purposes, and state what electrical measurements you would make to determine the efficiency of the furnace for any given operation.

5. Describe how you would desilverize lead containing considerable quantities of silver. If gold were present, how would you separate this?

6. What is the effect of lead, bismuth, and arsenic, on the properties of copper? What is the maximum percentage of each constituent you would allow in copper tube plates for locomotives?

TUESDAY and WEDNESDAY, JUNE 30th and JULY 1st, 1908:

10 *a.m. to* 4.30 *p.m.*

(*At the* ROYAL SCHOOL OF MINES, LONDON.)

1. Examine the sample of copper ore and report on its commercial value, giving your reasons.

2. Make an analysis of the given alloy,

or,

Take a cooling curve of the sample of steel given you, and state at what temperature you would anneal and oil harden to obtain the best results.

THURSDAY and FRIDAY, JULY 2nd and 3rd, 1908:

10 *a.m.* to 4.30 *p.m.*

(*At the* ROYAL SCHOOL OF MINES, LONDON.)

1. Determine the percentage of chromium, carbon, and phosphorus in the given sample of ferro chrome.

2. Determine the percentage of silver and lead in the given sample.

Branch (*c*).—Physical Chemistry.

MONDAY, JUNE 29th, 1908: 2.30 *to* 5.30 *p.m.*

(*At the* MUNICIPAL TECHNICAL SCHOOL, BIRMINGHAM.)

1. What is the "Theorem of Le Chatelier"? Show how it can be applied in the following cases: (*a*) influence of pressure on the melting point; (*b*) influence of pressure on the dissociation of phosphorus pentachloride at constant temperature; (*c*) influence of temperature on the solubility of a salt in water; (*d*) influence of change in volume on the equilibrium between iron and water vapour at constant temperature.

2. State what you understand by osmotic pressure. Give some account of the recent work which has been done on the subject, describing the apparatus used.

3. Give an outline of the processes adopted for the isolation of argon and its companions from the atmosphere. State fully the evidence for the assumption that the molecules of these elements are monatomic.

4. Point out how a knowledge of the following may be of importance in various manufacturing operations: (*a*) migration of ions; (*b*) effect of the concentration of an electrolyte on the deposition potential of a metal; (*c*) the effect of varying (1) current density, (2) electromotive force, (3) the electrolyte, on the character of a metal deposited electrolytically.

5. Describe how the solubility of a salt can be determined accurately. What special method has to be used in the case of a salt such as silver chloride?

At a given temperature a litre of a saturated solution of silver bromate contains 0·0081 gm-molecules of salt: 0·0085 gm-molecules of silver nitrate are then added. Calculate the new solubility of the silver bromate, assuming that both salts are practically completely dissociated in solution.

6. What is meant by the "transport number" of an ion? Explain how it can be measured?

A solution of potassium chlorate is electrolysed, and during electrolysis 0·3514 gm. Ag is deposited in a silver voltameter in series. 41·079 gms. of the solution gave before electrolysis 1·0576 gms. K_2SO_4. The anode solution after electrolysis weighed 59·954 gms. and gave 1·3802 gms. K_2SO_4. The anode was of cadmium and was attacked by the chlorate ions. Find the transport number of the cathion (Ag = 108; K = 39; Cl = 35·5; O = 16; S = 32; Cd = 112).

TUESDAY, JUNE 30th, 1908: 10 *a.m. to* 4.30 *p.m.*

From an investigation of the freezing point curves determine whether the substance, A, forms a compound with the substance, B.

WEDNESDAY, JULY 1st, 1908: 10 *a.m. to* 4.30 *p.m.*

(*a*) Fit up a normal calomel electrode.

(*b*) Determine the percentage hydrolysis at 25° of aniline hydrochloride in $\frac{N}{20}$ and $\frac{N}{30}$ aqueous solution, using the electrometric method.

THURSDAY, JULY 2nd, 1908 : 10 *a.m. to* 4.30 *p.m.*

You are supplied with a standard solution of sodium hydroxide, and with a solid acid. Determine (1) the basicity of the acid by the conductivity method, (2) the molecular weight by the silver salt method.

Find also the molecular weight of the acid when dissolved in benzene, using the freezing point method.

FRIDAY, JULY 3rd, 1908 : 10 *a.m. to* 4.30 *p.m.*

1. Find the radius of the given capillary tube by measuring the height to which benzene rises in the tube at 25° and 35°.

2. Use the same tube to determine the molecular surface energy and association factor of the given liquid, the molecular weight of which is 58·06.

Branch (*d*).—Organic Chemistry.

(London and Glasgow.)

MONDAY, JULY 6th, 1908 : 2.30 *to* 5.30 *p.m.*

1. An organic acid gave the following results on analysis : 0·1531 yielded 0·3883 CO_2 and 0·1410 H_2O. The silver salt contained 41·1 per cent. of silver, and when the acid was heated with bromine and afterwards with alcoholic potash, it yielded an acid which contained C = 70·1 ; H = 9·1 per cent. This latter, when heated with sulphuric acid, was converted with loss of hydrogen into an aromatic acid which yielded *m*-xylene on distillation with lime. Suggest possible formulæ for these substances.

2. Write a short account of any evidence which favours the view that oxygen is tetravalent.

3. What synthetical methods have afforded the most conclusive evidence as to the constitution of naphthalene? Describe the action of chlorine, nitric acid, sulphuric acid and oxidising agents on naphthalene, and state in each case the conditions under which action takes place.

4. What is the constitution of isoquinoline and how has this been proved analytically and synthetically?

5. What are the principal oxidising agents? Explain, with practical details and examples, the way they are employed.

6. From a sugar containing n-carbon atoms, how would you prepare a sugar containing $n + 1$ carbon atoms, and a sugar containing $n - 1$ carbon atoms?

TUESDAY, JULY 7th, 1908 : 10 *a.m. to* 4.30 *p.m.*

1. Determine the percentage of nitrogen in the substance, H, by the Kjeldahl method. (Hydrobenzamide.)

2. Investigate the substance, I ; ascertain what elements it contains, and endeavour to discover its identity. (Cyanamide-calcium.)

WEDNESDAY, JULY 8th, 1908 : 10 *a.m. to* 4.30 *p.m.*

1. Fully investigate and report on the given substance, J. (Phthalimide.)

2. The substance, K, is the salt of a base ; determine its nature. (Diphenylamine hydrochloride.)

THURSDAY, JULY 9th, 1908: 10 *a.m. to* 4.30 *p.m.*

1. Determine by any method you prefer the molecular weight of the substance, L. (Chloro-benzene; *p*-chloro-toluene; ethylene dibromide. One to each candidate.)

2. Investigate the ester, M, and determine its nature. Leave specimens of any product you obtain from it. (Iso-butyl tartrate.)

FRIDAY, JULY 10th, 1908: 10 *a.m. to* 4.30 *p.m.*

Separate the liquid, O, into its three constituents. State approximately the proportions in which they are present. Determine their physical properties and endeavour to identify them. (Toluene; phenol; *p*-toluidine.)

