



SPECIAL GROUP MEETING
ON PHARMACY EDUCATION

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PHARMACEUTICAL EDUCATION IN THE UNITED KINGDOM
UNDERGRADUATE AND GRADUATE

by

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I. UNDERGRADUATE EDUCATION

Standard of Student Intake: Entry Requirements

In general, the students have received training in chemistry, physics, mathematics, a biological subject, English, a foreign language, etc., and in general, they are required to pass at advanced level in the General Certificate of Education in three subjects, which usually include chemistry, a biological subject and mathematics or physics. Thus, a reasonable educational basis and foundation in science has been laid before they commence their studies for a degree at the university or college.

A potential student is given the following information by the Pharmaceutical Society of Great Britain:

"You become a pharmacist by reading for a degree in pharmacy awarded by one of the schools of pharmacy in Great Britain. Each school has its own entrance standard but a prospective student with the following passes in the General Certificate of Education would be accepted by most schools:

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- Ordinary level 1 English Language
 2 Mathematics
- Advanced level 3 Chemistry
 4 Physics or Mathematics
 5 Biology or Botany or Zoology or Mathematics

The degree course occupies three years and leads to either a Bachelor or Pharmacy degree (B Pharm) or a Bachelor of Science degree (B.Sc.) in Pharmacy. When you have your degree you must obtain twelve months' practical experience in retail, hospital or manufacturing pharmacy, working under the supervision of a pharmacist. Having gained this experience, you may apply to the Pharmaceutical Society of Great Britain for admission to the Register of Pharmaceutical Chemists. On admission, you will be a Member of the Pharmaceutical Society (M.P.S.) entitled to practice as a pharmacist in any branch of the profession."

Courses

All students in pharmacy now read for a degree either at the universities which award their own degrees, or at the polytechnics, which award a degree whose standard is governed by the C.N.A.A.* The Pharmaceutical Society of Great Britain approves the courses as suitable for registration purposes.

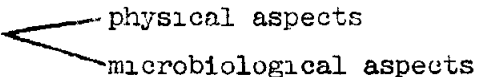
Schools of Pharmacy in the United Kingdom are as follows:

*Aberdeen	Robert Gordon's Institute of Technology
Bath	Bath University of Technology
Birmingham	University of Aston in Birmingham
Bradford	University of Bradford
*Brighton	College of Technology
Cardiff	University of Wales Institute of Science and Technology

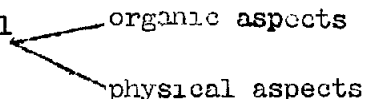
* These schools conduct courses leading to B.Sc. degrees in pharmacy of the Council for National Academic Awards.

Edinburgh	Heriot-Watt University
Glasgow	University of Strathclyde
*Leicester	City of Leicester Polytechnic
*Liverpool	Regional College of Technology
London (1)	Chelsea College, Manresa Road, Chelsea, S.W.3 (University of London)
(2)	School of Pharmacy (University of London), Brunswick Square, London, W.C.1
Manchester	The University
Nottingham	University of Nottingham
*Portsmouth	Portsmouth Polytechnic
*Sunderland	Sunderland Polytechnic

The Courses Contain the following.

Pharmaceutics 

- physical aspects
- microbiological aspects

Pharmaceutical
Chemistry 

- organic aspects
- physical aspects

Physiology/ _____ concentrated especially on
Pharmacology _____ the applied aspects

Pharmacognosy _____ increasing emphasis is being given to the chemical aspects

A potential student is given the following information by the Pharmaceutical Society of Great Britain.

Pharmaceutics. The preparation of medicines in a stable, effective, convenient and palatable form for the patient is studied in this part of the course. The subject also includes the production of sterile preparations, involving a study of bacteriology

* These schools conduct courses leading to B.Sc. degrees in pharmacy of the Council for National Academic Awards.

Administration: Theoretical instruction is given in the day to day practice of pharmacy in the three main branches, in the history and traditions of pharmacy, and in the ethics and laws governing practice today.

Pharmacognosy: This is mainly the study of medicinal plants, but it includes certain animal and mineral sources of drugs. It is necessary to know how vegetable drugs are grown, collected, prepared, and stored so that their constituents remain active. It is necessary to be able to identify the crude drug as well as substances used as adulterants, and this involves a specialized knowledge of microscopy and histology.

Physiology: The study of the normal structure and functions of the human body is also a fundamental subject, and it forms the basis for the study of pharmacology.

Pharmacology: Here the effect of drugs on living tissue is studied. It is to the pharmacist that the medical practitioner will turn for information and advice on the action and uses of drugs.

Pharmaceutical chemistry: Here the student is taught physical, inorganic, organic, and analytical chemistry, as well as the principles of chemotherapy and the relationship between chemical structure and physiological action.

The year of practical training, which is taken after the academic course has been completed, is received under the supervision of a pharmacist in either a pharmacy, a hospital pharmaceutical department or a pharmaceutical manufacturing laboratory. It is not until this year - which corresponds to the medical student's post-qualification year - has been completed that the graduate can become a member of the Pharmaceutical Society and be entitled to practise on his own account.

