UNIVERSITY OF DUBLIN

TRINITY COLLEGE DUBLIN

SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES

B.SC. (PHARM.) DEGREE COURSE 2012/13

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This handbook applies to all students taking the B.Sc. (Pharm.) Degree taught by the School of Pharmacy & Pharmaceutical Sciences. It provides a guide to what is expected of you on this programme, and the academic and personal support available to you. Please retain for future reference. The information provided in this handbook is accurate at time of preparation. Any necessary revisions will be notified to students via email. Please note that, in the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in course handbooks, the provisions of the General Regulations will prevail.

1 INTRODUCTION

1.1 SCHOOL VISION

- To produce pharmacy graduates and specialist graduates who will enhance health care through their patient-oriented understanding of aspects of disease, health strategies, medicines and pharmacoeconomics of existing and new therapies.
- To deliver pharmacy and science postgraduates with the qualified specialist skills required by Ireland's pharmaceutical/chemical and biotechnological industries.
- To encourage research by engaging high quality pharmaceutical scientists capable of devising new drug entities, syntheses, analytical protocols and delivery systems.

1.2 SCHOOL MISSION

- To ensure the delivery of the B.Sc. (Pharm.) Course in compliance with EU syllabus specifications and educational standards, as well as accreditation requirements of the pharmaceutical society of Ireland to a broad, socially inclusive student base comprised of Irish, EU, non-EU, mature and graduate entrants;
- To provide quality educational programmes through the collective input of innovative teaching methodologies delivered by committed academics, researchers and healthcare professionals.
- To develop new postgraduate courses appropriate to National, European and International demands and standards in the pharmaceutical context;
- To double the number of taught postgraduate students through enrolling the maximum number of students into existing taught courses and encouraging life-long learning by devising distance-learning programmes and electronic formatting of modules;
- To double the number of research students and encourage collaboration with other researchers of schools and institutes in health sciences;
- To enhance the national and international reputation of the school by attracting world-renowned researchers.

1.3 TRADITION

Brief history

The School of Pharmacy at Trinity College Dublin was the first centre for pharmaceutical education in Ireland. A Pharmacy Degree has been offered by the School since 1977. The School has also delivered courses leading to Diploma qualifications for Pharmaceutical Assistants (until 1983) and Pharmaceutical Technicians (until 2006). Originally sited in Ballsbridge and teaching a maximum intake of 50 students per year, since October 1997 the School has been located at the East End of the TCD campus in the Panoz Institute, a purpose-built facility (ca. 3000 m^2) for which the School actively fund-raised.

The Pharmacy undergraduate syllabus leading to a B.Sc. (Pharm) degree is taught over 4 years and satisfies the requirements of the Pharmaceutical Society of Ireland, *i.e*. the statutory registration body. It also complies with the training standards defined in three pharmaceutically relevant EU Directives- 2005/362/EC as amended, 2001/82/EC as amended and 2001/83/EC as amended.

Directive 2005/36/EC specifies the educational requirements necessary for the mutual recognition of registered pharmacists within the European Economic Area (EEA) member states. Directives 2001/82/EC and 2001/83/EC specify the educational requirements necessary to perform the functions in the pharmaceutical industry of the 'Qualified Person' *i.e.,* one who is

responsible for the supervision and control of the manufacture of pharmaceutical products for human and veterinary use.

Undergraduate students attend lectures, tutorials, CAL sessions and practical laboratory classes in all subject areas to encourage their understanding of aspects of healthcare, drug sources, medicines preparation, analysis, quality control, chemistry, metabolism, safety, efficacy, regulation, etc.

Academic Staff in the School though originally assigned to the traditional pharmacy disciplines**:** Pharmaceutics & Pharmaceutical Technology, Pharmaceutical Chemistry, Pharmacology and Pharmacognosy, and more recently Practice of Pharmacy, are now teaching integrated courses formulated in the context of European and international curriculum strategies. Staff of the School provide courses and research facilities for approximately 330 students per year (280 undergraduate B.Sc.(Pharm); 50 postgraduate research students). In addition, Staff contribute to four postgraduate taught full-time, part-time and distance-learning M.Sc/Diploma courses. The Pharmaceutical Sciences and Practice of Pharmacy subject areas are currently taught by part- and full-time academic staff, in conjunction with Teacher-practitioners and a number of external lecturers from Community Pharmacy, Hospital Pharmacy, the Pharmaceutical Industry and Regulatory Bodies.

Academic staff are actively engaged in research programmes in the School: The School's research activities are broadly described as consisting of three main research areas. These are:
1. Drug design, discovery and analysis (Chemistry),
2. Drug development (Pharmacology),
3. Drug delivery (Pharmaceutics).

Eleven Research Groups have been formally established with the idea to foster interdisciplinary and collaboration both within the former Pharmacy Departments and with likeminded Schools/Departments within College. These Research Groups are: Advanced Drug Delivery, Clinical Pharmacokinetics, Natural Products, Drug Design and Discovery, Neuropharmacology, Platelets, Inflammatory Bowel Diseases, Drug Transport and Targeting, Pharmacy Practice, Allergy, and Pharmaceutical Nanosciences.

1.4 CORE VALUES

- Courses catering for a broad socially-inclusive student base varying in age, nationality, ability
- Educational programmes that integrate pharmaceutical sciences and clinical skills
- Practice-based courses which foster life-long learning and continuing professional development
- Innovative and flexible research-led teaching using methods to encourage student-oriented learning
- Programmes to encourage integration and open partnership with health care professionals
- Internationally recognised scholarship at undergraduate and postgraduate levels.

1.5 OVERVIEW OF THE B.SC. (PHARM.) DEGREE COURSE

The aim of the B.Sc. (Pharm.) course is to provide students with a basic education in the Pharmaceutical Sciences and the Practice of Pharmacy in all its forms. To quote from the Accreditation Document of the Pharmaceutical Society of Ireland *"the purpose of undergraduate pharmacy education (the pharmacy degree course), is to produce pharmacy graduates who are able to communicate and apply in their chosen field of practice; the elements of pharmaceutical knowledge and care and whose relevant skills are based upon and underpinned by appropriate and sufficient understanding of the principles and techniques of the pharmaceutical sciences".*

In order to achieve the aims of the course, the Syllabus has been designed to provide you firstly with learning opportunities in some of the basic sciences (such as aspects of Chemistry, Biochemistry, Biology, Physics, Physiology, Microbiology, Mathematics and Statistics) which are relevant to an understanding of the Pharmaceutical Sciences and to the Practice of Pharmacy. Subsequently the Pharmaceutical Sciences (Pharmaceutics and Pharmaceutical Technology, Pharmaceutical Chemistry, Pharmacognosy, Pharmacology and also Practice of Pharmacy) are introduced and taught in an integrated way and your knowledge of them and relevance to pharmacy developed progressively over the four years of the course.

2 STRUCTURES, MANAGEMENT AND SYSTEMS IN PLACE

2.1 COLLEGE

For details see*: http://www.tcd.ie/local/structures/governance.php*

2.2 SCHOOL GOVERNANCE

The School of Pharmacy & Pharmaceutical Sciences is one of the four Schools which make up the Faculty of Health Sciences. The other three are the School of Dental Science, the School of Medicine and the School of Nursing and Midwifery.
http://www.tcd.ie/local/structures/governance.php

HEAD OF SCHOOL

Professor Marek Radomski, M.A., M.D. (COPERNICUS ACADEMY OF MEDICINE), PH.D. (COPERNICUS ACADEMY OF MEDICINE), D.SC. (POLISH ACADEMICY OF SCIENCES) F.T.C.D. (2007), DOCTOR HONORIS CAUSA (COMPLUTENSE UNIVERSITY MADRID (2009)
Heads of School are appointed by, and are formally accountable to, the Board.
The Head of School is a member of the College Head of Schools Committee.
http://www.tcd.ie/local/structures/govappointheadschool.php

DIRECTOR OF TEACHING AND LEARNING (UNDERGRADUATE)

Asst. Professor Astrid Sasse, STAATSEXAMEN PHARMAZIE (BERLIN), DR. RER. NAT. (BERLIN), M.A., M.P.S.I.
The Director of Teaching and Learning (Undergraduate) has delegated responsibility for the undergraduate affairs of the School and plays a central strategic role with regard to both existing and new teaching programmes. The Director of UGTL is a member of the College Undergraduate Studies Committee.
http://www.tcd.ie/local/structures/govdirug.php

DIRECTOR OF TEACHING AND LEARNING (POSTGRADUATE)

Asst. Professor Lidia Tajber, M.PHARM. (MEDICAL UNIVERSITY OF SILESIA), PH.D., P.G.DIP. Q.I. (2003)
The Director of Teaching and Learning (Postgraduate) has delegated responsibility for the postgraduate affairs of the School and plays a central strategic role with regard to both existing and new research programmes. The Director of PGTL is a member of the College Postgraduate Teaching & Learning Committee.
http://www.tcd.ie/local/structures/govdirpg.php

DIRECTOR OF RESEARCH

Asst. Professor Lorraine O'Driscoll, B.SC.(HONS; N.U.I), M.SC. (RES; N.U.I), PH.D. (N.U.I.), F.T.C.D. (2012)
The Director of Research has delegated responsibility for the development of research and innovation in the School. The Director plays a strategic role in promoting and enabling research in the School, working closely with the Head of School.
http://www.tcd.ie/local/structures/govdirres.php

2.3 FACULTY AND SCHOOL COMMITTEES AND SUPPORT STRUCTURES

Faculty Committee http://www.tcd.ie/local/structures/govfacctte.php

School Committee http://www.tcd.ie/local/structures/govschoolctte.php
This Committee currently includes one Undergraduate and one Postgraduate representative.

SCHOOL EXECUTIVE COMMITTEE
http://www.tcd.ie/local/structures/govschoolexec.php
This Committee currently includes one Undergraduate representative

Course Management Committee (*Syn*. Curriculum Review Committee)
This is a sub-committee of the School Executive and responsible for monitoring, reviewing and making recommendations on the development of the pharmacy degree course.
This Committee currently includes one representative from Freshman Pharmacy and one representative from Sophister Pharmacy.

Student Representation
Undergraduate students in each of the four years of the course select a representative to relay the ideas and concerns of their year and to report to their year on developments within the School.

Student Forum
This is a student-led forum which together with Tutor Representatives discusses issues of student importance. It is currently comprised of the 4 Student Representatives - one from each year.

College Tutors

Asst. Professor John Quigley	email: **jquigley@tcd.ie**
Asst. Professor John Walsh	email: **jjwalsh@tcd.ie**
Assoc. Professor Andrew Harkin	email: **aharkin@tcd.ie**
Asst. Professor Lorraine O'Driscoll	email: **lodrisc@tcd.ie**
Asst. Professor Fabio Boylan	email: **fabio.boylan@tcd.ie**
Asst. Professor Astrid Sasse	email: **sassea@tcd.ie**

Disability liaison officer

Asst. Professor Helen Sheridan	email: **hsheridn@tcd.ie**

Undergraduate - Year Coordinators

Junior Freshman year:	Asst. Professor John Walsh	email: **jjwalsh@tcd.ie**
Senior Freshman year:	Asst. Professor John Quigley	email: **jquigley@tcd.ie**
Junior Sophister year:	Asst. Professor Fabio Boylan	email: **sassea@tcd.ie**
Senior Sophister year:	Asst. Professor Deirdre D'Arcy	email: **ddarcy@tcd.ie**

Undergraduate Research Liaison Officer

Asst. Professor Carlos Medina	email: **carlos.medina@tcd.ie**

Trinity Access Programmes (TAP) contact

Asst. Professor John Walsh	email**: jjwalsh@tcd.ie**

Student Counselling Service: email: **student-counselling@tcd.ie**

Erasmus/ International contact

Asst. Professor Carlos Medina	email: **carlos.medina@tcd.ie**

SCHOOL NOTICE BOARDS
Notice boards for undergraduates and postgraduates are located in the School lobby and also at the entrance to the laboratories.

2.3 THE SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES ACADEMIC STAFF

Head of School
Professor of Pharmacology
Marek Radomski, M.A., M.D. (ACADEMY OF MEDICINE), PH.D (COPERNICUS ACADEMY OF MEDICINE), D.SC. (POLISH ACADEMY OF SCIENCES), F.T.C.D (2007), DOCTOR HONORIS CAUSA (COMPLUTENSE UNIVERSITY MADRID (2009)

Assoc. Professor of Pharmacology
Andrew Harkin, B.SC. (N.U.I.), M.A., PH.D. (N.U.I.), F.T.C.D.(2011)

Asst. Professors of Pharmacology
Carlos Medina, M.B. (LA LAGUNA), PH.D. (A.U. BARCELONA)
Lorraine O'Driscoll, B.SC.(HONS; N.U.I), M.SC. (RES; N.U.I), PH.D. (N.U.I.), F.T.C.D. (2012)
Neil Frankish, B.SC. (C.N.A.A.), M.A.,PH.D.(STRATH.)