Branch (*e*).—The Chemistry of Food and Drugs, and of Water.

MONDAY, JULY 6th, 1908: 10.30 *a.m. to* 1 *p.m.*

1. Describe the various methods by which drugs are administered, otherwise than by the mouth. Give any instances you can to illustrate how far the limits of safe dosage are affected by the method of administration.

Or,

Give a succinct account of arsenic and its compounds as drugs and as poisons. Illustrate the possibilities of the accidental contamination of food-stuffs and beverages with arsenic, owing to its presence in raw products. Define in any instance the limits of safety in such contamination.

2. Give a general account of the method used to prepare the following for satisfactory examination by the microscope: an animal tissue (*e.g.*, muscle, suspected of being affected by *trichina spiralis*); a culture of bacteria; hard vegetable tissues.

3. Explain the common usage of the terms anæsthetic, narcotic, hypnotic, giving instances of drugs which come properly under these headings. How would you proceed to identify chloroform in the stomach of a person poisoned by the drug?

Answer the following in a separate note-book.

1. Describe briefly the chief methods employed for the determination of starch in vegetable food-stuffs. How would you estimate added starch in cocoa, in pepper, and in margarine?

2. What is the significance of nitrogen as nitrates and as nitrites in water analysis. State briefly the methods employed for estimating these compounds in natural waters.

3. Assuming that you have obtained the results given below, by the analysis of samples of milk (*a* and *b*), and of separated milk (*c*) respectively, how would you word your certificate if legal proceedings under the "Sale of Food and Drugs Acts" were to be taken in each case?

Samples of milk:

	Specific gravity.	Total solids.	Fat.	Non-fatty solids.	Ash.
(*a*)	1·027	11·35	3·70	7·65	·64
(*b*)	1·028	10·08	2·45	7·63	·63
Sample of separated milk:					
(*c*)	1·028	8·91	1·52	7·39	·62

MONDAY, JULY 6th, 1908: 2 *p.m. to* 4.30 *p.m.*

1. You are to suppose that the implement, A, is suspected of having been used in a case of homicide. Decide, by direct microscopic examination, or by the use of micro-chemical tests, whether any stains upon it would justify such suspicion.

2. The sample, B, is dust swept from the floor of a crowded tenement. Identify so far as possible the constituents. Make drawings of what you describe.

3. Report upon the sample of "corn-flour," C.

The candidates were examined orally and practically in the recognition of chemicals and drugs.

TUESDAY, JULY 7th, 1908: 10 *a.m. to* 4.30 *p.m.*

1. Examine the sample of honey and report as to its genuineness. (Honey adulterated with commercial glucose.) (*A biological method may be employed and the work continued during the remainder of the examination.*)

2. Estimate the proportion of any adulterant you may find in the sample of cayenne pepper. (Rice starch.)

WEDNESDAY, JULY 8th, 1908: 10 *a.m. to* 4.30 *p.m.*

1. Identify the active constituent in the "Headache Powder." (Caffeine citrate, potassium bromide.)

2. Estimate the alcohol in the tincture of ginger and examine the sample generally with the view of ascertaining if it has been prepared in accordance with the directions in the British Pharmacopœia. (Of excessive strength and adulterated with methylated spirit.)

3. Examine the sample of saffron for vegetable adulterants. (Adulterated with calendula.)

THURSDAY, JULY 9th, 1908: 10 *a.m. to* 4.30 *p.m.*

Determine the following constants in the sample of lard:—iodine absorption, bromine thermal equivalent, saponification equivalent, specific gravity at 100°C, and melting point, and report generally as to its genuineness or otherwise. (Adulterated with cotton-seed oil.)

FRIDAY, JULY 10th, 1908: 10 *a.m. to* 4.30 *p.m.*

1. Identify the poison in the sample of "tea." (Brucine hydrochloride.)

2. Examine the sample of tea, and report as to its genuineness or otherwise. (Adulterated with foreign leaves.)

Obituary.

JAMES BAYNES died on August 9th, 1908, at Hull, aged sixty-three years. Originally trained as a pharmaceutical chemist, he afterwards studied at Heidelberg, and, about the year 1878, was appointed Public Analyst for the City of Hull, and, in the course of time acquired a considerable practice. At the time of his death, he was also Public Analyst for the East Riding of Yorkshire, Beverley, Kingston-on-Hull, York, Scarborough, Boston, Grimsby, Lincoln, Louth, Hanley, and the Soke of Peterborough, and Agricultural Analyst for Hanley and Kingston-on-Hull. He was elected a Fellow of the Institute in 1878.

BENNETT HOOPER BROUGH died at Newcastle-on-Tyne on October 3rd, 1908, aged forty-eight years. He was the eldest son of Mr. John Cargill Brough, a former Editor of *The Chemist and Druggist*, and was educated at the City of London School, proceeding to the Royal School of Mines, and, later, to the Royal Prussian Mining Academy at Clausthal. In 1882, he acted as assistant to Professor (afterwards Sir) Warington Smyth, at the Royal School of Mines, and four years later became Instructor in Mine Surveying, which position he held until 1893, when he was appointed General Secretary to the Iron and Steel Institute. From 1882-95, he was an abstractor to the Journal of the Chemical Society; from 1883-93, co-Editor of the Journal of the Iron and Steel Institute; and from 1892-96, Assistant Examiner in Mining to the Science and Art Department. During 1895, he was a member of the Research Committee of the Imperial Institute. He acted as juror in connection with the Inventions Exhibition (London) in 1885; he was a member of the Mining and Metallurgical Committee of the British Section of the Paris Exhibition in 1889, and of the St. Louis Exhibition in 1904, and he was a member of the Iron and Steel Section Committee at the Franco-British Exhibition, 1908. He was an examiner in Mining at the Royal School of Mines, Glasgow University, and the University of Wales. He was a Knight of the Swedish Order of Wasa. At different periods he served on the Councils of the Institution of Mining Engineers, the Chemical Society, and the Chartered Institute of Secretaries. In addition to his well-known "*Treatise on Mine Surveying*," Mr. Brough was the author of many papers on mining and other matters, contributed to scientific and other journals. He was elected a Fellow in 1887, and served on the Council for two periods of three years each. At his funeral, the Institute was represented by Mr. F. W. Harbord, A.R.S.M., Examiner in Metallurgical Chemistry, and Dr. Edward Divers, F.R.S. A wreath was sent in the name of the Fellows and Associates of the Institute.

JOHN TREVOR CART died at Scarborough on September 5th, 1908, aged twenty-eight years. After three years experience in pharmaceutical chemistry at Shrewsbury, he obtained a Bell Scholarship in 1902 and entered the School of the Pharmaceutical Society, subsequently qualifying as a pharmaceutical chemist, and also taking, in 1904, the degree of B.Sc. (Lond.). For some months he held the position of Demonstrator in Chemistry at the School of Pharmacy, and, in June, 1905, joined the staff

of Messrs. Hopkin & Williams, Ltd. Towards the end of 1906, he entered the service of Messrs. C. A. Parsons & Co., of Newcastle-on-Tyne, with whom he remained until his death. He was elected an Associate of the Institute in 1906.