The degrees in pharmacy at the various universities are based on the above but, in the third year (i.e. the final year) there is sometimes some degree of specialization allowed. For instance, there may be some specialization in applied pharmacology or pharmaceutical analysis or pharmaceutical technology, but this must only be regarded as laying a basis for further studies at Master's level. A student cannot be regarded as competent in his field of specialization without training subsequent to his final degree.

Some colleges have now included an element of business management in their final year course. Others have included a direct link with the hospitals so that students receive instruction along with medical students in certain aspects, with emphasis on 'clinical pharmacy'.

Another recent development is the introduction of sandwich courses in which the first two years of the course are spent at the university and the third year is spent outside in industry, hospital, or general practice, with the work being co-ordinated by the university; and the final year is spent back at the University.

In the majority of pharmacy courses, there is a high component of training in practical classes. The students are taught to handle instruments such as pH meters, polarographs, spectrophotometers, etc., as well as the more classical type of analytical equipment. Special emphasis is laid upon accuracy. The students are also trained to use apparatus which is of value in pharmaceutical technology, e.g. experiments on viscosity, particle size analysis and surface chemistry. The students also receive training in analytical and separation techniques, such as paper, thin layer chromatography and gas-liquid chromatography. In the applied pharmacology area, students are taught to work with animals and parts of animals, but increasingly the emphasis is on demonstrations of the action of drugs on whole animals.

In the past, the courses in pharmacy have proved to lay a good foundation for those students who wish to proceed into industry or teaching and, to a lesser extent, into the hospital service. Now, many colleges are attempting to broaden the training for the majority of students to produce a course more useful for the pharmacist in general practice. Increasingly it is considered that the pharmacist in general practice must be more knowledgeable about drugs and medicines so that he acts as an effective bridge between the medical profession and the patient. With this in mind, in addition to training in academic subjects, more attention is now being given to training in the general understanding of the practice of pharmacy and the institutions, organizations and legal aspects surrounding the profession of pharmacy.

II. GRADUATE EDUCATION

Detailed provision has been made for the continuing education of the pharmacist. If it is accepted that the first degree lays a general basis for the knowledge and understanding of the pharmacist, it is imperative that facilities for graduate work are also available. Graduate education in pharmacy must take cognizance of the following points:

1. Pharmacy is a profession based upon scientific disciplines and therefore contributions to science by members of the profession are imperative.
2. The pharmacist is the vital link between the medical man, as prescriber, and the patient, and is the last bastion of safety between doctor and patient. Drugs are becoming very potent and specific in their actions but incorrect use of drugs can produce many problems. Interactions between drugs when administered simultaneously are becoming increasingly important and sometimes dangerous.

3. The medical practitioner's responsibility is to diagnose and prescribe, but he cannot be expected to keep up to date with his field and also with advances in the knowledge of drugs and medicines, drug-drug and drug-food interactions, and be knowledgeable about the scientific aspects of the stability of medicines and about biological availability of drugs from medicines.

4. The general practice pharmacist must have a knowledge of the law relating to pharmacy in addition to his knowledge of drugs and medicines, and also have experience in business methods, to enable him to function correctly with appropriate reward in the community.

Thus continuing education in pharmacy must make provision for some pharmacists to make a research contribution and, equally important, there should be provision made for the pharmacist to keep up to date with advances in the fields which make him an expert in medicines and an expert on drugs. Business aspects must not be ignored in the continuing education programme.

In the United Kingdom provision is made for scientific contribution primarily in the universities and colleges, and in industry. It is hoped that hospital pharmacy will increasingly play a role. Masters and Ph.D. degrees by research are available, but equally important are the masters degree courses, which can be full-time, part-time or of a sandwich character.

Provision is made for pharmacists to keep up to-date by means of short residential courses, which sometimes include both lectures and practicals, and sometimes just lectures; universities and colleges are involved primarily.

Provision is also made for evening lectures and one-day symposia, and many of these are college based. The Pharmaceutical Society of Great Britain plays an important role in the provision for 'continuing education'

by making use of regional organizations in regions containing a school of pharmacy. Lectures are also organized by the local branches of the Pharmaceutical Society. Many short courses and symposia have been organized by the Society in conjunction with universities and with other scientific bodies. Joint evening seminars involving pharmacists and medical practitioners are also arranged. The Guild of Hospital Pharmacists also plays an important role in continuing education.

The facilities available at postgraduate level in the United Kingdom are as follows.