Professor of Pharmaceutical Chemistry
Mary J.Meegan, B.SC. (N.U.I), M.A., PH.D. (N.U.I), C.CHEM., M.R.S.C., F.T.C.D.(2011)

Asst. Professors of Pharmaceutical Chemistry
Astrid Sasse, STAATSEXAMEN PHARMAZIE (BERLIN), DR. RER. NAT. (BERLIN), M.A., M.P.S.I.
John Gilmer, B.A., PH.D.
John Quigley, B.SC. (N.U.I), M.A., PH.D. (N.U.I.), M.I.C.I.

Assoc. Professors of Pharmaceutics and Pharmaceutical Technology
Anne Marie Healy, B.SC. (PHARM.), PH.D., M.P.S.I., F.T.C.D.(2010)
Carsten Ehrhardt, STAATSEXAMEN PHARMAZIE (HAMBURG), DR. RER. NAT. (SAARBRÜCKEN, GERMANY)

Asst. Professors of Pharmaceutics and Pharmaceutical Technology
Deirdre D'Arcy, M.PHARM. (R.GORDON). PH.D. DIP. CLIN.PHARM. (LIV.J.MOORES), M.P.S.I.
Lidia Tajber, M.PHARM. (MEDICAL UNIVERSITY OF SILESIA), PH.D., P.G.DIP. Q.I

Asst. Professor of Nanopharmaceutical Drug Discovery (Ussher)
Maria Jose Santos Martinez, M.B. (LA LAGUNA); M.D. (U.A. BARCELONA); PH.D. (T.C.D.)

Assoc. Professor of Practice of Pharmacy
Martin Henman, B.PHARM. (BRAD.), M.A., PH.D. (BRAD.), M.R.PHARM.S., M.P.S.I.
Cicely Roche, B.SC. (PHARM.), M.SC. (HEALTHCARE ETHICS & LAW), M.SC. (COMM PHARM), M.P.S.I. ***(PART-TIME)***
Tamasine Grimes, B.SC. (PHARM.), M.SC (HOSP.PHARM.), P.G. DIP (HEALTH SERVICES MANAGEMENT), PH.D. (R.C.S.I), M.P.S.I. ***(PART-TIME)***

Asst. Professor of Practice of Pharmacy
Asst. Prof Sheila Ryder, B.SC. (PHARM.) M.SC. (BELFAST), M.P.S.I.

Adjunct Assoc. Professor of Practice of Pharmacy (Part-time)
Catriona Bradley, B.SC. (PHARM.), DIP.(LEGAL) , H.DIP.(Q.I), M.P.S.I., PH.D. (TCD)

Teacher Practitioner (PART-TIME) Boots the Chemists
Karen Rossi, B.SC. (PHARM.), M.SC. (COMM. PHARM), M.P.S.I.

Asst. Professor of Practice of Pharmacy (Hospital Pharm.)
Evelyn Deasy, B.SC. (PHARM.), M.SC.

Asst. Professors of Pharmacognosy
Fabio Boylan, B.SC. (PHARM.), (UNIVERSITY OF RIO), PH.D. (UNIVERSITY OF RIO), M.A.
John Walsh, B.A., PH.D.
Helen Sheridan, B.SC. (N.U.I.), M.A., PH.D. (N.U.I.), C.CHEM., M.R.S.C. ***(PART-TIME)***

Assoc. Professors of Pharmacognosy (PART-TIME)
Desmond Corrigan, B.SC. (PHARM) (N.U.I), M.A., PH.D. (N.U.I), F.P.S.I.
Ingrid Hook, B.SC.(PHARM) (MANC.), M.A., M.SC. (N.U.I.). M.R.PHARM.S.

Asst. Professor of Cancer, Biology and Therapeutics (Ussher)
David Finlay, B.A. (MOD), PH.D.

2.4 ADMINISTRATIVE STAFF, EXECUTIVE OFFICERS AND TECHNICAL STAFF IN THE SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES

SCHOOL ADMINISTRATOR

Dr. Cecilia McAllister	mcallisc@tcd.ie	Ext. 2938

EXECUTIVE OFFICERS

Ms. Marian Cash	Executive Officer	compharm@tcd.ie	Ext. 3736
Ms. Catherine Coffey	Executive Officer	cacoffey@tcd.ie	Ext. 2803
Ms. Betty Daly	School Executive Officer	edaly3@tcd.ie	Ext. 2809
Ms. Liesa Eckhardt	Senior Executive Officer	pharmtec@tcd.ie	Ext. 2350
Ms. Alison Finlay	Senior Executive Officer	finlaya@tcd.ie	Ext. 2811
Ms. Bernadette McLoughlin	Executive Officer	bmclough@tcd.ie	Ext. 2791

TECHNICAL STAFF

Mr. Ray Keaveny	Chief Technical Officer	rkeaveny@tcd.ie	Ext. 2814
Ms. Therese Moloney	Senior Technical Officer	tmalony@tcd.ie	Ext. 2824/2859
Ms. Rhona Prendergast	Senior Technical Officer	rprndgst@tcd.ie	Ext. 2831/2855
Mr. Brian Talbot	Senior Technical Officer	talbotb@tcd.ie	Ext.2859/2862
Mr. Joseph Reilly	Senior Technical Officer	jreilly@tcd.ie	Ext. 2854/2856
Ms. Maureen Brunt	Senior Lab Attendant	bruntm@tcd.ie	Ext. 2854/2856
Ms. Pauline McGlue	Senior Lab Attendant	mcgluep@tcd.ie	Ext. 2854/2856
Mr. Conan Murphy	Senior Lab Attendant	murphyc5@tcd.ie	Ext. 2833
Ms. Irene Pelow	Senior Lab Attendant	pelowi@tcd.ie	Ext. 2931

3 SAFETY WITHIN THE SCHOOL

3.1 General Information:

(i) Students are encouraged to bring any concerns re safety to the attention of the School and College Safety Officer, Mr. Tom Merriman, ext. 1914 (email: tom.merriman@tcd.ie).

(ii) All undergraduate students presenting in each year's practical classes are advised by the Staff Supervisor about general safety issues such as fire hazards, smoking, eating, protective clothing, etc. and first aid facilities.

Health and Safety Manual: It is the obligation of each students to familiarise themselves with the content of the safety manual.

SCHOOL SAFETY OFFICERS

Asst. Prof. C. Medina	**Biological Safety Officer**	**email: carlos.medina@tcd.ie**
Mr. R. Keaveny	**Chemical Safety Officer**	**email: rkeaveny@tcd.ie**
Asst. Prof. A. Harkin	**Radiation Safety Officer**	**email: aharkin@tcd.ie**

The B.Sc. (Pharm.) course consists of lectures, laboratory classes, seminars, study visits, tutorials and some work experience. Laboratories by their nature require those working in them to be highly aware of the safety implications of that particular working environment.
The School wishes to establish and maintain a working environment in which the physical and mental well-being of staff and students is maintained at the highest levels practicable, and to provide a basis whereby problems of safety that arise in the working environment are solved in co-operation with staff and students and their representative organisations.

3.2 Staff and students are obliged to operate the 'neighbour principle'. This involves:

(i) Taking reasonable care for their own safety and health and that of others who may be affected by their acts or omissions while at work;
(ii) Co-operating with the College to such an extent as will enable the College comply with the provisions of legislation and to meet its general duties on safety, welfare and health;
(iii) Not intentionally interfering with or misusing any means, appliance, equipment or other aid provided for securing the health, safety or welfare of the College community;
(iv) The use of any clothing, equipment or appliance required for the purpose of securing his/her health, safety and welfare at work;
(v) Reporting to the College management defects in plant, equipment or procedures which are a danger to safety, health or welfare.

N.B. In the interests of safety, any student who fails to obey regulations or instructions from academic or technical staff, including demonstrators, may be excluded from the laboratory.

3.3 IMPORTANT SAFETY PRECAUTIONS – PLEASE READ CAREFULLY

(i) Smoking in College buildings is not allowed.
(ii) Hallways and passageways must be kept clear.
(iii) The location of fire exits should always be noted.
(iv) The location of fire extinguishers and their mode of use should be noted.
(v) The location of the first aid cabinet in each laboratory should be noted.

(vi) Dress code when working in the laboratories:
- White lab coats must always be worn and closed

- Safety spectacles must be worn when appropriate
- Appropriate masks may need to be worn when working with certain types of equipment and /or chemicals
- No open-toed shoes or sandals may be worn while in the laboratory.
- Long hair must be tied back and kept from covering the face.

(vii) Use of mobile/camera phones, iPods, radios and all other electronic equipment unrelated to practical work is prohibited while working in laboratories.

(viii) In the event of an accident taking place in the laboratory involving injury, no matter how trivial it may seem, the proper procedure is to:
- Call the 'First-Aider' associated with the laboratory to give first-aid if appropriate.
- Phone the College Health Service (Ext. 1556) for advice and refer for medical evaluation if he/she is ambulatory and not in distress or otherwise seriously injured.
- If the victim is known to be or likely to be seriously injured always call the College emergency number (1999) for help.
  Never transport the victim to hospital in a private car or taxi.
- Report all accidents to a School of Pharmacy & Pharmaceutical Sciences Safety Officer.

(ix) Laboratory work must be performed where at all possible only during normal working hours. No laboratory work of any kind should be undertaken after hours unless at least **two** persons are present

(x) Eating and drinking in the laboratories is strictly forbidden, this includes chewing gum.

(xi) Any suspicious persons / packages / floods etc. must be immediately reported to the College Emergency Number **(1999)** at Front Gate.

4 UNIVERSITY STUDY

The B.Sc. (Pharm.) course is accredited by the Pharmaceutical Society of Ireland (P.S.I) and is also recognised for "free movement" purposes under the various European Union Directives on Pharmacy which lay down the modules to be studied. The minimum number of study hours for a Pharmacy course form part of National and European accreditation criteria. There are **two types of study** hours set out in this booklet.

1. **Supervised study** which is comprised of the lecture and laboratory practical courses, tutorials, workshops, seminars, study visits and specified work experience. It can also include laboratory report preparation**. School regulations require you to attend all scheduled classes and you may be refused permission to take your written examinations if your attendance is deemed unsatisfactory.** (See TCD Calendar; **General regulations and information** *Non-satisfactory attendance and course work, Calendar 2012-13, H6, #24*)

2. **Guided study** is comprised of directed but unsupervised study you must do outside the formal course. It can consist of suggested reading of text book references, published articles in scientific and medical journals, use of electronic data bases (e.g., Micromedex Healthcare Series), exercises in problem solving, reading and extension of your lecture notes, revision for term tests and annual examinations. The amount of Guided Study on average involves 2-3 hours per lecture and 1 hour for each hour of practical work. The hours specified are very much **minimum** hours of guided study expected of you over the four years of the course. Independent study, note-taking at lectures and the writing of laboratory reports etc., are an important way of developing your learning abilities and capacity for study. For Pharmacists in particular, the ability to learn continuously is absolutely essential because of the necessity for continuing education at professional level. If you are concerned about study technique at University level you should discuss this with your Tutor and avail of the courses made available each year in College. It is vital that you learn how to use the library efficiently particularly the electronic databases of relevance to Pharmacy and the Pharmaceutical Sciences.

Continuous assessment marks will be allocated based on attendance at practicals, performance and practical write-ups. Laboratory notebooks/manuals must be presented for assessment by the date specified in the notebook/manual.

IMPORTANT
Late submissions will not be assessed unless a valid reason is provided, and students will be deemed not to have satisfied the School's examination requirements.

Academic Integrity and Plagiarism
There is a well established academic convention that work performed and published by other people is acknowledged fully if it is being used in any written work submitted for assessment. This convention applies to all academic work (theses, research papers, text books etc.) but in your case it applies to all material used in assessments, lab books and written examinations. College takes breaches of its regulations on plagiarism very seriously and you must read the next section very carefully.

See TCD College Calendar 2012-13, Part 1, H19 #81-89.
http://www.tcd.ie/calendar/assets/pdf/archive/2012-2013/tcd-calendar-h-regulations.pdf

Plagiarism

Plagiarism is interpreted by the University as the act of presenting the work of others as one's own work, without acknowledgement. Plagiarism is considered as academically fraudulent, and an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University.