Reginald Nestor Stavro Doresa died on July 4th, 1908, at the age of thirty-two years. Born at Bristol, he was educated at the Merchant Venturers' Technical College, and completed his training under Dr. E. H. Cook, F.I.C., at the Clifton Laboratory, Bristol, to whom he afterwards acted as assistant for some years. In succession to his father he also held, for a short period, the appointment of Greek Consul at Bristol. On coming to London in 1901, he entered the laboratory of Messrs. Stanger & Blount, at Westminster, and on the dissolution of that firm in 1903, became chief chemical assistant to Mr. R. H. H. Stanger, which position he occupied at the time of his death. He was elected an Associate of the Institute in 1899, and a Fellow in 1903.

Arthur Warren Ellis died on September 21st, 1906, aged twenty-six years. He was trained at Mason College (now the University), Birmingham, and under Mr. J Kear Colwell, F.I.C. After working for some months with Mr. W. W. Fisher, M.A., F.I.C., he became, in 1902, assistant to Dr. W. Scott-Tebb, M.A., F.I.C., with whom he remained for four years, when he was obliged to resign owing to ill-health. He was elected an Associate in 1903, and a Fellow in 1906.

Sydney John Steel died on June 25th, 1908, in his fortieth year. After working for two years at the Crystal Palace School of Practical Engineering, he entered the laboratory of Dr. Bernard Dyer, F.I.C., and, in 1891, was appointed chemist to Messrs. David Martineau & Sons, sugar refiners. On the firm shutting down their works five years later, he returned to Dr. Dyer, with whom he remained until his death. He also held an appointment as one of the relieving gas examiners to the London County Council. He was elected a Fellow of the Institute in 1899.

Sir Thomas Stevenson died at Streatham, S.W., on July 27th, at the age of seventy. He was born at Rainton, Yorkshire, and was educated privately. At the age of twenty-one he became medical pupil to Mr. Steel, of Bradford, and, after matriculating at London University, he entered in 1859, Guy's Hospital Medical School. Three years later he obtained the M.R.C.S., and, in 1864, he graduated as M.D. (Lond.), and was elected University Scholar in Forensic Medicine and Obstetrics. He became F.R.C.P. in 1871. In 1870, he was appointed Lecturer in Chemistry at Guy's Hospital, which post he retained until 1898. In 1878, he became Lecturer in Forensic Medicine, and occupied that position up to the time of his death. In 1881, he was appointed Senior Analyst to the Home Office, and, as such, was connected with many of the trials, involving toxicological evidence, which have been held during the last quarter of a century. Mainly for his unique services to the State in that capacity, he was knighted in 1904. He edited, in 1883 the third edition of "*Taylor's Principles and Practice of Medical Jurisprudence*," and, in 1904, conjointly with Sir Shirley Murphey, a "*Treatise on Hygiene and Public Health*." He also contributed various professional papers to *The Proceedings of*

the Royal Society, *The Chemical News*, *The British Medical Journal* and *Guy's Hospital Reports*. He was Public Analyst for the counties of Bedford and Surrey, and for the Boroughs of Shoreditch, St. Pancras, Northampton, Reigate, and Tunbridge Wells. He was President of the Society of Public Analysts from 1895-1896. He took great interest in the welfare of the Institute from its foundation, and by his personal influence largely promoted the recognition of the qualifications of the Institute by Government Departments. To meet the requirements of the Local Government Board in respect of Public Analyst Appointments, the Council, during his presidentship, instituted the Examination in Therapeutics, Pharmacology, and Microscopy, for which he was the first examiner (honorary) in these subjects. He was an Original Fellow, and his services on the first and succeeding Councils extended over periods amounting to about twenty-two years, including three years as president, from 1897 to 1900, and three years as vice-president. He was also a censor for fourteen years. At his funeral, the Institute was represented by Mr. David Howard, Mr. Oscar Guttmann, and Dr. Dyer, vice-presidents, and the Assistant Secretary; and a wreath was sent in the name of the Fellows and Associates of the Institute.

The Library.

Since the issue of Proceedings, Part III., the Library Committee have had much pleasure in acknowledging a number of gifts, including the following:—

GIFTS OF BOOKS, &c.:

AUSTRALASIAN INSTITUTE OF MINING ENGINEERS:
Transactions of the Australasian Institute of Mining Engineers. Vol. XII. Edited by the Secretary. *Melbourne*, 1907.

BUTTERFIELD, W. J. A., M.A., F.I.C.:
Board of Trade Journal. Vol. II. (No. 7) to Vol. XXV. (No. 141). *London*, February, 1887, to April, 1898.

CHURCHILL, MESSRS. J. & A.:
A treatise on qualitative analysis and practical chemistry. Adapted for use in the laboratories of colleges and schools. Frank Clowes. 8th Edition. *London*, 1908.

GEOLOGICAL SURVEY OF ENGLAND AND WALES, DIRECTOR:
The coals of South Wales, with special reference to the origin and distribution of anthracite. Aubrey Strahan and W. Pollard. *London*, 1908.

GLOVER, G. T., F.I.C.:
Atti del VII. congresso internazionale di chimica applicata. *Roma*, 1907. (7 vols.).

GREY, H. E. THE RIGHT HON. EARL:
Royal atlas of Canada. *Issued by the Department of the Interior at Ottawa.* 1906.

HOLLOWAY, G. T., F.I.C.:
"The Mining Journal," 1873—1882, inclusive.

LOCAL GOVERNMENT BOARD:
The forty-fourth annual report on alkali, &c., works. By the Chief Inspector. *London*, 1908.

LONDON UNIVERSITY, GOLDSMITHS' LIBRARIAN:
The libraries of London: a guide for book students. E. A. Rye. Published by the University of London. 1908.

MANCHESTER, RIVERS DEPARTMENT OF THE CITY OF:
The annual report of the Rivers Department of the city of Manchester for the year ending March 25th, 1908. *Preston.*

METROPOLITAN WATER BOARD:
First report on research work, by Dr. A. C. Houston, on the vitality of the typhoid bacillus in artificially-infected samples of raw Thames, Lea, and New River water, with special reference to the question of storage. 1908.

NASH, L. M., F.I.C.
"The Chemical News," Vol. LXXXIV., Nos. 2183—2196, and Index. 1902.

NEW SOUTH WALES, ROYAL SOCIETY OF:
Journal and proceedings of the Royal Society of New South Wales. Edited by the Hon. Secretaries. 1903—7. Vols. XXXVII.—XLI. *Sydney*, 1904—8.

SALAMON, A. GORDON, A.R.S.M., F.I.C.:
Exposition universelle internationale de 1900 a Paris. Rapports du jury international. Introduction générale. Tome IV., 5me partie, 2me et 3me sections. *Paris*, 1906.

SOUTHERDEN, FRANK, B.Sc., F.I.C.:
"The Chemical News," Vol. LXXIII.: Nos. 1893, 1895—8, 1900, 1902—9, and Index. Vol. LXXIV.: Nos. 1910—35, and Index complete. Vol. LXXV.: Nos. 1936—61, and Index complete. Vol. LXXVI.: Nos. 1962—8 inclusive. *London*, 1896—7.