Provision for Continuing Education in Pharmacy in UK

- | | |
|---|--------------------------------|
| a. Research Degrees | 1. Ph.D. Degrees |
| | 2. Masters Degrees |
| b. Masters Degrees Courses | 1. Full time |
| | 2. Part time |
| | 3. Sandwich |
| c. Short Courses - Residential (few days) | 1. Lectures and Practical |
| | 2. Lectures only |
| | 3. Symposia |
| d. Evening Lectures and One-Day Symposia | 1. College based |
| | 2. College/Region Organization |
| | 3. Region Organization |
| | 4. Local Branch Organization |
| e. Short Courses Related to Pharmacy. | |

a. Research Degrees

Ph.D.	Approx. 3 years full time
Masters	1 to 2 years full time

Subjects

Pharmaceutics	- physical aspects
	- microbiology
	- pharmaceutical technology

Pharmaceutical Chemistry	- medicinal chemistry
	- physical aspects
	- analysis and quality control

Biopharmacy

Drug Metabolism and Distribution

Pharmacognosy	- anatomical aspects
	- phytochemistry

Toxicology

Pharmacology

Forensic Science

Finance

Science Research Council

Medical Research Council

Pharmaceutical Society

Various Foundations

Industry

College Scholarships

b. Masters Degree Courses

Full Time

1 Calendar year duration

(Orientation Course in addition may be required)

<u>Subject</u> Pharmaceutical Technology	(CHELSEA)
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Pharmaceutical Analysis and Forensic Science	(STRATHCLYDE)
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Pharmacology	(CHELSEA AND BRADFORD)
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<u>Part Time</u>	2 years' duration	
	<u>Subject</u> Pharmaceutical Analysis	(CHELSEA)
	Biopharmacy	(CHELSEA)
<u>Sandwich</u>	Pharmaceutical Sciences	(ASTON in conjunction with BIRMINGHAM REGIONAL HOSPITAL BOARD - 2 year course)
	Hospital Pharmacy	(HERIOT-WATT UNIVERSITY in conjunction with ABERDEEN GENERAL HOSPITALS)

c. Short Residential Courses

Lectures and Practical

<u>Week</u>	Postgraduate School on the Absorption, Distribution and Metabolism of Drugs (CHELSEA in conjunction with PHARMACEUTICAL SOCIETY)
<u>Week</u>	Preservation of Pharmaceuticals (CHELSEA)
<u>Week</u>	Veterinary Pharmacy (CARDIFF in conjunction with MONMOUTH COLLEGE OF AGRICULTURE)
<u>Week</u>	Modern Dispensing in Hospital and General Practice (HERIOT-WATT UNIVERSITY)

Lectures and Symposia

<u>Two days</u>	Modern methods of stock control	(BATH)
<u>Two days</u>	Toxicology - Extrapolation to Man	(BRADFORD)
<u>Few days</u>	Powder Technology	(BRADFORD)
<u>Few days</u>	Course for Hospital Pharmacists	(BRIGHTON)
<u>Two days</u>	Computer Applications in Pharmacy	(HERIOT-WATT UNIV.)
<u>Two days</u>	Rheology in Medicine and Pharmacy	(LONDON)

d. Evening Lectures and One Day Symposia (1969-1970)

<u>College Based</u>	Organization, Administration and Management of General Practice Pharmacy (8 lectures)	(BRADFORD and CHELSEA)
	An Introduction of Analytical Techniques	
	Electroanalytical and Radiochemical Methods (10 lectures)	(CARDIFF)

	Recent Advances in Pharmaceutical Sciences (6 lectures)	(LIVERPOOL)
<u>Chelsea/Regions</u>	Biopharmaceutics and Drug Interactions	(LEICESTER/MERCIA)
	Agricultural and Veterinary Pharmacy	(LEICESTER/MERCIA)
	Postgraduate Series in Pharmacy	(CHELSEA/CHILTERN)
	Pharmacology of Drugs in Current Use	(PORTSMOUTH/ WESSEX)
	One day Symposium "Whither Pharmacy"	(NOTTINGHAM/ SHERWOOD)
	Chemical and Physical Aspects of Drug Stability	(MANCHESTER/ NORTH WEST)
	Pharmacological Topics	(MANCHESTER/ NORTH WEST)
	Postgraduate lectures	(BRIGHTON/ SOUTH EAST)

Regional Organization (usually in conjunction with local School of Pharmacy)

- e.g. CHILTERN (a) Postgraduate courses
- (b) Lecture at CHELSEA - evening and then SYMPOSIUM in Oxford for one day
- MERCIA Short postgraduate courses with LEICESTER POLYTECHNIC at various centres
- SOUTH-EAST Postgraduate lecture in conjunction with BRIGHTON at various centres

Local Branch Organization

- e.g. AYRSHIRE BRANCH Five weekly lectures on 'Clinical Uses of Drugs'
- BIRMINGHAM AND DISTRICT Lecture on 'Business Economics and Retail Management'
- CAMBRIDGE, HUNTINGDON AND DISTRICT Four weekly lectures on 'Drug Interactions'
- HARROW AND DISTRICT Weekly lecture on 'General Therapeutics'

e. Courses Related to Pharmacy (1969-1970)

Society for Drug Research

A few one day Symposia
e.g. L-Dopa, Non-steroidal anti-inflammatory drugs

P.S.G.B. Department of
Pharmaceutical Sciences

A few one day Symposia

Guild of Public Pharmacists

1. Two day residential course for
Scottish Hospital Pharmacists
2. Weekend School on 'Immune and
Anticancerous Therapy'

Institute of Pharmacy
Management

Pharmacy Study Tour in Spain

also Lecture

- Dermatology

Symposium

- Society of Cosmetic Chemists

Course (5 day)

- Radiopharmacy for Pharmacists

Workshop

- Drug Metabolism