Plagiarism can arise from deliberate actions and also through careless thinking and/or methodology. The offence lies not in the attitude or intention of the perpetrator, but in the action and in its consequences. Plagiarism can arise from actions such as:

(a) **copying** another student's work;
(b) **enlisting** another person or persons to complete an assignment on the student's behalf;
(c) **quoting** directly, without acknowledgement, from books, articles or other sources, either in printed, recorded or electronic format;
(d) **paraphrasing**, without acknowledgement, the writings of other authors.

Examples *(c)* and *(d)* in particular can arise through careless thinking and/or methodology where students:

(i) fail to distinguish between their own ideas and those of others;
(ii) fail to take proper notes during preliminary research and therefore lose track of the sources from which the notes were drawn;
(iii) fail to distinguish between information which needs no acknowledgement because it is firmly in the public domain, and information which might be widely known, but which nevertheless requires some sort of acknowledgement;
(iv) come across a distinctive methodology or idea and fail to record its source.

All the above serve only as examples and are not exhaustive.

Students should submit work done in co-operation with other students only when it is done with the full knowledge and permission of the lecturer concerned. Without this, work submitted which is the product of collusion with other students may be considered to be plagiarism.

It is clearly understood that all members of the academic community use and build on the work of others. It is commonly accepted also, however, that we build on the work of others in an open and explicit manner, and with due acknowledgement. Many cases of plagiarism that arise could be avoided by following some simple guidelines:

(i) Any material used in a piece of work, of any form, that is not the original thought of the author should be fully referenced in the work and attributed to its source. The material should either be quoted directly or paraphrased. Either way, an explicit citation of the work referred to should be provided, in the text, in a footnote, or both. Not to do so is to commit plagiarism.

(ii) When taking notes from any source it is very important to record the precise words or ideas that are being used and their precise sources.
(iii) While the Internet often offers a wider range of possibilities for researching particular themes, it also requires particular attention to be paid to the distinction between one's own work and the work of others. Particular care should be taken to keep track of the source of the electronic information obtained from the Internet or other electronic sources and ensure that it is explicitly and correctly acknowledged.

It is the responsibility of the author of any work to ensure that he/she does not commit plagiarism. Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All subject areas in Pharmacy should include, in their handbooks or other literature given to students, advice on the appropriate methodology for the kind of work that students will be expected to undertake.

If plagiarism as referred to above is suspected, the Head of School or Director of Teaching and Learning (Undergraduate) will write to the student, and the student's tutor advising them of the concerns raised and inviting them to attend an informal meeting with the Head of School and the lecturer concerned, in order to put their suspicions to the student and give the student the opportunity to respond. The student will be requested to respond in writing stating his/her agreement to attend such a meeting and confirming on which of the suggested dates and times it will be possible for the student to attend. If the student does not in this manner agree to attend such a meeting, the Head of the School may refer the case directly to the Junior Dean, who will interview the student and may implement the procedures as referred to under CONDUCT AND COLLEGE REGULATIONS.

If the Head of School or Director of Teaching and Learning (Undergraduate) forms the view that plagiarism has taken place, he/she must decide if the offence can be dealt with under the summary as set out in the College Calendar. In order for this summary procedure to be followed, all parties attending the informal meeting as set out above must state their agreement in writing to the Head of School. If the facts of the case are in dispute, or if the Head of School feels that the penalties provided for under the summary procedure below are inappropriate given the circumstances of the case, he/she will refer the case directly to the Junior Dean, who will interview the student and may implement the procedures as referred to under CONDUCT AND COLLEGE REGULATIONS.

If the offence can be dealt with under the summary procedure, the Head of School will recommend to the Senior Lecturer one of the following penalties:

(i) that the piece of work in question receives a reduced mark, or a mark of zero; or
(ii) for satisfactory completion of the piece of work is deemed essential for the student to rise with his/her year or to proceed to the award of a degree, the student may be required to re-submit the work. However, the student may not receive more than the minimum pass mark applicable to the piece of work on satisfactory re-submission.

5 B.SC. (PHARM.) DEGREE

The purpose of undergraduate pharmacy education (the pharmacy degree programme) is to produce pharmacy graduates who have the knowledge, skills and attributes to safely participate in the National Pharmacy Internship Programme (NPIP). Graduates should be prepared for patient-facing pharmacy practice, and their learning should be based upon and underpinned by appropriate and sufficient understanding of the principles and techniques of the pharmaceutical, biomedical and social sciences.

The provision of a common Pharmacy Syllabus allows individual graduates to choose for themselves the branch of pharmacy within which they wish to practice. ***Work Placement in Community and/or Hospital Pharmacy Practice is required to progress through the course.*** While the minimum requirements are stated in the Senior Freshman Module, **PH2007** and the Junior Sophister Module, **PH3006**, we would encourage students and graduates to obtain experience in as many different facets of pharmacy practice as possible since the differing experiences will enrich your subsequent professional career.

The B.Sc. (Pharm) is awarded on the successful completion of the four year undergraduate course. In order to become a registered pharmacist a one-year training period must be

undertaken followed by the Licence Examination.The pre-registration year and the Licence Examination are the responsibility of the Pharmaceutical Society of Ireland.

5.1 GARDA VETTING

Students undertaking the B.Sc. (Pharm.) are required to undergo vetting by the Garda Síochána or other relevant police force prior to commencing any placements. If, as a result of the outcome of these vetting procedures, a student is deemed unsuitable to attend clinical or other professional placements, he/she may be required to withdraw from his/her programme of study.

5.2 FITNESS TO PRACTICE AND CODE OF CONDUCT

Students undertaking the B.Sc. (Pharm.) are expected to abide by the Code of Conduct for Pharmacy students which may be found on the School website (see https://pharmacy.tcd.ie/undergraduate/course-notices/coursenotes.php).

Students should also note the School's procedure's for dealing with Fitness to Practice issues (see https://pharmacy.tcd.ie/undergraduate/course-notices/coursenotes.php) and the general College Regulations on Fitness to Practice (see page H6, #27 of the University Calendar 2012/2013).

FURTHER INFORMATION FOR STUDENTS

http://www.tcd.ie/disability/

http://www.tcd.ie/local/scholreview/

http://www.pharmaceuticalsociety.ie/

School Office (Ground Floor)
Ms. Elisabeth Daly
Opening hours: 9.15 am – 12.45 pm, Monday – Friday
& afternoons on Tuesday, Wednesday & Friday.
Email: pharmacy@tcd.ie

5.3 LEARNING OUTCOMES FOR THE B.SC. (PHARM.) DEGREE PROGRAMME

The Pharmacy graduate should be able to:

(i) Commit to the ethos of professionalism and in particular should have a duty of care to and respect for the patient and a maturity to make professional decisions in the best interest of the patient;
(ii) Commit to life-long learning, in particular an awareness of the need for continuing education and professional development in the chosen field of pharmacy practice and
(iii) Adapt to developments in pharmacy and medicine.

The graduate will be able to:

- Demonstrate a foundation level of knowledge and understanding of the biological, physical and quantitative sciences underpinning Pharmacy;
- Explain how medicines are developed, manufactured, tested and brought to the market place;
- Demonstrate and describe how different types of medicinal preparations are formulated and be capable of preparing medicines extemporaneously, where appropriate;
- Supply medicines in accordance with pharmaceutical knowledge, legislation and codes of professional conduct and practice;
- Apply pharmacological, pharmaceutical and clinical knowledge to safely and effectively interpret and evaluate prescriptions and other orders for medicines;

- Fulfil their professional role as a pharmacist in advising and counselling patients, other healthcare professionals and others about medicines and their usage;
- Recognise common disease states and make appropriate responses to presented symptoms;
- Apply the principles of quality and quality assurance mechanisms in all aspects of scientific and professional activities;
- Employ research methodologies relevant to natural, clinical and social sciences;
- Apply an empirical approach to problem solving.

5.4 ATTENDANCE AND COURSE WORK

Students must attend for appropriate academic instruction in each term of each academic year and must satisfy the Head of the School as to their academic progress in each term in order to proceed with their year. The School may, from time to time, draw up regulations determining the required attendance of students at the various forms of instruction.

To rise with their class students must (a) attend satisfactorily the lectures, seminars, tutorials etc. given in the module of their course each term as required by the University Council and the School of Pharmacy and Pharmaceutical Sciences regulations, (b) perform and complete all laboratory work to the satisfaction of the Head of the School, (c) attend and complete to a satisfactory standard all visits and teaching exercises at Practice sites and the prescribed periods of work placement and (d) pass the prescribed examinations (including practical tests and continuous assessment schemes).

Non-satisfactory attendance and course work

At the end of the teaching term, students who have not satisfied the School requirements with regard to attendance may be returned to the Senior Lecturer as non-satisfactory for that term. In accordance with the regulations laid down by the University Council. **Non-satisfactory students may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat their year.**

5.5 EXEMPTIONS – MATURE STUDENTS AND TRANSFER STUDENTS

Mature or transfer students may apply for exemptions from coursework and lectures. They do so by applying to the appropriate Module Co-ordinator, who may make a recommendation to the Director of Undergraduate Teaching & Learning. Exemption applications from one or more modules must be made through the student's tutor in the first instance, **within four calendar weeks of the start of Michaelmas Teaching Term**. All students must present for examinations in all modules. In the case of those who have been granted an exemption from practicals, their theory mark is returned.

N.B. PLEASE NOTE EXAMINATION REGULATIONS AND DETAILS ON COURSE MODULES MAY BE SUBJECT TO AMENDMENT.

5.6 COURSE MODULES

JUNIOR FRESHMAN

Course Code	Course Title	ECTS	PSI (Appendix)
PG1001	Physiology	5	**D**
BY1101	Cell and Molecular Biology	10	**B**
BIPH01	Biochemistry	5	**D**
PH1001	Sources and Characteristics of Substances used in Medicines	5	**B**
PH1002	Physical Pharmacy I	5	**B**
PH1003	Discovery, Isolation, Separation & Analysis of Substances used in Medicines	10	**B**
PH1004	Introduction to Pharmaceutics & Formulations	5	**C**
PH1005	Mathematical Methods & Pharmaceutical Calculations	5	**C**
PH1006	Practice of Pharmacy I	5	**A**
PH1007	Orientation & Learning Skills and Integrated Pharmacy Studies (incl. Problem Based Learning)	5	**A**

SENIOR FRESHMAN

Course code	Course Title	ECTS	PSI (Appendix)
PH2001	Pharmaceutical Properties of Materials Used in Medicines	5	**B**
PH2002	Physical Pharmacy II	5	**B**
PH2003	Isolation, Separation & Analysis of Substances Used in Medicines	10	**B**
PH2004	Formulation & Pharmaceutical Technology	5	**C**
PH2005	Microbiology and Biochemistry	5	**B/D**
PH2006	Practice of Pharmacy II	5	**A**
PH2007	Professional Development & Career Planning	5	**A**
PH2008	Pharmaceutical Biotechnology I	5	**B**
PH2009	General Principles of Pharmacology	5	**D**
PH2010	Molecular and Chemotherapy Pharmacology	5	**D**

JUNIOR SOPHISTER

Course Code	Course Title	ECTS	PSI (Appendix)
PH3002	Medicinal & Pharmaceutical Chemistry III	10	**B**
PH3003	Natural Sources of Drugs and Medicines	10	**B**
PH3004	Sterile Products	10	**C**
PH3005	Pharmaceutical Data Analysis & Bioinformatics	5	**C**
PH3006	Practice of Pharmacy III	5	**A**
PH3008	Pharmaceutical Biotechnology II	5	**C**
PH3009	Endocrine & Reproductive Pharmacology and Veterinary Pharmacy	5	**D**
PH3010	Respiratory & Gastrointestinal Pharmacology	5	**D**
PH3011	Blood, Cardiovascular & Renal Pharmacology	5	**D**

SENIOR SOPHISTER

Course Code	Course Title	ECTS	PSI (Appendix)
PH4002	Medicinal and Pharmaceutical Chemistry IV	5	**C**
PH4003	Ectoparasiticides, Natural Remedies and Complementary Medicine	5	**D**
PH4004	Advanced Drug Delivery	5	**C**
PH4005	Pharmacokinetics, Pharmacodynamics, Biopharmaceutics & Drug Metabolism	5	**C**
PH4006	Practice of Pharmacy IV[1]	5	**A**
PH4007	Practice of Pharmacy IV[2] (including electives)	10	**A**
PH4008	Addiction Pharmacy	5	**D**
PH4009	Neuropharmacology	5	**D**
PH4011	Malignant, Disease, Immunopharmacology & Pharmacology of the Eye	5	**D**
PH4012	Research Project	10	

Definition of the ECTS:

"The European Credit Transfer and Accumulation System (ECTS) is a student-centred system based on the student workload required to achieve the objectives of a programme of study. " Ref: ECTS Users' Guide (Feb 2005) EU Commission, DG for Education and Culture".