VICTORIA, DEPARTMENT OF MINES AND FORESTS:
Report of the Department of Mines and Forests for the State of Victoria, for the year 1907. *Melbourne*, 1908.

WINSER, P. J., F.I.C.:
"The Chemical News," Vols. XXXIII.—XXXVIII. *London*, 1876—1878. "Nature," Vols. XVIII.—XXIII. *London*, 1878—1881.

WHITTAKER & Co.:
Electric lighting and power distribution. An elementary manual of electrical engineering. W. Perren Maycock, M.I.E.E. Vol. I. 7th edition. Thoroughly revised and mostly rewritten. *London and New York*, 1908.

BOOKS PURCHASED.

The chemical analysis of iron. A complete account of all the best-known methods for the analysis of iron, steel, pig-iron, iron ore, limestone, slag, clay, sand, coal, coke, and furnace and producer gases. A. A. Blair. 6th edition. *Philadelphia and London*, 1908.

L'ozone et ses applications industrielles. H. de la Coux. *Paris*, 1904.

Gmelin-Krauts' Handbuch der anorganischen Chemie. C. Friedheim.
Band II., Abteilung, 1. *Heidelberg*, 1906.
Band III., Abteilung, 2. *Heidelberg*, 1908.

Treatise on chemistry. Roscoe and Schorlemmer.
Vol. I. The non-metallic elements. *London*, 1905.
Vol. II. The metals. *London*, 1907.

Gerberei-Chemie. Sammlung von Hüffazen. J. von Schroeder. *Berlin*, 1898.

The Mineral Industry. Its statistics, technology and trade during 1907. Vol. XVI. *New York and London*, 1908.

JOURNALS WANTED.

The Library Committee will be greatly obliged by gifts of any of the following, which are needed to complete sets :—

Publication.	*Wanted.*
The Analyst	Vols. 1–4, inclusive.
The Chemical News	Vols. 27–32, inclusive, and Vols. 69–72; Nos. 1894, 1899, 1901 of Vol. 73; Nos. 1969–87 of Vol. 76; Vols. 77–83; Nos. 2171–82 of Vol. 84.
The Chemical Trade Journal...	Vols. 1–30, inclusive.
Chemiker-Zeitung	Vols. 1–25, inclusive.
Chemisches-Zentralblatt ...	Vols. 1–5, inclusive, of the 5th series.
The Metallographist	Vols. 1–4, inclusive.
Journal of the Board of Agriculture :	Prior to August, 1906.
Journal of the Chemical Society :	July, 1883; April, September, and October, 1899; and Vols. 37 and 38 (year 1880, except May).
Journal of the Institute of Brewing :	1897 (whole year); 1898 (Nos. for January and March, and from July to December, inclusive); 1899 (Nos. 1–5, inclusive).
Journal of the Society of Arts	Many early parts.
Nature	Vols. 1–17, 24–66, inclusive.
Zeitschrift für angewandte Chemie :	All prior to 1898; and 1901.

The Register.

Since the publication of Proceedings, Part III., in July, the Council have elected 3 new Fellows and 23 new Associates. 11 Associates have been elected to the Fellowship, and 28 new Students have been admitted. 4 former Fellows have been re-elected.

The deaths of 6 Fellows and 1 Associate have been reported.

New Fellows.

Caldwell, Kenneth Somerville, B.Sc. (Wales), Ph.D. (Leipzig), 136, Merton Hall Road, Wimbledon; and Chemical Department, St. Bartholomew's Hospital, London, E.C.
Dupré, Louis William, Kiangnan Arsenal, Shanghai.
Tankard, Arnold Rowsby, 63, Somerset Road, Newport, Mon.

Associates Elected to the Fellowship.

Bain, Alexander William, B.A., B.Sc. (Lond.), 2, Muswell Rise, Muswell Hill, London, N.
Barrowcliff, Marmaduke, 82, Highfield Road, Dartford, Kent.
Brisbane, James William, Holmwood, Bycullah Road, Enfield.
Darling, Charles Robert, Assoc.R.C.Sc.I., Bryniach, Brent Road, Plumstead, London, S.E.
Goodson, John Augustus, Chemical Research Laboratory, Gordon College, Khartoum, Soudan.
Hills, James Stuart, 225, Oxford Street, London, W.
James, Garnet William, B.A. (Oxon.), 37, Vestry Road, Camberwell, London, S.E.
Laws, Harry Edwin, B.Sc. (Lond.), Gonubie Park, P.O. Gonubie, *via* East London, South Africa.
Race, Joseph, Public Analyst's Laboratory, Burnley.
Sheldon, John Charles, c/o The Nickel Co., Kirkintilloch, near Glasgow.
Twiss, Douglas Frank, M.Sc. (Birm.), B.Sc. (Lond.), 89, Wood Lane, Harborne, Birmingham.

New Associates.

Akers, Noel Charles, 26, King's Avenue, Muswell Hill, London, N.
Boyd, James, Bellevue, 244, Garngad Hill, Glasgow.
Brebner, John, M.A., B.Sc. (Aberdeen), 2, Springbank Terrace, Aberdeen.
Butler, Gerald Snowden, B.A. (Oxon.), The Hill House, Stockton-on-Tees.
Cameron, Alec Munro, B.Sc. (Edin.), Ardchattan, Eskbank, Midlothian.
Cameron, William, 20, Avon Street, S.S., Glasgow.
Caulkin, Howard Alfred, B.Sc. (Lond.), Oaklands, Solihull, near Birmingham.
Cunningham, George Alexander Main, Northcote, Uddingston, near Glasgow.

Fletcher, Matthew Cunningham, c/o The Birmingham Metals and Munition Co., Ltd., Birmingham.
Freak, Gilbert Arthur, B.Sc. (Lond.), Hazleden, Hillside Road, Bushey, Herts.
Hayman, Jack Vernon Johnson, A.C.G.I., c/o Société Annonyme des Ciments d'Egypte, Massarah, near Helouan, Cairo, Egypt.
Heap, Harri, M.Sc. (Manc.), 3, Thursby Square, Burnley, Lancs.
Hepburn, Andrew, The Cross, Crieff; and 53, Exeter Drive, Partick, Glasgow.
Joy, Arthur Stanley, Assoc.R.C.Sc. (Lond.), 7, Elms Road, Clapham Common, London, S.W.
Kenyon, Joseph, B.Sc. (Lond.), 6, Cheltenham Street, Blackburn.
Norton, Harold Richard, B.Sc. (Lond.), 16, Trinity Road, Handsworth, Birmingham.
Pattison, James William Henry, Drimnamona, Kilmalcolm, N.B.
Petrie, Alexander Swanston, 4, Lorne Terrace, Maryhill, Glasgow; and c/o Messrs. Ebbs & Co., Iquique, Chili, South America.
Rolfe, Robert Thatcher, 12, Lawn Crescent, Kew Gardens, Surrey.
Russell, William Fraser, Gryffebank, Bridge of Weir.
Stock, Cyril Joseph Heath, B.Sc. (Dun.), Cockerton Hall, Darlington.
Sutherland, Miss Maggie Millen Jeffs, St. Margaret's, Lenzie, N.B.
Warner, Charles Horne, 17, Bloomsbury Square, London, W.C.

New Students.

Alcock, Miss Mary, 50, Cromford Road, Wandsworth, London, S.W.
Brimley, Harold John, 25, Audley Gardens, Seven Kings, Essex.
Caw, William, Whinmount, Crieff, N.B.
Cooper, Alfred Leslie, Inglenook, Lincoln Square, Hunstanton.
Crawford, John, 30, Ardgowan Street, Greenock, N.B.
Eastburn, Gerald Jerome, Towerville, Helensburgh, N.B.
Elkington, Harold Douglas, St. Aubyns, Woodborough Road, Putney, London, S.W.
Gill, Harold Warren, 10, Montague Road, Rusholme, Manchester.
Greenough, Thomas Rigby, B.A. (Cantab.), Beechwood, Leigh, Lancashire.
Grey, Egerton Charles, University of Sydney, N.S.W.
Griffiths, Hugh, 34, Dunning Road, Middlesbrough.
Griffiths, Richard Elliott, 27, Essex Road, Acton, London, W.
Johnston, Thomas Nicholl, Seaview House, Carnlough, co. Antrim.
Keith, Robert Philip, Forth Bank, Lenzie, N.B.
Kind, Robert Gordon, 14, Stoneby Drive, New Brighton.
Leeds, Miss Kathleen Mary, Tower House, Birdhurst Road, South Croydon.
Lundholm, Nils Olaf, Nobel House, Stevenston, Ayrshire.
Mabbitt, Alan Thomas, 3, Wallwood Road, Leytonstone, London, N.E.
Mason, Frederick Alfred, 21, Queen's Square, London, W.C.
Naunton, William Johnson Smith, 1, New Street, Woodbridge, Suffolk.
Pechey, William George, 54, High Street, Maldon, Essex.
Petrie, George Campbell, 4, Lorne Villas, Maryhill, Glasgow.
Pogson, Harold Arthur, 12, Viewpark Drive, Rutherglen, Glasgow.
Sanders, Henry Launcelot George, The Cottage, Little Heath, Coventry.
Sayers, Andrew, Nobel Villas, Stevenston.
Tagg, Max Herbert, 29, Chapel Street, Hyde, Cheshire.
Vinicombe, Lionel Frank, 196, Eglinton Road, Plumstead, London, S.E.
Wedgwood, Gordon, 12, Elliott Road, Thornton Heath, Surrey.

Deaths.

Fellows.

James Baynes.
Bennett Hooper Brough, A.R.S.M.
Reginald Nestor Stavro Doresa.
Arthur Warren Ellis.
Sydney John Steel.
Sir Thomas Stevenson, M.D. (Lond.), F.R.C.P.

Associate.

John Trevor Cart, B.Sc. (Lond.).

General Notices.

Intermediate and Final Examinations.

The next Intermediate Examination will commence on Tuesday, the 5th of January, 1909. Final Examinations in (*a*) Mineral Chemistry, (*b*) Metallurgical Chemistry, (*c*) Physical Chemistry, and (*d*) Organic Chemistry, may commence on Monday, the 4th of January, 1909, or on Monday, the 11th of January, 1909.

The Final Examination in (*e*) Analysis of Food and Drugs, etc., may commence on Monday, the 4th of January, 1909, or on Monday, the 11th day of January, 1909. This Examination is also open to Fellows and Associates who desire to obtain the Certificate of the Institute in Therapeutics, Pharmacology, and Microscopy, approved by the Local Government Board, under the Regulations as to the competency of Public Analysts.

The list of Candidates for the above examinations will be closed on Tuesday, the 1st day of December. If, at that

date, less than 35 Candidates have entered their names, the places will be allotted to the first 25 Candidates whose applications and fees are received. If there are more than 35 Candidates, a second examination will be held in the following week, but the examinations will not extend over more than two weeks, and the Council cannot undertake to admit more than 25 Candidates in each week.

Forms of application and further particulars may be obtained from the Registrar.

Examinations in Chemical Technology.

The Council will be prepared to arrange examinations in Chemical Technology to be held in April, 1909. The examinations will be open only to Fellows, and to those Associates who have been registered as such for at least one year, who produce evidence of practical technological training.

Forms of application and further particulars can be obtained from the Registrar.

Notice to Associates.

Associates who can produce evidence satisfactory to the Council that they have been continuously engaged in the study and practice of chemistry for at least three years since their election to the Associateship, can obtain forms of application for election to the Fellowship.

Appointments Register.

1. A Register of Fellows and Associates of the Institute of Chemistry who are seeking appointments is kept at the Offices of the Institute, and anyone desirous of obtaining the services of a professional chemist is requested to make application to the Registrar, stating his requirements and the

particulars of the appointment, which will be circulated among those whose names are on the Appointments Register.

2. Any Fellow or Associate, on payment of the sum of 2*s.* 6*d.*, is entitled to have his name placed on the Appointments Register for a period not exceeding six months, at the expiration of which, the Council may authorise his name to be kept on the list for a similar period on payment of a further sum of 2*s.* 6*d.*

3. Any Fellow or Associate desiring to have his name entered on the list is required to fill in a form, to be obtained from the Registrar, giving the following particulars:—Name; address; age; date of admission to the Associateship or Fellowship of the Institute; the special branch, if any, which he desires to follow; previous experience and positions held (if any); and the names of references.

4. Any Fellow or Associate whose name is on the list is required to communicate with the Registrar as soon as he obtains employment, in order that his name may be removed.

5. The existence of the Appointments Register will be made known, from time to time, in the Institute's publications and announcements, but, beyond acquainting those whose names are on this Register with the particulars of vacant appointments, neither the Institute nor its officers can take part in, or be held responsible for, any negotiations which may follow.

Fellows and Associates are invited to communicate with the Registrar in any instance in which they are able to assist in finding employment for qualified professional chemists.

Copy of form to be filled in by Fellows and Associates who wish their names placed on the Appointments Register:—

I wish my name to be placed on the Appointments Register.

Name ..... *Age* .....

Address .....

Degrees, or other qualifications, obtained by Examination .....

Date of Admission as Fellow or Associate .....

State whether employment in a particular Branch is desired:

.....

Experience and positions held (if any) .....

.....

.....

.....

.....

Names and Addresses of references:

.....

.....

.....

I enclose remittance for 2s. 6d.

Dated this ..... *day of* 19

The Seventh International Congress of Applied Chemistry will be held in London, from the 27th of May to the 2nd of June, 1909, under the Patronage of His Majesty the King and His Royal Highness the Prince of Wales. Sir Henry E. Roscoe, F.R.S., will be Honorary President, and Sir William Ramsay, K.C.B., F.R.S., President.