ECTS equivalent for each year of the course is 60 credits.

TCD website: http://www.tcd.ie/vp-cao/bd/bd2collegevp.php

5.7 EXAMINATION REGULATIONS IN THE SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES

1. General College Regulations shall apply as set out in the University Calendar in the chapter General Regulations and information for students

   http://www.tcd.ie/calendar/assets/pdf/archive/2012-2013/tcd-calendar-h-regulations.pdf

   Particular attention is drawn to the following:

1.1 **ILLNESS AT EXAMINATIONS**

Students who consider that illness will prevent them from attending an examination (or any of the sessions thereof) should see their medical adviser and request a medical certificate for an appropriate period. If a certificate is granted, it must be forwarded immediately to the Senior Lecturer's Office; the certificate will not be accepted more than three days after the beginning of the period of absence from the examination. If the illness is of short duration, the student should complete the remaining sessions of the examination (if any).

Students who are taken ill during an examination session will be escorted to the Student Health Centre. If they recover rapidly, they may complete the paper either in the examination hall, or in another appropriate place. If they are more seriously ill they should see their medical adviser without delay and request a medical certificate. If a certificate is granted, it must be sent immediately to the Senior Lecturer's Office, where it will be taken as notice of withdrawal from the examination. Where the examination in an individual module involving more than one paper has been partially completed the candidate must resit the entire examination in that module. Where an examination has been completed subsequent withdrawal is not permitted. Medical certificates will not be accepted in explanation of poor performance.

Students who are unable to complete their examinations at the Annual or Supplemental Examination may be given permission to repeat the year. Examinations outside these two sessions will only be considered by the Senior Lecturer in exceptional circumstances.

1.2 **CONDUCT OF EXAMINATIONS**

Candidates for examinations are forbidden to bring books, notes, mobile phones or pagers with them into an examination hall, to copy from or exchange information with other candidates or in any way make use of information improperly obtained. Such actions are regarded as serious offences (see Calendar H20, III Conduct and College Regulations) for which a student may be expelled from the University.Students must not leave the hall before the time specified for the examination has elapsed, except by leave of the invigilator. Examinations or other exercises which are part of continuous assessment are subject to the same rules as other College examinations. Where submitted work is part of a procedure of assessment, plagiarism is similarly regarded as a serious offence and is liable to similar penalties.

1.3 **USE OF CALCULATORS IN EXAMINATIONS**

Electronic calculators are permitted in certain examinations provided that they are battery operated, pocket sized, silent in operation and are not capable of using previously recorded programmes. The College does not supply calculators. The operation of calculators is entirely the responsibility of the students. No allowance is made for errors or omissions arising from the malfunction of calculators or the misuse of calculators by students. Calculators may not be passed from one candidate to another during examinations.
It is essential that the stages of numerical work, including intermediate answers, be written clearly to demonstrate knowledge of the problems and their solutions.

1.4 **APPEALS**

Students may appeal through their Tutors to the School of Pharmacy & Pharmaceutical Sciences Court of First Appeal in the first instance and thereafter to the Academic Appeals Committee (see page H12, # 52-53 of the University Calendar 2012/13).

1.5 **ACADEMIC PROGRESS**

A student may not repeat any academic year more than once and may not repeat more than two academic years, except by special permission of the University Council.

To rise with their class students must:

(i) Attend satisfactorily the lectures given in the modules of their course in each term as required by the University Council and the School of Pharmacy & Pharmaceutical Sciences regulations;
(ii) Perform and complete all laboratory work including project work and dissertations to the satisfaction of the Head of the School or module coordinator concerned; and
(iii) Pass, in accordance with the School of Pharmacy & Pharmaceutical Sciences regulations, the prescribed examinations (including practical tests and continuous assessment schemes).

2. JUNIOR FRESHMAN, SENIOR FRESHMAN AND JUNIOR SOPHISTER STUDENTS

To be successful at the Annual Examinations, a student will normally be required to pass in each Module. However, the Court of Examiners may allow compensation in one Module (with the exception of **PH1006, PH2006, PH2007 and PH3006**) provided that the student has

(i) gained a mark of 35% or higher in the module in which they have failed and
(ii) obtained (and are returned with) an overall average of at least Grade III.

Compensation will not be allowed where a student is returned as "ungraded" in any module.

Students who fail to satisfy the examiners at the annual examination must present for a supplemental examination at the beginning of Michaelmas term. There is no fee for the supplemental examination.

Students who are unsuccessful at the annual examination will normally be given credit for those modules in which they were successful, and will be examined in the supplemental examinations only in those modules in which they are unsuccessful.

Students who are unsuccessful at both an annual and supplemental examination may repeat the year. Repetition requires full attendance at lectures and such other courses as may be prescribed by the Head of the School of Pharmacy & Pharmaceutical Sciences.

Students may not repeat any academic year more than once within the degree programme and may not repeat more than two academic years within the degree programme, except by special permission of the University Council.

3. B.SC. (PHARM) DEGREE EXAMINATION

The B.Sc. (Pharm) degree examination will be held in Trinity Term of the Senior Sophister year. The Pharmacy Law paper is however, taken between Michaelmas and Hilary Terms.

A student is normally expected to pass each module. However, the Court of Examiners may allow compensation in **one** module (with the exception of **Practice of Pharmacy modules, PH4006 and PH4007**) provided that all the modules concerned have been taken in a single sitting and that the student has

(i) gained a mark of 35% or higher in the module in which they have failed and
(ii) obtained (and are returned with) an overall average of at least Grade III.

Compensation will not be allowed where a student is returned as "ungraded" in any module.

Compensation in Practice of Pharmacy is precluded by the accreditation criteria of the Pharmaceutical Society of Ireland.

Students who are unsuccessful at the Annual Degree Examination will normally be given credit for those modules in which they were successful, and if presenting for a Supplemental Examination, will be examined only in those modules in which they were unsuccessful.

In order to qualify for the award of the degree, students are required to pass the degree examination, and associated coursework and assessments, in their entirety within eighteen months from the date on which they first became eligible to present for the degree examination.

Students who are unsuccessful at both the Annual and Supplemental Examinations must apply to the School of Pharmacy & Pharmaceutical Sciences Court of First Appeal in the first instance and thereafter to the Academic Appeals Committee for permission to repeat the year. Repetition requires full attendance at lectures and such other courses as may be prescribed by the Head of School.

4. **PHARMACY LAW, ETHICS AND PROFESSIONALISM**

The Pharmaceutical Society of Ireland require, as part of the Interim Accreditation Standards for the Level 8 Bachelor Degree (2012), that success in a formal examination of pharmacy law and a summative assessment of ethics and professionalism in final year shall be a condition for the award of the Degree. Accordingly students who fail to satisfy the examiners in XPH40061 will be ungraded and will be required to take a supplemental examination.

5.8 CALCULATION OF ANNUAL EXAMINATION & FINAL DEGREE GRADES

For Annual Grades - Individual module weightings will be based on ECTS (e.g. a 10 ECTS module would represent 1/6 or a 5 ECTS module would represent 1/12 of the annual result).

A student is normally expected to pass each module. However, the Court of Examiners may allow compensation in one module (with the exception of specific modules as detailed in the Examination Regulations) where only a small deficiency exists.

Students who fail a module or a component of a module and who present for a repeat examination (in that particular module) are returned with a pass mark in that module or the failed component and in the latter case this mark is used to calculate the module mark.

B.SC. (PHARM) DEGREE

In calculating the final degree mark the following proportions will be observed:
50% of the final mark will be awarded on work examined in the SS year
25% of the final mark will be awarded on work examined in the JS year
15% of the final mark will be awarded on work examined in the SF year
10% of the final mark will be awarded on work examined in the JF year

THE DEGREE GRADES ARE AS FOLLOWS:

First Class Honours	70% +
Second Class Honours Division 1	60-69%
Second Class Honours Division 2	50-59%
Third Class Honours	40-49%

5.9 VIVA VOCE EXAMINATIONS

Senior Sophister Students may be asked to attend a Viva Voce examination. Accordingly they **must** be available for such examinations when the External Examiners are visiting the School. Dates for *Viva* examinations are published as soon as they are known. However, students should note that *Viva* lists are unlikely to be available until a few days before the actual *Viva*.

5.10 FOUNDATION SCHOLARSHIP EXAMINATION

University Calendar 2012-13 "Foundation an Non-Foundation Scholarships", S1
http://www.tcd.ie/calendar/assets/pdf/archive/2012-2013/tcd-calendar-s-prizes-awards.pdf

N.B. This examination will be held in January, before the commencement of Hilary Teaching Term. Candidates are examined in their course work up to the end of Michaelmas Term of the Senior Freshman year, together with such additional reading as may be required by the Head of the School of Pharmacy & Pharmaceutical Sciences.

The examination consists of the following:
Three papers, each of 3 hours duration with equal weighting; papers arranged as follows:

Paper 1 – Pharmaceutical Sciences 1
Topics will be drawn from the following modules: Pharmaceutical Properties of Materials used in Medicines (PH2001) and Isolation, Separation and Analysis of Substances used in Medicine (PH2003).

3 hour paper. Four questions to be answered from four.

Paper 2 – Pharmaceutical Sciences 2
Topics will be drawn from Formulation & Pharmaceutical Technology (PH2004), Practice of Pharmacy II (PH2006) and General Principles of Pharmacology (PH2009)

3 hour paper. Four questions to be answered from five.

Paper 3 – Disease management: Interdisciplinary understanding and research
3 hour paper. Four questions to be answered from five.

In relation to Paper 3, candidates will be given selected scientific papers at the beginning of the Michaelmas Term.

In the examination candidates will be asked questions relating to, for example;

- the disease state and its molecular basis
- the types of treatment used at present
- the nature of the API, its presentation and the forms of delivery in use
- the provision of care for patients with the condition
- future developments in understanding of the disease, potentially new types and forms of treatment and the challenges of care.

In order for students to be proposed for election to scholarship, they must obtain an overall average first class result (70% or higher) in the Scholarship examinations, and a mark of at least 60% in each of the three papers.

5.11 PRIZES

- **Gold Medal**: The Board of Trinity College may award Gold Medals to candidates who show exceptional merit at the degree examination.

- **Pfizer Healthcare Ltd. Junior Freshman Pharmacy Prize**: This prize is awarded for overall first place in the Junior Freshman Pharmacy Annual Examination.

- **Sanofi Prize**: This prize is awarded to the student who attains the highest overall combined mark in modules PH3003 and PH4003

- **Pfizer Healthcare Ltd. Prize in Pharmacology**: This prize is awarded to the student who attains the highest overall combined mark in modules PH3009, PH3010, PH3011, PH4009 and PH4010.

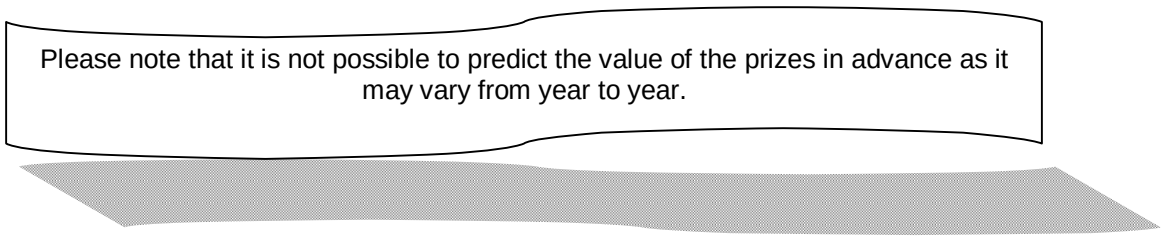
- **Paul Higgins Memorial Prize -Cahill May Roberts Ltd Prize in Pharmaceutical Chemistry**: This prize is awarded to the student who attains the highest overall combined mark in modules PH3002 and PH4002.

- **LEO Pharma Prize in Pharmaceutics**: This prize is awarded to the student who attains the the highest overall combined mark in modules PH4004 and PH4005.

- **McNeil Pharmaceutical Prize**: This prize is awarded to the student who attains the highest overall combined mark in modules PH4006, PH4007 (including electives)

- **Alumni Prize**: This prize is awarded for the best combined overall mark in the Junior Sophister year.