The Organising Committee consists of representatives of the principal scientific societies and of the most important industries. A list of the Sections and their officers is here given:

SECTION.	PRESIDENT.	VICE-PRESIDENT.	HON. SECRETARY.
1. Analytical Chemistry	Dr. T. E. Thorpe, C.B., F.R.S.	Sir W. Crookes, F.R.S., F.I.C.	A. C. Chapman, F.I.C.
2. Inorganic Chemistry	Dr. Ludwig Mond, F.R.S., F.I.C.	Sir J. Dewar, F.R.S., F.I.C.	Dr. E. F. Armstrong.
3.(*a*) Metallurgy and Mining	Sir Hugh Bell, Bart.	Prof. Henry Louis, F.I.C.	D. A. Louis, F.I.C.
(*b*) Explosives ...	Sir A. Noble, Bart., K.C.B., F.R.S.	Capt. T. G. Tulloch.	J. E. Petavel, F.R.S.
4.(*a*) Organic Chemistry	Prof. W. H. Perkin, F.R.S., F.I.C.	Prof. F. S. Kipping, F.R.S., F.I.C.	Dr. G. T. Morgan, F.I.C.
(*a.bis.*) Physiological	Prof. W. H. Perkin, F.R.S., F.I.C.	Dr. Arthur Gamgee, F.R.S.	Dr. Aders Plimmer.
(*b*) Allied Industries	Prof. R. Meldola, F.R.S., F.I.C.	Prof A. G. Green, F.I.C.	Dr. J. C. Cain.
5. Sugar	Sir Richard Garton	Ed. Tate.	Dr. L. T. Thorne, F.I.C.
6.(*a*) Starch	Dr. Horace T. Brown, F.R.S., F.I.C.	Sir Walter Palmer, Bart.	J. L. Baker, F.I.C.
(*b*) Fermentation ...	J. Gretton, M.P. ...	Prof. Adrian J. Brown, F.I.C.	A. R. Ling, F.I.C.
7. Agriculture ...	Rt. Hon. Lord Blyth	Dr. J. A. Voelcker, F.I.C.	A. D. Hall.
8.(*a*) Hygiene... ...	Sir J. Crichton-Browne, F.R.S.	Prof. H. R. Kenwood.	Dr. K. Menzies.
(*b*) Pharmaceutical Chemistry	N. H. Martin ..	J. C. Umney, F.I.C.	E. F. Harrison, F.I.C.
(*c*) Bromatology ...	R. R. Tatlock, F.I.C.	E. J. Bevan, F.I.C.	C. H. Cribb, F.I.C.
9. Photographic Chemistry	Sir W. de W. Abney, K. C. B., F. R. S., F.I.C.	Sir H. Trueman Wood.	H. Chapman-Jones, F.I.C.
10. Electro-Chemistry	Rt. Hon. Sir John Brunner, Ba t.	Dr. G. T. Beilby, F.R.S., F.I.C.	Dr. F. Mollwo Perkin.
11. Law, Political Economics and Legislation with reference to Chemical Industries	Rt. Hon. Lord Alverstone, G.C.M.G., F.R.S.	Rt. Hon. Sir J. Fletcher-Moulton, F.R.S.	Rt. Hon. Viscount Tiverton.

The Hon. Treasurers are Mr. Thos. Tyrer, F.I.C., and Mr. Charles Wightman. The Hon. Secretary is Mr. William Macnab, F.I.C., of 10, Cromwell Crescent, South Kensington, London, S.W., to whom communications should be addressed.

INSTITUTE OF CHEMISTRY.

The Institute of Chemistry was founded in October, 1877, and incorporated by Royal Charter in June, 1885, to promote the better education of persons desirous of becoming professional consulting and technological chemists, public analysts, and chemical advisers; to examine Candidates, and to grant certificates of competency; and to elevate professional Chemistry by setting up a high standard of scientific and practical proficiency, and by insisting on the observance of strict rules in regard to professional conduct.

OUTLINE OF THE REGULATIONS.*

THE STUDENTSHIP.

(Annual Registration Fee: 5s. 0d.)

Every Candidate for admission to the Studentship is required to produce evidence that he is upwards of 17 years of age, and that he has passed a Preliminary Examination in subjects of general education, approved by the Council of the Institute. He must also show that, at the time of making application for registration, he is working at an Institution recognised by the Council, or under the direction of a Fellow of the Institute in a laboratory approved by the Council, with the object of qualifying for the practice of professional Chemistry.

The List of Examinations accepted by the Council as approved Preliminary Examinations is given in the Book of Regulations. The List includes the Matriculation (or Preliminary) Examinations and the Senior Local Examinations of recognised Universities, the Examinations of the Scotch Educational Department for Leaving Certificates on the Higher Standard, the Intermediate Educational Board of Ireland, and the Central Welsh Board, the Examination for a First Class Certificate of the College of Preceptors, and the Examination for a Higher Certificate of the Oxford and Cambridge Schools Examinations Board. The Candidate must produce a Certificate of having passed the full Examination, including the following subjects:—

(*a*) English Language.

(*b*) Elementary Mathematics, comprising Arithmetic; Algebra (including simple equations); Geometry (including Euclid, Books I., II., and III., or the equivalent).

*** The Book of Regulations for the Admission of Students, Associates and Fellows, may be obtained, for One Shilling, on application to the Registrar, Institute of Chemistry, 30, Bloomsbury Square, London, W.C.**

(*c*) At least one of the following:—Greek, Latin, French, German, Italian, Spanish, any other modern language approved by the Council,

and, if not more than one language be taken under (*c*),

(*d*) Higher Mathematics, or any other subject prescribed in the regulations for a Preliminary Examination approved by the Council.

Although not compulsory, it is advantageous for a Candidate to register as a Student, in view of the fact that a Registered Student is required to fulfil only those regulations, relating to training and examinations, which are in force at the time of his registration. Any Candidate not so registered is required to comply with the regulations in operation at the time of his application for admission to the Examinations. Registered Students receive the "Proceedings" (containing the Reports of the Examinations with the Pass Lists, Examination Papers and particulars of the practical exercises set). They are admitted to the Library of the Institute during the same hours as Fellows and Associates.

THE ASSOCIATESHIP (A.I.C.).

There are three Examinations for admission to the Associateship, viz.:—I., A Preliminary Examination; II., the Intermediate Examination in general, theoretical and practical Chemistry; and III., the Final Examination in a Branch of Chemistry selected by the Candidate.

The Intermediate and Final Examinations are conducted by the Institute and are open only to Candidates who have complied with the Regulations.

THE INTERMEDIATE EXAMINATION.

(Fee: £5 5s.)

Candidates for admission to the Intermediate Examination are required to produce evidence of having passed an approved Preliminary Examination in subjects of general education; of having regularly attended systematic *day* courses, in an Institution recognised by the Council, during at least *three academic years*, in theoretical and practical Chemistry, in Physics, in Mathematics, and in one of the following subjects, in accordance with the Regulations of the Institute: (i.) Higher Physics, (ii.) Advanced Mathematics, (iii.) Mechanics and Chemical Engineering, (iv.) Metallurgy, (v.) Geology and Mineralogy, (vi.) Physiology, (vii.) Bacteriology, (viii.) Agriculture, (ix.) Botany, (x.) Biology; and of having satisfactorily passed the Class Examinations in the said subjects.