- **The Actavis Academy Senior Sophister Pharmacy Prize**: This prize is awarded for the best combined overall mark for the Senior Sophister year.



JUNIOR FRESHMAN (1st Year)

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*
- *Reports, continuous assessments and laboratory notebooks must be presented for assessment by the date specified by the examiner.*
- *Reports, continuous assessments and laboratory notebooks submitted after the specified date will not be assessed unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

GENERAL PRE-REQUISTE: Matriculation Requirements and in Mathematics at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in Chemistry at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

PHYSIOLOGY

Year 1 (Junior Freshman) **Course Code**: **PG1001**

Staff of the Department of Physiology: Assoc. Prof. Á. Kelly (AK), Prof. M. Lynch (ML), Asst. Prof. M. Egaña (ME), Asst. Prof. D. Ulrich (DU), Asst. Prof. A. Witney (AW), Asst. Prof. A. Gowran (AG)

Coordinator: Professor Marina Lynch

AIMS: To provide a basic core knowledge of the normal function of the human body as a foundation for your future application of Physiology to therapeutic practice.

PRE-REQUISITES – In addition to Matriculation Requirements, students without Leaving Certificate Biology are expected to do some extra reading in areas such as cell structure & function and the basic functions of body organs also please refer to general pre-requisites stipulated on page 20.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Recognise the structural characteristics of the basic mammalian cell types.
- Describe the functional roles of these cell types and how they interact in the various organ systems studied during the course.
- Explain the mechanisms by which these different organ systems are controlled in the normal human body.
- Describe the functional interrelationships that normally exist between the organ systems during daily life.
- Explain pathophysiological examples in some of the main organ systems
- Recall typical normal values for those physiological variables commonly used in clinical practice.

COURSE OUTLINE

LECTURES	**Lecturer**
1. C&T1: Introduction. Tissue and organ composition	AK
2. C&T2: Principles of cellular function	AK
3. C&T3: Composition of the blood	AK
4. C&T4: Homeostasis, Body composition and water distribution	AK
5. C&T5: Systems of immunity and defence	AK
6. C&T6: Membrane transport & membrane potential	AK
7. N&S1: Organisation of the nervous system	ML
8. N&S2: Electrical activity in nerve pathways	ML
9. N&S3: Sensory Perception	ML
10. N&S4: The Eye	ML
11. N&S5: The Ear	ML
12. MSC1: Nervous activation of skeletal muscle	DU
13. MSC2: Contraction of skeletal muscle	DU
14. MSC3: Determinants of skeletal muscle force	DU
15. MSC4: Smooth and cardiac muscle	DU
16. CVS1: Introduction to cardiovascular physiology	ME
17. CVS2: The heart & blood vessels	ME
18. CVS3: Regulation of cardiac output	ME
19. CVS4: The cardiac cycle	ME
20. CVS5: Haemodynamics	ME
21. CVS6: Regulation of blood pressure	ME
22. RESP1: Organisation of the respiratory system	ME
23. RESP2: Mechanics of breathing	ME
24. RESP3: Gas exchange	ME
25. RESP4: Gas transport	ME
26. RESP5: Regulation of breathing	ME
27. RESP6: Swallowing/larygeal function	ME
28. D&M1: Organisation and motility of the digestive system	AG
29. D&M2: Digestion and absorption of nutrients	AG
30. D&M3: Regulation of digestive function	AG
31. D&M4: Functions of the liver and gall bladder	AG

32. D&M5: Regulation of metabolism AG
33. D&M6: Regulation of body temperature AG
34. REP1: Endocrine regulation of reproduction AW
35. REP2: Menstrual cycle AW
36. REP3: Pregnancy, labour and lactation AW
37. REN1: Organisation and function of the urinary system AW
38. REN2: Regulation of body salt and water AW
39. REN3: Regulation of body pH AW

TUTORIALS Computer-supported learning via coursecompass.com; a specific support including lecture notes/slides, test questions and exercises.

DIRECTED READING
The standard text (linked to coursecompass) is Stanfield, C & Germann, W. *Principles of Human Physiology* 4th edn.

ASSESSMENT	Weighting
In-Course; On-line MCQs on each unit of the course	10% of marks
Written Paper: 3 hours	90% of marks
Section A: 10 short-answer questions; Section B: ~43 MCQs	

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Guided study	TOTAL	ECTS
39	0	3	42	63	105	5

NB This course is taken with students from Clinical Speech & Language Studies and Radiation Therapy.

CELL AND MOLECULAR BIOLOGY

Year 1 (Junior Freshman) **Course Code**: **BY1101**

Staff of School of Biochemistry and Immunology: Prof. L. O'Neill
Staff of the School of Genetics and Microbiology: Prof. G.J. Farrar, Prof. T. Foster, Prof. C. Smyth
Staff of the School of Natural Sciences: Assoc. Prof. P. Murphy, Assoc. Prof. J. Rochford

Coordinator: Prof. Timothy Foster

AIMS: To provide students with a thorough foundation in all aspects of modern molecular and cellular biology in preparation for more applied professional and clinical studies.

PRE-REQUISITES: Please see the general pre-requisites which are stipulated on page 20.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Discuss the fundamental principles of biology, including the structure and function of biologically important molecules; cell structure, function and reproduction; genetics and heredity; developmental biology; and the role and function of microorganisms,
- Use the scientific method as a fundamental mechanism for critical analysis and problem solving,
- Use general texts, reference books and a range of other resources to further develop knowledge of biological issues through continued independent learning,
- Carry out a range of laboratory exercises, demonstrating the development of practical scientific skills.

COURSE OUTLINE:

MOLECULAR AND CELLULAR BASIS OF LIFE (Prof. Luke O'Neill)
The chemical context of life
Proteins - uniquely suited to life
A tour of the cell
The origin and evolution of life: from molecules to cells to multicellular organism
The nucleus: from DNA to mRNA
mRNA to protein: The endoplasmic reticulum and Golgi apparatus
Energy and the cell
From photons to protons and electrons to ATP
Lysosomes and peroxisomes
How cells communicate - signal transduction

GENETICS (Prof. Jane Farrar)
Mendel's Laws 1. Segregation and random assortment of unit factors (genes)
Analysis of mono-hybrid and di-hybrid crosses
Mendel's Laws 2. Linkage and crossing over. Sex linkage. Gene mapping
Chromosomes. Mitosis, Meiosis. Crossing over and recombination.
Understanding the role and function of genes. Garrod: inborn errors of metabolism. Beadle and Tatum: the "one gene – one enzyme" hypothesis
What are genes made of? Genes = nucleic acids
The logic of genetic analysis
Controlling gene expression
Developmental Genetics 1 & 2
Genetic Engineering 1 & 2
Quantitative Genetics; Population Genetics; Evolutionary Genetics; Applied Genetics

BIOLOGY OF MICROORGANISMS (Assoc. Prof Alasdair Fleming; Prof. Timothy Foster)
Growth of bacteria. Cell division. Binary fission. Aseptic technique and pure culture
Differences between eukaryotic cells and prokaryotic cells
Bacterial cell structure. Gram-positive and Gram-negative. Peptidoglycan. Fimbriae
Antibiotics. Mechanisms of action of and resistance to penicillin and tetracycline.
Bacterial pathogens. Staphylococcus aureus and Vibrio cholera. Virulence factors & pathogenic mechanisms
Viruses. Structure and replication. The Baltimore scheme. Herpes and retroviruses. Diseases
Immunity. Innate defences. Acquired immunity. Antibodies – structure and functions. Neutrophils and phagocytosis. Complement

Immunological memory. Antigen presentation. Clonal selection. T cells and B cells. Active and passive immunity. Vaccination
Eukarotic microbes. Structure function and replication of fungi and amoeba.
Introduction to the Archaea

DEVELOPMENTAL BIOLOGY (Assoc. Prof. Paula Murphy)
Introduction to embryology and developmental biology.
Amphibian development 2 & 3
Reptile and bird development 1 & 2 (using the chick as an example).
Mammal development 1 & 2
Introduction to part 2
Focus on experimental model systems
Differential gene expression
Developmental genetics
How developmental regulatory genes work
Limb development
What developmental genetics can teach us about evolutionary change : evo-devo
Sex determination

PRACTICAL CLASSES (28 HOURS) (Assoc. Prof. John Rochford)
1 Molecular Techniques: Pipetting and spectrophotometry
2 Molecular Techniques: Purification of glutathione S - transferase by affinity chromatography
3 Molecular Techniques: Electrophoresis of proteins
4 Molecular Techniques: Assaying glutathione S - transferase
5 Microscopy 1: Use and care of microscopes and examination of simple tissues and cells
6 Microscopy 2: Some features of tissues and cells
7 Genetics: Microscopic examination of chromosomes, continuous variation and examination of pedigrees
8 Microscopy 1: Basic bacteriological techniques, examination of bacteria and fungi, and demonstration of antibiotic resistance and susceptibility
9 Microbiology 2: Continuation of above

Tutorials: A series of informal, small-group tutorials is provided by post-graduate teaching assistants to support the lecture and practical programmes, and provide the students with advice and direction in relation to continued independent learning.

DIRECTED READING:

Campbell, N.A. and Reece, J.B. *Biology* , 8th ed. Pearson/Benjamin Cummings. (2005) ISBN 978-0-321-53616-7.
Other sources, for further information and general background reading, as directed by lecturers.

ASSESSMENTS: Weighting

Written Paper: XBY11011 Essay & short-answer paper (3 hours) 66.6 % of total marks
Answer two essay questions from six, and ten compulsory short–answer questions.

Practical Test: MCQ Test (45 min). 30 questions based on practicals. 22.2% of total marks
Answer all questions (no negative marking).

Continuous assessment of Practical work during year. 11.1 % of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
48	28	10	86	-	114	200	10

BIOCHEMISTRY

Year 1 (Junior Freshman) **Course code: BIPH01**

Staff of the School of Biochemistry & Immunology: Asst. Prof. K. Mok (KM), Assoc. Prof. R. Porter (RP), Asst. Prof. T. Mantle (TM), Assoc. Prof. P. Voorheis (PV).

Coordinator: Prof. Andrew Bowie (AB)

AIMS: To provide current basic biochemical concepts of cell function, and describe, by way of example, the importance of several protein and cellular functions.

PRE-REQUISITES: Matriculation Requirements and in Mathematics at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in Chemistry at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Describe the components of the cell;
- Detail how protein structure leads to protein function;
- Describe how cells grow and divide;
- Discuss how cells extract and transduce energy;
- Describe the basics of control of cell functions;

COURSE OUTLINE: (Taken with JF Med/SF RT)

LECTURES		**Lecturer**
1	Introduction	AB
2-6	Protein structure and function	KM
7-10	Enzymology	TM
11-12	Membranes and transporters	RP
13-16	Intermediary metabolism (carbohydrates)	RP
17-20	Cell division and cell cycle	PV
21-22	Bioenergetics	RP

BIOINFORMATICS EXERCISE (Computer-Aided-Learning) 5 hrs

Coordinator: Dr. Glynis Robinson (GR)

ASSESSMENT

MCQ = 75%
Bioinformatics Exercise = 25%

DIRECTED READING

Berg, JM, et al. (2006). 'Biochemistry', 6th edition. WH Freeman & Co.

SUMMARY OF HOURS

Lectures	CAL	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
22	5	-	27	-	55	82	5

SOURCES AND CHARACTERISTICS OF SUBSTANCES USED IN MEDICINES

Year 1 (Junior Freshman) **Course Code: PH1001**

Staff of the School of Pharmacy and Pharmaceutical Sciences: Asst. Prof. J.J. Walsh (JJW), Prof. M.J. Meegan (MJM), Asst. Prof. J. Quigley (JMQ), Dr. C. O'Donohoe (CO'D)

Coordinator: Prof. M.J. Meegan

AIMS: To provide the pharmacy student with an appropriate foundation course in Chemistry leading to an understanding of the chemical properties of substances used in human and veterinary medicines.

PRE-REQUISITES: Matriculation Requirements and in Mathematics at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in Chemistry at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Describe the structure and nomenclature of simple chemical compounds of relevance in pharmacy
- Explain the influence of atomic structure, stereochemistry and molecular shape on drug design and activity
- Explain and illustrate the mechanisms for simple organic and bioorganic reactions of specific relevance to the synthesis of drug molecules
- Discuss the nature of functional groups and chemical reactivity in drug molecules
- Perform standard synthetic laboratory procedures
- Compile a short pharmaceutical chemistry profile of a drug molecule

COURSE OUTLINE:

The course comprises four sections which are designed to provide the student with a broad understanding of the underlying principles of organic, bioinorganic and pharmaceutical chemistry which are required by Pharmacy students. It will place appropriate emphasis on the relationship of molecular structure to drug activity and will provide an introduction to the basic reaction mechanisms important to drug design.