As an alternative to three years' training in a recognised Institution, a Candidate may take two years' such training and work systematically for two *other* years, under the direction of a Fellow of the Institute in a laboratory approved by the Council.

Any Candidate who has taken a Degree in Science, in a University recognised by the Council, is eligible for admission to the Intermediate Examination of the Institute, provided that inorganic and organic Chemistry, and Physics, were taken as subjects in the Degree, and that Mathematics was taken in either the Degree or the Intermediate University Examination.

The Intermediate Examination of the Institute extends over at least four days. The theoretical part of this Examination requires a thorough acquaintance with the fundamental laws of Chemistry; with the methods of preparation of the more important elements, and of their compounds both inorganic and organic; with the principles of chemical classification, and with the current theories of chemistry. The practical part may include exercises in qualitative and quantitative inorganic analysis, qualitative and quantitative organic analysis, gas analysis, preparation of pure materials, physical determinations, the use of the spectroscope, the microscope, the calorimeter, the polarimeter and the refractometer, and other experimental work set forth in the Regulations. At the same time the Candidate is required to submit note-books containing records of the practical work performed by him during the last two years of his training, the contents of which are taken into account by the Examiners in deciding the Examinations.

EXEMPTIONS.

Candidates who have passed any of the following examinations are exempted from the Intermediate Examination provided they produce evidence, satisfactory to the Council, of having been trained in theoretical and practical Chemistry, in theoretical and practical Physics, and in one optional scientific subject, in one or more of the Institutions recognised by the Council, in accordance with the Regulations of the Institute:

ABERDEEN: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

BIRMINGHAM: The University.

The Final Examination for the Degree of B.Sc. in the subjects of Chemistry and Physics, the Candidate's name being placed in either of the first two Divisions, with Chemistry as his principal subject, including theoretical and practical inorganic and organic Chemistry.

CAMBRIDGE: The University.

A First or Second Class in Part II. of the Natural Sciences Tripos, with Chemistry as the principal subject.

DUBLIN: The University (Trinity College).

The Senior Moderatorship in Experimental Science.

The Royal University of Ireland.

The Final Examination for the Degree of B.A., with the Final Examination for B.Sc. or M.A. (involving inorganic and organic Chemistry).

Royal College of Science for Ireland.†

The Examination for the Associateship (Assoc.R.C.Sc.I.) in the Faculty of Manufactures, passed prior to 1st October, 1902, together with a Certificate from the Professor of Chemistry in a

† See note on p. iv.

DUBLIN (*continued*).

University or College recognised by the Institute, that the Candidate has spent an additional period of six months exclusively in the Chemical Laboratory of such College.

The Examination for the Associateship (Assoc.R.C.Sc.I.) in the Faculty of Applied Chemistry, together with evidence that the Candidate has passed an approved Preliminary Examination, and has been trained in accordance with the Regulations.

DURHAM: The University.

The Final Examination for the Degree of B.Sc. in the subjects of Chemistry and Physics, with distinction in Chemistry as chief subject, including theoretical and practical inorganic and organic Chemistry.

EDINBURGH: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

GLASGOW: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

LEEDS: The University.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

LIVERPOOL: The University.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

LONDON: The University.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

City and Guilds College. †

The Examination for the Associateship (A.C.G.I.) in the Department of Chemistry, if passed prior to 1st October, 1902.

The Examination for the Associateship of the College in the Division of Chemistry, together with evidence that the Candidate has passed an approved Preliminary Examination, and has been trained in accordance with the Regulations.

Royal College of Science. †

The Examination for the Associateship (Assoc.R.C.Sc., London) in the Division of Chemistry, if passed prior to 1st October, 1902.

The Examination for the Associateship (Assoc.R.C.Sc., London), in the Division of Chemistry, together with evidence that the Candidate has passed an approved Preliminary Examination, and has been trained in accordance with the Regulations.

Royal School of Mines.

Associates of the Royal School of Mines in Metallurgy, who have passed an approved Preliminary Examination, and have, since obtaining the Diploma, been systematically trained in Chemistry, for six months, in the Laboratory of a University or College recognised by the Institute, are accepted as eligible for election to the Associateship of the Institute, on passing an Examination in general theoretical and practical Chemistry. (Fee: £10 10s.)

MANCHESTER: THE VICTORIA UNIVERSITY.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

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† Note.—The Regulations requiring Associates of the Royal Colleges of Science (London and Dublin) and Associates of the City and Guilds of London Institute to pass an approved Preliminary Examination, will not be enforced in the cases of those who produce evidence, satisfactory to the Council, that they entered on a systematic course of training in Chemistry at a recognised College prior to 1st July, 1902.

OXFORD: THE UNIVERSITY.
A First or Second Class in the Final Honour School of Natural Science in the subject of Chemistry.

ST. ANDREWS: THE UNIVERSITY.
The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

THE UNIVERSITY OF WALES.
The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

THE UNIVERSITY OF ADELAIDE, SOUTH AUSTRALIA.
The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

THE UNIVERSITY OF SYDNEY, N.S.W.
The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.

THE FINAL EXAMINATION FOR THE ASSOCIATESHIP (A.I.C.).

(Fees: Candidates who have passed the Intermediate Examination, £5 5s.; Candidates exempted from the Intermediate, £10 10s.)

Any Candidate who has passed the Intermediate Examination of the Institute, or who is entitled to apply for exemption from passing the Intermediate Examination in accordance with the foregoing Regulations, is eligible for admission to the Final Examination.

The Final Examination includes a written paper in addition to practical work extending over at least four days. The Candidate is expected to possess, in addition to a general knowledge of all branches of Chemistry, a *thorough* knowledge of one branch, to be selected by himself, from the following list:—

(*a*) **MINERAL CHEMISTRY**: including general inorganic qualitative and quantitative analysis, and the preparation of pure inorganic substances.

(*b*) **METALLURGICAL CHEMISTRY**: sampling, analysis and assay of metals, ores, fuel, metallurgical products, and minerals used in metallurgical processes, with reports thereon; analysis of producer gas, other fuel gases, and furnace gases; calorimetry of fuels; the principles involved in the preparation of alloys; practical knowledge of electrolytic methods, and of the construction and use of electrical furnaces and other apparatus employed in metallurgical investigations. Metallography: preparation of specimens, and recognition, under the microscope, of the characteristic structures of steel and common alloys, and of the typical structural changes produced on them by various forms of thermal and mechanical treatment. Pyrometry: calibration of pyrometers; determination of the temperatures of furnaces and the melting-points of metals and alloys; observation of critical changes in alloys, including steel.

(*c*) **PHYSICAL CHEMISTRY**: Candidates are expected to show special theoretical and practical knowledge of the methods, instruments and apparatus employed in physico-chemical processes and investigations.

(*d*) **ORGANIC CHEMISTRY**: including ultimate organic analysis and the estimation of the proximate constituents of organic mixtures. The preparation and detailed investigation of organic compounds.