Unit PH1001A: Structure and bonding in simple chemical compounds of relevance to pharmacy (8 Lectures): (JMQ)

1-3 Introduction to structure and bonding in organic compounds; ionic and covalent compounds; ionic bonding; covalent bonding; multiple bonds; nomenclature of simple organic molecules
4-5 Introduction to hybridization and sterochemistry; shape and polarity of covalent molecules
6 Non-bonding interactions between molecules;
7 Covalent bonding and chemical reactivity
8 Review of structure and bonding in organic compounds

Unit PH1001B: Nature of functional groups and chemical reactivity in drug molecules (17 Lectures): (JJW)

9-10 Functional groups in drug molecules, mechanisms for simple organic and bioorganic reactions of relevance to drug molecules; reaction pathways; writing equations for chemical reactions
11-12 Addition reactions to alkenes and carbonyls, nucleophilic aliphatic substitution
13-15 Elimination reactions from alkyl halides together with electrophilic aromatic substitution reactions
16-23 Chemical properties of important functional groups in drug molecules of use in predicting drug properties and chemical reactivity
24 Structures and properties of bioorganic materials (proteins, carbohydrates and lipids)
25 Review of introductory chemistry of organic compounds

Unit PH1001C: Practical Laboratory skills: (6 Practical laboratory classes) (MJM, CO'D)
The practical laboratory course is designed to introduce the students to standard synthetic laboratory procedures and provide the basic practical skills required for Good Laboratory Practice with the objective to produce accurate and reproducible results and to develop the skills required in the synthesis and purification of drugs.

1. Technique of crystallization: Purification of acetanilide
2. Paracetamol synthesis and characterisation
3. Esterification of benzoic acid to methylbenzoate
4. Aldol condensation reaction
5. Hydrolysis of esters
6. Aspirin synthesis and characterization

Unit PH1001D: Compilation of the pharmaceutical chemistry profile of a given drug molecule (Written Assignment) (MJM)
Students will be required to compile and submit a report (electronic format and hard copy) which will summarise the following information about a specific drug in an independent learning exercise:

(i) Systematic name and chemical structural features
(ii) Pharmaceutical use and pharmacological action
(iii) Chemical synthesis with relevant mechanistic detail
(iv) Metabolism
(v) Physical and Chemical properties
(vi) Pharmacopoeial assay method
(vii) List of references.

DIRECTED READING/Recommended textbook

Organic Chemistry A short Course, Hart, Craine, Hart & Hadad, Twelfth Edition, Houghton Mifflin, Boston, New York, 2007.
Dewick PM (2006) Essentials of Organic Chemistry. For students of Pharmacy, Medicinal Chemistry and Biological Chemistry. John Wiley & Sons, Chichester.

ASSESSMENT	Weighting
Written Theory Paper: 2 hours; 2 Sections, all questions are compulsory;	70% of Total
Section 1: MCQ;	(40% of Written paper total)
Section 2: 5 short questions	(30% of Written paper total)
Written assignment	10% of Total
Continuous practical assessment (15%) and test (5%)	20% of Total

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Pr. Write Up	Guided study	TOTAL	ECTS
25	18	5	48	9	46	100	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

PHYSICAL PHARMACY I

Year 1 (Junior Freshman) **Course Code**: **PH1002**

Staff of the School of Pharmacy: Asst. Prof J. Quigley (JQ), Assoc. Prof. A.M. Healy (AMH), Asst. Prof L. Tajber (LT)

Coordinator: Asst. Prof. John Quigley

AIMS: To explain physico-chemical aspects of substances used in pharmacy and medicine.

PRE-REQUISITES: Matriculation Requirements and in Mathematics at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in Chemistry at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the phases of matter with particular reference to pharmaceutical systems
- Discuss the importance of physicochemical parameters in relation to drug absorption and distribution
- Explain the theoretical basis of the stability of pharmaceutical agents in solution
- Describe the concept and theory of surface and interfacial phenomena as applicable to pharmaceutical systems
- Demonstrate a competence in related practical laboratory skills.

COURSE OUTLINE

LECTURES		**Lecturer**
1	Basic principles of Physical Pharmacy – phases of matter, phase rule/diagrams	JQ
2	Basic principles of Physical Pharmacy – real gases	JQ
3-4	Basic principles of Physical Pharmacy – properties of solids and liquids	JQ
5-6	Introduction to solubility and its measurement	LT
7	Solid state properties influencing solubility	LT
8	Enhancing solubility by ionisation and salt formation	LT
9	Enhancing solubility – co-solvation	LT
10-15	Stability of Pharmaceutical systems (Rate Laws, Arrhenius Equation, Collision/TS theories)	JQ
16	Thermodynamics of Pharmaceutical Systems	JQ
17-19	Ionisation, pK_a, Partitioning	JQ
20-21	Drug Absorption and Distribution	JQ
22-23	Interfaces and surfaces: definition & measurement of their tension, surface and interfacial free energy; contact angles & the wetting of solids	AMH
24	Definition, theory and factors affecting adsorption, effect of interfaces, Gibbs adsorption equation	AMH
25-26	Adsorption isotherms, pharmaceutical applications of adsorption	AMH
27	Surface films, film balance studies and uses in Pharmacy; surfactant uses.	AMH

PRACTICAL CLASSES (3 hours)

1. Solubility relationships of drugs and their metabolites
2. Dependence of reaction rate on concentration and temperature for an oxidation reaction
3. Determination of the critical micelle concentration of sodium lauryl sulphate
4. Determination of lipophilicity constants of sulphonamide substituents

DIRECTED READING

Sinko, Patrick J., *Martin's Physical Pharmacy and Pharmaceutical Sciences* (2006).
Florence, A.T. and Attwood, D., *Physicochemical Principles of Pharmacy*.4th edition,(2006).

ASSESSMENT

	Weighting
Written paper: 2 hours	
All 4 questions to be answered	85% of total marks
Practical: Continuous Assessment	15% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
27	15	0	42	8	56	106	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

DISCOVERY, ISOLATION, SEPARATION AND ANALYSIS OF SUBSTANCES USED IN MEDICINES

Year 1 (Junior Freshman) **Course Code: PH1003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M.J. Meegan (MM), Asst. Prof. John J Walsh (JW), Asst. Prof. A. Sasse (AS), Asst. Prof. F. Boylan (FB), Asst. Prof. J. Quigley (JQ), Asst. Prof. J.J. Gilmer (JG), Dr. C. O'Donohoe (COD)

Co-ordinator: Asst. Professor John J. Gilmer

PRE-REQUISITES: Matriculation Requirements and in Mathematics at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in Chemistry at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

COURSE OUTLINE

This module consists of two units PH1003A and PH1003B:

UNIT PH1003A: PHARMACEUTICAL, ANALYTICAL AND PURIFICATION METHODS

AIMS: To introduce the concepts of quality, together with appropriate regulatory frameworks and guidance, and the application of analytical techniques to pharmaceutical materials. (The unit is preparatory for module PH2003).

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the purpose and scope of pharmaceutical analysis
- Define identity, potency and purity
- Describe the structure and purpose of a pharmacopoeial monograph
- Interpret and explain basic spectroscopic data
- Interpret simple chromatographic data
- Determine system suitability parameters.
- Conduct pharmacopoeial chromatographic assays

LECTURES		**Lecturer**
1	Scope of pharmaceutical analysis, pharmaceutical materials, and context	AS
2	The concepts of identity, potency, purity, pharmacopoeial monographs	AS
3-4	Assay design, units used in pharmaceutical analysis, uniformity of content analysis	JQ
5-6	Introduction to atomic spectroscopy (AES, AAS)	AS
7-8	Introduction to molecular spectroscopy (UV-Vis)	AS
9-11	Introduction to separation science and chromatography (TLC)	JW
12-13	Pharmaceutical/pharmacopoeial applications of TLC	FB
14-16	Introduction to column and gas chromatography (GC)	JW
17-18	Pharmaceutical/pharmacopoeial applications of GC	FB
19-20	Theory & methodology of HPLC	JW
21	Pharmaceutical/pharmacopoeial applications of HPLC	FB

UNIT PH1003B: INTRODUCTION TO DRUG DISCOVERY and MEDICINAL CHEMISTRY

AIMS: To explain how from the molecular structure of drugs, their properties and chemical incompatibilities can be predicted. This material is preparatory for modules in medicinal chemistry in the Sophister years.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the basic sources of drugs, where they come from, how they are developed
- Explain what a pharmacophore is
- Explain how functional groups from organic chemistry impart properties to drug substances
- Classify common functional groups as polar or lipophilic
- Define and explain what a prodrug is and be able to give examples

- Summarise the properties of main group elements
- Identify the oxides of carbon and nitrogen relevant to pharmacy and medicine
- Describe co-ordination bonding and its geometries
- Describe heavy metal toxicity

LECTURES		**Lecturer**
1-2	The drug discovery process	MM
3-4	The natural world as a source drugs	FB
5	Classification of drugs by mechanism, chemical class, physiological effects	MM
6-8	The concept of the pharmacophore; drug receptor interactions	JQ
9-11	The relationship between structure, metabolism and disposition	MM
12-14	Prodrugs	JG
15	Survey of Group Metals relevant to medicines	COD
16-18	Bonding in transition metal complexes, TMs in living organisms	COD
19	Heavy metal toxicity - cadmium, lead, mercury	COD

PRACTICAL CLASSES (3 hours each)

1 Determination of boric acid in eye lotion
2 Aspirin determination
3 Determination of calcium carbonate in paediatric chalk mixture and sodium carbonate in capsules
4 Introduction to Thin Layer Chromatography
5 Introduction to Gas Chromatography
6 Introduction to High Performance Liquid Chromatography

DIRECTED READING

Chromatographic Methods A Braithwaite and FJ Smith. 5th Ed. Blackie Academic & Professional, London (1996)
Pharmaceutical Analysis: a textbook for pharmacy students and pharmaceutical chemistry. Watson, David G., 3rd Ed. (2012)
Foye's Principles of Medicinal Chemistry, Williams DA, 7th Ed (2012)
ICHQ6A, Preamble and Scope
European Pharmacopoiea, General Notices
Introduction to Medicinal Chemistry, Patrick GL, 4th Ed., Oxford University Press (2009)
General Chemistry, McMurry-Fay, Fifth Edition

ASSESSMENT

Written theory paper: 3 hours
Six questions to be answered from 7. Question 1 is compulsory. It carries double weighting.
Continuous assessment of Practical write-ups

	Weighting:
Written paper	80%
Continuous assessment	20%

N.B.: Students should pass (i.e. attain 40%) on the written paper and practical assessments. Failure to make a reasonable attempt at the compulsory Question 1 on the written paper will require the student to sit the supplemental examination at the beginning of Michaelmas Term.

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
40	18	4	62	16	100	178	10

INTRODUCTION TO PHARMACEUTICS AND FORMULATION

Year 1 (Junior Freshman) **Course Code: PH1004**

Staff of School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. C. Ehrhardt (CE), Assoc Prof. A.M. Healy (AMH).

Coordinator: Assoc. Professor Carsten Ehrhardt

AIMS: To provide an introductory course in Pharmaceutics, so that students may understand the importance and relevance of the subject area to their studies for a Degree in Pharmacy and in subsequent practice, and to be better able to participate in and benefit from work experience in community or another branch of Pharmacy.

PRE-REQUISITES: Matriculation Requirements and in Mathematics at Leaving Certificate An Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in Chemistry at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Articulate the importance of Pharmaceutics for their studies in Pharmacy and subsequent practice
- Select and use appropriate common reference textbooks in hard copy and electronic format and describe the content thereof
- Recall the basic principles of formulation, with particular reference to simple liquid preparations such as solutions and suspensions, topical products such as gels and pastes and solid dosage forms such as capsules and suppositories
- Prepare simple extemporaneous preparations such as solutions, suspensions, gels, pastes, capsules and suppositories, and show competency in performing common pharmaceutical calculations of relevance in pharmaceutical formulation and compounding
- Discriminate between pharmaceutical grades of water
- Appreciate the importance of proper packaging and labelling of medicines

COURSE OUTLINE:

LECTURES		**Lecturer**
1	Introduction to Pharmaceutics	CE
2	Introduction to essential reference books	CE
3	Discussion of reference books, including Pharmacopoeia and Martindale	CE
4-6	Pharmaceutical calculations relating to pharmaceutical formulation & compounding	CE
7	Introduction to basic principles of formulation	AMH
8-9	Design and preparation of solutions for oral administration	AMH
10-11	Design and preparation of suspensions	AMH
12-13	Water – potable and purified	AMH
14-16	Hard capsules, formulation, production and quality control	CE
17	Soft capsules, formulation, production and quality control	CE
18-20	Rectal dosage forms, suppository formulation, production and quality control	CE
21-22	Introduction to hydrogels, formulation and production	CE
23-24	Packaging of medicines	ANO

PRACTICAL CLASSES

1 Introduction to extemporaneous compounding and dispensing (2 h)
2 Pharmaceutical solutions 1 (2 h)
3 Pharmaceutical solutions 2 (3 h)
4 Pharmaceutical suspensions (3 h)
5 Solid dosage forms - capsules (3 h)
6 Solid dosage forms - suppositories and pessaries (3 h)
7 Topical semisolid products – gels and pastes (3 h)
8 Practice-based formulation exercises (3 h)
9 Practical examination preparation (3 h)
10 Repeat and revision (3 h)

TUTORIAL
Pharmaceutical formulation and calculation (AMH / CE).

DIRECTED READING
European Pharmacopoeia
British Pharmacopoeia
Martindale
Pharmaceutics, 3rd Ed., ME Aulton (Editor) Churchill Livingstone (2007)
Pharmaceutical Compounding and Dispensing, 2nd Ed., JF Marriott *et al.* (Ed.) Pharmaceutical Press (2010)

ASSESSMENT	Weighting
Written theory paper: 2 hours; 3 questions out of 4 to be answered	50% of total marks
Practical examination: 2.5 hours; 3 questions (no choice)	50% of total marks

Please note that pharmaceutical calculations related to this module will also be tested as part of the Pharmaceutical Calculations Tests in PH1005

NB. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for the module is 40%. Students who obtain an overall mark of less than 40% will be required to sit the Supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) in the annual examination, but who obtain a Class II or better in the practical examination will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e., less than 50% in the practical examination) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to supplement in the practical examination only.

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
24	28	1	53	28	29	110	5

MATHEMATICAL METHODS & PHARMACEUTICAL CALCULATIONS

Year 1 (Junior Freshman) **Course Code: PH1005**

Staff of School of Pharmacy & Pharmaceutical Sciences

Staff of School of Mathematics

Coordinator: Asst. Prof John Quigley (JQ)

AIMS: To explain basic techniques in Applied Mathematics and Introductory Statistics and calculations of relevance to Pharmacy.

PRE-REQUISITES: Matriculation Requirements and in Mathematics at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level also please refer to the general pre-requisites stipulated on page 20.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Use Differential and Integral Calculus
- Explain the fundamental theory of statistical analysis
- Develop systems of linear equations
- Perform calculations relevant to Pharmaceutical Practice
- Determine the derivation of relevant kinetic data as applicable to pharmaceutical systems

COURSE OUTLINE:

Unit PH1005A: MATHEMATICAL METHODS given by Staff of the School of Mathematics:

16 Lectures & 8 Tutorials / Workshops

- Differential and Integral calculus (Linear, exponential, logarithmic and trigonometric relationships)
- Differential equations (1^{st} & 2^{nd} order)
- Algebra; Systems of linear equations

Unit PH1005B: INTRODUCTORY STATISTICS & PHARMACEUTICAL CALCULATIONS given by Staff of Pharmacy & Pharmaceutical Sciences:

13 Lectures (JQ)

- Random & Discrete variables; Population Parameters & Pharmaceutical Statistics
- Probability Distributions (Poisson & Binomial)
- The Normal (Gaussian) Distribution; Properties & Applications; Cumulative Frequency Curve (Applications & Calculations)
- Derivation of the Rate Laws
- Prescription Compounding and Formulation Calculations; Dilution, Concentration & Alligation; Isotonic & Electrolyte Solutions
- Bioavailability & Bioequivalence; Drugs in different forms; Reconstitution for Oral and Parenteral use

TUTORIALS: Weekly problem sheets and supporting problems classes.

DIRECTED READING

Rees JA, Smith I & Smith B (2005) Introduction to Pharmaceutical Calculations. Pharmaceutical Press: London.

PRACTICAL SESSIONS: 6 hours

- Use of Excel; Data Presentation and Analysis; Plotting; Error Estimation;
- Statistical Analysis of repeated measurements; Uniformity of Content & Weight

ASSESSMENT

Written theory paper: 2 hours; 2 Sections, all questions to be answered

Section A (PH1005A Maths Methods): 3 questions;	60% of written paper
Section B (PH1005B Statistics & Calculations): 2 questions	40% of written paper

Continuous Assessment:

*Two term tests	4%
Exercise	4%

***Students will be required to attain a mark of at least an average mark of 70% in these Pharmaceutical calculations tests (comprising 10 questions each). Otherwise, they will be required to present for a further examination (pass mark 70%) prior to the Annual Examination session (comprising 20 questions).The use of calculators will be disallowed. No compensation is allowed in this element of the module assessment.**
Facility with simple pharmaceutical calculations, with a mark of a minimum of 70% in Pharmaceutical Calculations Test(s), is a pre-requisite for entry into the Senior Freshman year.

Please note that relevant material from PH1004 will also be assessed in the Pharmaceutical Calculations Tests.

OVERALL WEIGHTING:

Written Paper	92%
Continuous Assessment	8%

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Pr. Write-ups	Guided Study	TOTAL	ECTS
29	6	8	43	3	60	106	5

PRACTICE OF PHARMACY I

Year 1 (Junior Freshman) **Course Code: PH1006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. M. Henman (MH), Asst. Prof. S. Ryder (SR), Assoc. Prof. C. Roche (CR), Assoc. Prof. T. Grimes (TG), Asst. Prof. F. Boylan (FB)
Teacher-Practitioner K. Rossi (KR)
External staff: Librarian, St John's Ambulance Service, Faculty of Health Sciences

Coordinator: Asst. Professor Sheila Ryder

AIMS: To introduce students to all aspects of pharmacy practice, including the roles and responsibilities of pharmacists, the institutions of pharmacy and the organisation of the health service, the structure and operation of community and hospital practices, the manufacture and supply of medicines, the law relating to medicines, medicine supply schemes and prescription dispensing, communication skills and alternative systems of medicine.

PRE-REQUISITES: See general pre-requisites for Junior Freshman year (page 20). Exceptions may be made in individual cases for students who have transferred from a pharmacy degree programme in another university, including one-year international students.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Define pharmaceutical care, identify the characteristics of a profession, outline the development of the profession of pharmacy and explain its professional status.
- Explain the differences between drugs, medicinal substances and medicinal products.
- Describe the drug use process, the characteristics of community and hospital pharmacy practice in Ireland, typical care paths in these settings, the healthcare professionals involved and the organisation of the health services.
- Describe the sequence of events in drug development, production and marketing, identify the regulatory bodies that are relevant to pharmacy, pharmacists and pharmaceuticals, and describe the regulation of product authorisation, drug distribution and supply in Ireland.
- Critically discuss case studies in the light of legislation and professional codes.
- Discriminate between action options open to a pharmacist when faced with professional dilemmas, justify preferred options with respect to professional responsibilities and consider principlism as a framework for professional decision-making.
- Identify relevant medicine supply schemes when presented with a prescription, provide advice to a patient or prescriber on how these schemes operate, and dispense mock prescriptions or respond to patients' needs in a legal, safe and appropriate manner using suitable information resources.
- Describe the communication process and the structuring of explanations.
- Discuss key disease processes, signs and symptoms, dose-response relationships, pharmacodynamics, pharmacokinetics and toxicology.
- Explain the concepts of efficacy, side effects and therapeutic index.
- Describe the principal classes of cellular and molecular targets for drug action.
- Discuss the pharmacology and toxicology of paracetamol.
- Systematically collect and apply knowledge about patients, their conditions and their medicines, in order to provide and justify treatment recommendations and patient counselling, in a diverse range of patient case studies.
- Demonstrate the principles of academic writing by presenting a structured dissertation on an assigned topic.

COURSE OUTLINE:

LECTURES (30 hours)		**Lecturer**
1	Introduction, pharmacy in Ireland and medicines in Irish society	MH
2	Pharmacy, pharmacists and professions	MH
3	History and the institutions of pharmacy	MH
4	The manufacture and supply of medicines	MH
5-6	Introduction to ethics and entry DIT2	CR
7	The health service and health policy	CR

8	Pharmacists' roles and responsibilities	CR
9	Community pharmacy	CR
10	Hospital pharmacy	CR
11	Health information and health informatics – applied literacy skills; dissertation	MH
12	Pharmaceutical care	MH
13	Health and illness; patient care	MH
14	Pharmaceutical care using prescription and non-prescription medicines	MH
15	Clinical introduction to the patient	MH
16	Introduction to pathology and disease	MH
17-21	Introductory pharmacology	MH
22-23	Introduction to complementary and alternative medicine	MH
24-25	Communication skills	MH
26-30	Legislation, PSI Code of Conduct and guidance, medicine supply schemes	SR

PRACTICAL CLASSES / WORKSHOPS (28 hours)

Ethics: Introduction to principlism (2h)	CR
Professionalism in pharmacy practice (2h)	CR
Health informatics – applied literacy skills (1h)	Librarian
Communication skills (3h)	KR
Clinical skills 1.1: Responding to requests for prescription only medicines (3h)	MH
Clinical skills 1.2: Responding to requests for OTC medicines (3h)	MH
Clinical skills 1.3: Responding to symptoms (3h)	MH
Dispensing and patient care 1.1: Introduction to pharmacy software (2h)	SR/KR/CR/TG
Dispensing and patient care 1.2: Introduction to prescriptions, use of reference sources, GMS (2h)	SR/KR/CR/TG
Dispensing and patient care 1.3: Medical card prescriptions – additional features (2h)	SR/KR/CR/TG
Dispensing and patient care 1.4: DPS, HAA, LTI, High Tech schemes (2h)	SR/KR/CR/TG
Dispensing and patient care 1.5: Tax refunds, EHIC, 'hardship' scheme, stock order forms (2h)	SR/KR/CR/TG
Dispensing and patient care 1.6: Practical examination (1h; examination duration: 50 mins)	SR/KR/CR/TG

TUTORIALS (4 hours)

Dispensing and patient care 1.2 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 1.3 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 1.4 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 1.5 feedback (1h)	SR/KR/CR/TG

DISSERTATION

Literature review and critical analysis of topic associated with the JF course (25h) MH/guided study

<u>OPTIONAL</u> ADDITIONAL COMPONENT

First aid course (certificate evening course, 21 hours)
St. John's Ambulance Service and Faculty of Health Sciences

DIRECTED READING

Irish Medicines Formulary
British National Formulary
IPHA Summary of Product Characteristics (SmPC) Compendium (*www.medicines.ie*) and SmPCs on the Irish Medicines Board website (*www.imb.ie*)
DrugDex
The Health Services in Ireland, Brendan Hensey, 1998
PSI Pharmacy Practice Guidance Manual
PSI Code of Conduct
PCRS Handbook: Information and Administrative Arrangements for Pharmacists
Legislation relevant to the course.

ASSESSMENT

Each component must be passed (see notes below)	Weighting
Written examination: 1.5 hours. 1 essay (from choice of 2) and 40 MCQs (no choice, negative marking)	75% of total marks
Dispensing and patient care – worksheets : practical exam (70:30) Minimum 60% in worksheets, and Minimum 50% in practical exam (50 mins, 2 cases, no choice), and Minimum 60% overall (worksheets and practical exam combined)	10% of total marks
Clinical skills evaluation – satisfactory/unsatisfactory	---
Communication skills evaluation and reflection – satisfactory/unsatisfactory	---
Social and administrative pharmacy group exercise	5% of total marks
Completion of DIT2 – satisfactory/unsatisfactory	---
Professionalism assessment: Intermediate Concept Measure (ICM) – satisfactory/unsatisfactory	---
Dissertation	10% of total marks

NB: Students will be expected to draw upon clinical skills gained in this module when undertaking the Clinical Pharmacy Assessment that forms part of the evaluation for modules PH3009A, PH3010 and PH3011. Pharmacy legislation, ethics, professional codes/guidance, health schemes and all aspects of clinical skills/dispensing/patient care are also examinable in 4th year (XPH40061; dispensing and patient care evaluation).