(*e*) **THE CHEMISTRY OF FOOD AND DRUGS AND OF WATER**: including the examination and analysis of any food or drug within the scope of the Sale of Food and Drugs Acts; the assay of alkaloids; the recognition of poisonous chemicals and of crude drugs ordinarily found in commerce and having well-marked physical characters; the use of the microscope in the detection of adulterations, substitutions, commonly occurring parasites, and impurities in food, drugs and water.

Candidates in Branch (*e*) are required to show a general knowledge of the therapeutic effects of chemicals and drugs, and of the quantities which, taken internally, would be injurious or fatal to man. This part of the Examination will consist of practical work in Microscopy, a written paper in Therapeutics and Pharmacology, and an oral examination in the recognition of chemicals and drugs. Candidates will be required to produce duly authenticated note-books containing evidence of systematic instruction and practice in Microscopy. They will be expected to possess a general knowledge of the Acts relating to adulteration.

After 1st January, 1909, all Candidates taking Branch (*e*) will be required to produce evidence of having taken a prescribed course in Elementary Botany.

(*f*) **BIOLOGICAL CHEMISTRY**: with special reference to fermentation, enzyme-action, the Chemistry and Bacteriology of food-stuffs, water supply and sewage disposal, and the application of Biological Chemistry to industries and manufactures.

After the 1st of January, 1909, all Candidates taking Branch (*f*) will be required to produce evidence of having taken a prescribed course in Elementary Biology.

[*During the practical Examinations, Candidates are at liberty to consult books of reference, but not during any part of the Examination conducted by the Examiner in Therapeutics, Pharmacology, and Microscopy, in Branch* (*e*).]

In the Final Examination, the Candidate is at liberty to present a thesis upon any chemical subject to which he has given special attention, and the Examiners will take it into account in deciding the Examination. The Examiners are at liberty to apply any test which they think desirable in order to obtain evidence as to the knowledge possessed by the Candidate.

After the 1st of January, 1910, Candidates for the Final Examination will be required to translate French and German technical literature into English, with the aid of dictionaries, to the satisfaction of the Examiners.

PUBLIC ANALYSTS.

Any Candidate desiring to qualify himself for appointment as a Public Analyst is recommended to pass the Final Examination in Branch (*e*): The Chemistry of Food and Drugs, and of Water, including an examination in Therapeutics, Pharmacology, and Microscopy. The Examination in Branch (*e*) is open also to any Fellow or Associate of the Institute of Chemistry who can produce evidence satisfactory to the Council, that he has been *systematically* engaged in the practice of the Analysis of Food and Drugs for at least one year prior to the date of his application for admission to the Examination, and that he has been trained in Elementary Botany. The Examination is conducted on lines approved by the Local Government Board for England and Wales, and the Local Government Boards for Scotland and Ireland, who accept the Certificate of Fellowship or Associateship of the Institute of Chemistry, together with the Certificate granted on passing this examination, as evidence that the holder is qualified for appointment as Public Analyst under the Sale of Food and Drugs Acts, 1875-1899.

That part of the Examination which is conducted by the Examiner in Therapeutics, Pharmacology, and Microscopy may

include:—The recognition of the official drugs of the British Pharmacopœia, and of such non-official drugs as are of therapeutical importance. The uses of the commoner drugs, and their prominent action as such. The commoner impurities and falsifications in drugs; their recognition, and how far the impurities affect the medicinal value of the drugs. The chemical changes which familiar drugs may undergo in the body, and their paths of excretion, as illustrated by the following examples:—Arsenic, salts of lead, hydrocyanic acid, carbolic acid, chloral hydrate, salicin, aconitine. The reputed medicinal, deleterious and average fatal doses of such drugs as are poisonous, and the reputed effects of age, idiosyncrasy, and habituation in modifying these.

BIOLOGICAL CHEMISTRY.

Candidates intending to enter for the Final Examination in Branch (*f*), viz., Biological Chemistry, are recommended to study the following subjects:—

1. Elementary Biology.
2. The morphology, physiology, and life history of bacteria, yeasts and moulds, in their relation to food, water supply, the treatment of sewage, agriculture, and the fermentation industries. (A *special* study of pathogenic organisms is not demanded, but the candidate should acquire a knowledge of such as are of importance in relation to food and to water supply.) Practical work should include: (*a*) General bacteriological methods and preparation of pure cultures: (*b*) microscopy: the staining and mounting of preparations, and the recognition of species; (*c*) fermentation changes caused by micro-organisms.
3. Enzymes and their actions.
4. The methods employed in the examination and estimation of the carbo-hydrates.
5. The proteids and their decomposition products.

The Examination in Biological Chemistry is also open to any Fellow or Associate of the Institute who desires to obtain a certificate of competency in this branch of work, provided he has been satisfactorily trained in Elementary Biology.

Intermediate and Final Examinations are held each year in January, April, and July, except the Final Examination in Branch (*f*), Biological Chemistry, which is held in October.

FELLOWSHIP (F.I.C.).

For admission to the Fellowship, an Associate is required to have been registered for three years, and to have been continuously engaged during that period in the study and practical work of Applied Chemistry in a manner satisfactory to the Council. (Entrance fee: £5 5s.)

CHEMICAL TECHNOLOGY.

The Council have resolved to hold Examinations in Chemical Technology and to grant Certificates in respect thereof. These Examinations are open only to Fellows and to those Associates who have been registered as such for at least one year. Candidates are required to produce evidence of practical technological training. Fee: £3 3s.)

LIST OF UNIVERSITIES, COLLEGES AND INSTITUTIONS RECOGNISED FOR THE TRAINING OF CANDIDATES FOR THE EXAMINATIONS OF THE INSTITUTE OF CHEMISTRY.

Aberdeen ...	The University.
Aberystwyth ...	The University College of Wales.
Bangor	University College.
Belfast	Queen's College.
Birmingham ...	The University.
Bristol	Merchant Venturers' Technical College.
,, ...	University College.
Cambridge ...	The University.
Cardiff	University College.
Cork	Queen's College.
Dublin	Royal College of Science for Ireland.
,, ...	Trinity College.
Dundee... ...	University College.
Edinburgh ...	The Heriot-Watt College.
,, ...	The University.
Galway... ...	Queen's College.
Glasgow ...	The University.
,, ...	The Glasgow and West of Scotland Technical College.
Leeds	The University.
Liverpool ...	The University.
London... ...	City and Guilds College.
,, ...	City and Guilds Institute, Finsbury Technical College.
,, ...	King's College.
,, ...	Royal College of Science.
,, ...	*School of the Pharmaceutical Society of Great Britain.
,, ...	University College.
Manchester ...	The Victoria University.
,, ...	Municipal School of Technology (Faculty of Technology in the Victoria University).
Newcastle-on-Tyne	The Armstrong College.
Nottingham ...	University College.
Oxford	The University.
Sheffield ...	The University.
St. Andrews ...	The University.

Adelaide, South Australia ...	The University.
Montreal, Canada	McGill University.
Sydney, N.S.W.	The University.

* For Chemistry only.