SUMMARY OF HOURS (excludes optional first aid course)

Lectures	Practicals/ Workshops	Tutorials	Contact hours	Practical reports	Guided study	TOTAL	ECTS
30	28	4	62	5	58	125	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

Continuous assessment exercises for this module must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose where applicable. Work submitted late will not be assessed unless a valid reason is provided, and permission for late submission should be obtained in advance of the submission deadline from the staff member responsible for the continuous assessment component. Where late work is accepted for assessment, the marks available may be capped at the pass mark.

In common with other modules for the pharmacy degree, attendance at all scheduled classes for this module is compulsory. A student who is unable to attend a class for any reason must notify his/her tutor of the reason for absence without delay, and present certification as appropriate. However, all continuous assessment components must be completed even if the student is absent for a valid reason. It is the student's responsibility to obtain details of the assessment for the missed class(es) from the relevant staff member without delay, and to complete it on a self-study basis. The deadline for submission of the completed assessment to the relevant staff member is five days from the student's return to College (return date notified to staff member by tutor, based on certification as appropriate) unless otherwise agreed in advance with the relevant staff member. Where feedback on the assessment has already been provided to the class prior to submission, marks may be capped at the pass mark. See above for late submissions.

Students must satisfy the examiners in each component of the module independently. Examination marks may be withheld and/or a student may be refused permission to progress with his/her class until he/she has satisfied the examiners in all components of the module. This may necessitate sitting a supplemental examination and/or repetition/(re)submission of one or more continuous assessment components (including submission of one or more alternative exercises that have been set to replace failed/missed continuous assessment

components). In such circumstances, the marks available for the supplemental examination and/or continuous assessment component(s) may be capped at the pass mark.

Furthermore, students who have not fulfilled the module requirements with regard to attendance and/or coursework may be reported to the Senior Lecturer as non-satisfactory for one or more terms. Students reported as non-satisfactory for the Michaelmas and Hilary terms may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat the year.

Because of the importance accorded to this aspect of the course by the PSI, who accredit the degree, it is not possible to compensate in this module.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities *etc*.).

ORIENTATION AND LEARNING SKILLS AND INTEGRATED PHARMACY STUDIES

Year 1 (Junior Freshman) **Course Code**: **PH1007**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. M. Henman
Staff of Student Learning Development: Dr. T. O'Connor (TOC)

Coordinator: Assoc. Professor Martin Henman

PRE-REQUISITES: Please refer to the general pre-requisites stipulated on page 20.

COURSE OUTLINE

The module is divided into 2 Units:
PH1007A Orientation and Learning Skills
PH1007B Integrated Pharmacy Studies

UNIT PH1007A: ORIENTATION AND LEARNING SKILLS (MH)

AIMS: To enable the students to acquire a knowledge of the School of Pharmacy and Pharmaceutical Sciences and of the B.Sc. (Pharm.) degree. To encourage the students to appreciate the importance of different study skills and their application in different learning situations. Students will apply Problem-Based Learning (PBL) techniques to selected pharmacy topics.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the B.Sc.(Pharm) degree and the Learning Supports available in the College
- Reflectively evaluate their own learning skills and strategies
- Assess and reflect upon their personal planning and time-management skills
- Compare the skills required for verbal and written communication
- Discuss the mechanisms by which different approaches to learning and assessment can aid understanding
- Discuss the interrelationships between the different forms of knowledge and the implementation of evidence-based practice
- Describe the role of experiential learning in the development of professional competencies
- Apply the techniques used in Problem-based learning

LECTURES

1 Introduction to staff, procedures and policies and support networks of the School;
2 Expectations of College and of Pharmacy and survival skills;
3 Learning styles and experiential learning;
4 Scientific method & development of understanding in the Humanities;
5 Effective use of Internet and Library;
6 Academic writing and Presentation skills;
7 Self assessment and Peer group assessment;
8-9 Managing studies and exam techniques.

CAL: 16 hrs
Tutorials/Workshops: 6 hrs

ASSESSMENT
Learning Portfolio Satisfactory/Unsatisfactory

Unit PH1007B: Integrated Pharmacy Studies (MH)

AIMS: To introduce students to the learning style of Problem-Based Learning using a common theme and problems that may require the resources of more than one academic subject area for the their solution.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Work in groups
- Clarify the nature and components of a problem
- Identify the resources and resource people who can contribute to its solution
- Allocate tasks and manage a plan of work
- Formulate and evaluate possible solutions
- Develop an agreed solution
- Devise and present the solution as a slide presentation to the class
- Contribute to the individual and group assessment of their peers

Unit OUTLINE: (1 hour)
1 Introduction to Problem Based Learning (PBL) method
Problems drawn from the Pharmaceutical Chemistry, Pharmacology, Toxicology, Formulation, Pharmaceutical Technology, Pharmacognosy and Pharmacy Practice of Aspirin and salicylates, will be assigned to 8-10 small groups for development and presentation of a solution to the whole class.

WORKSHOPS (15 hours)
5 Small group workshops facilitated by Staff of the School

PRESENTATION & REVIEW (1 hour) Group presentations and Assessment

ASSESSMENT Group and Individual assessment based upon contribution to Problem Solving and Presentation and Facilitator assessment Satisfactory/Unsatisfactory

Unit	Lectures	Workshops/CAL	Presentation	Total Contact	Guided study	TOTAL	ECTS
PH1007A	9	22	-	31	29	60	
PH1007B	1	15	3	19	21	40	
TOTAL	10	38	3	50	50	100	5

SENIOR FRESHMAN (2nd Year)

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*
- *Reports, continuous assessments and laboratory notebooks must be presented for assessment by the date specified by the examiner.*
- *Reports, continuous assessments and laboratory notebooks submitted after the specified date will not be assessed unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

PHARMACEUTICAL PROPERTIES OF MATERIALS USED IN MEDICINES

Year 2 (Senior Freshman) **Code: PH2001**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M. J. Meegan (MM), Asst. Prof. J. Gilmer (JG), Dr. C. O'Donohoe (CO'D)

Co-ordinator: Asst. Professor John Gilmer

AIMS: To develop and consolidate the fundamental pharmaceutical and bioorganic chemistry of the materials used in medicines from first year with emphasis on more advanced topics. Stereochemistry is introduced, the chemistry of some important heterocycles is covered, as is polymer chemistry relevant to pharmacy.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the characteristics of pharmaceutical materials containing conjugated and aromatic systems and consolidate ideas about chemical bonding and its representation.
- Explain the reactivity of benzene and related compounds using mechanistic conventions
- Explain what an azo bond is and how the group behaves in vivo
- Discuss the process of ionisation in acids and bases and electronic and structural factors that affect equilibria
- Identify amine salts and describe their role in solubilisation and stabilization
- Discuss why shape is important in drug molecules;
- Describe how stereochemistry is classified, analysed and how it is accommodated in pharmaceutical science and regulations.
- Explain what a heterocyle is and describe their chemistry and importance in pharmacy
- Explain what a synthetic polymer is, how they are produced, characterised and used in pharmacy.
- Be competent in preparation, purification and characterization of drug substances

COURSE OUTLINE:

Unit PH2001A: Conjugation, aromaticity and reactivity in pharmaceutical compounds (JG)

1. Review of bonding and electronic structure of unsaturated molecules
2. Conjugation; thermodynamic and reactivity issues
3. MO Theory and modelling of pharmaceutically relevant compounds
4. Aromaticity, stability, electronic structure, 4n+2 rule, quasi-aromatics
5. Electrophilic aromatic substitution, metabolism of benzene containing compounds
6. Directing effects in electrophilic substitution
7. Azo compounds, the diazonium reaction, azocoupling, applications in pharmaceutical analysis and drug delivery

Unit PH2001B: Pharmaceutical properties of drugs containing amines and carboxylic acids; physical and electronic characteristics (JG)

8. Amines, the concepts of basicity, relationship between pH and lipophilicity
9. Factors affecting amino drug basicity
10. Acidity in organic compounds, review of pKa and relationship to electronic structure.
11. Acid derivatives: stability, reactivity, amides, ester drugs

Unit PH2001C: Pharmaceutical properties of drugs containing carbonyl groups; physical and electronic characteristics (JG)

12. Structure and reactivity of aldehydes and ketones, a review
13. Acetals and ketals, the concept of the protecting group

Unit PH2001D: Stereochemistry and pharmacy (MM)

14. Definition and concepts of stereochemistry, nomenclature, single and multiple chiral centres
15. Sources and production of chiral drugs
16. Characterisation of chiral drugs
17. Pharmacology of chiral drugs
18. Regulatory aspects of chiral drugs

Unit PH2001E: Basic heterocyclic chemistry relevant to pharmacy (JG)

19. What is a heterocycle? distribution, nomenclature and uses in pharmacy
20. Six membered compounds: Pyridine, reactivity, tautomerism.
21. Six membered pyrimidine
22. Five membered heterocycles: pyrrole, furan, thiophene, imidazole

Unit PH2001F: Properties of pharmaceutical polymers (MM)

23. Free radical chemistry
24. Monomers, polymers, copolymers; structures and definitions
25. Addition polymerization
26. Condensation polymerization

PRACTICAL CLASSES: Drug specifications and process chemistry (MM, CO'D)

1. Sulfonamide preparation and specifications
2. Phenytoin preparation and characterisation
3. Heterocyclic chemistry: Pyrimidine synthesis
4. Pharmaceutical process chemistry I: Nitration of aromatic substrates
5. Pharmaceutical process chemistry II: Alkylation of aromatic substrates
6. Pharmaceutical process chemistry III: Reduction methods for carbonyls

DIRECTED READING

Essentials of Organic Chemistry for Students of Pharmacy, Medicinal Chemistry and Biological Chemistry. Dewick. Wiley 2006.
Mechanism in Organic Chemistry. Sykes.

ASSESSMENT	Weighting
Written Paper: (2 hours) 4 Questions from 5	80% of total marks
Continuous Practical Assessment	20% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorial	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
26	18	0	44	13	48	105	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

PHYSICAL PHARMACY II

Year 2 (Senior Freshman) **Course Code: PH2002**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. J. Quigley (JQ), Asst. Prof. L. Tajber (LT)

Coordinator: Asst. Professor John Quigley

AIMS: To explain more fully physicochemical aspects of substances used in pharmacy and medicine.

PRE-REQUISITES: SUCCESSFUL COMPLETION OF JUNIOR FRESHMAN (YEAR 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Appreciate the importance of pH – rate profiles in respect of the stability of pharmaceutical systems
- Describe the principal mechanistic pathways of drug degradation
- Explain the role of physicochemical properties in relation to drug distribution and activity
- Describe the occurrence of polymorphism in pharmaceutical systems
- Summarise the fundamental theory of electrochemical systems
- Discuss the rheological aspects of pharmaceutical systems and products
- Demonstrate competence in related practical laboratory skills.

COURSE OUTLINE:

LECTURES		**Lecturer**
1-2	Accelerated Stability Analysis; Extrapolation, Criteria & Limitations	JQ
3-4	pH – rate profiles; V-graphs, determination of minimum pH value	JQ
5	Sigmoid curves (ionisation & pKa) & Bell-shaped curves	JQ
6	Selected examples and Pharmaceutical calculations	JQ
7-10	Hydrolysis & Oxidation of Pharmaceutical Agents	JQ
11-14	Physicochemical properties of drugs in solution (buffers, solubility)	JQ
15	pH – partition profiles / ionisation	JQ
16-18	Electrochemical Definitions; Redox Potentials; Glass Electrode	JQ
19-20	Enhancing solubility – complexation and other methods	LT
21-22	Pharmaceutical implications of Polymorphism	JQ
23	Introduction to rheology	ANO
24	Pharmaceutical disperse systems	ANO
25	Non-Newtonian systems	ANO
26	Measurement of viscosity	ANO
27	Texture of pharmaceutical systems	ANO

PRACTICAL CLASSES (3 hours each)

1. Colour & Clarity of Solutions / Refractive Index / Optical Rotation.
2. Potentiometric Titrimetry. Potentiometric determination of the pK_a of benzoic acid.
3. Spectrophotometric determination of the Ionisation constant (pK_a). Determined for both bromophenol blue and procaine.
4. Conductivity Measurements. Determination of Λ^0 for a salt. Conductometric titrimitry.
5. The standardization of molecular size by viscosity measurements

DIRECTED READING

Sinko, Patrick J. *Martin's Physical Pharmacy and Pharmaceutical Sciences*, (2006).
Florence, A.T. and Attwood, D., *Physicochemical Principles of Pharmac* 4th edition, (2006).
Cairns, D., *Essentials of Pharmaceutical Chemistry* (2000).

ASSESSMENT	Weighting
Written theory examination: 2 hour; all 4 questions to be answered	90% of total marks
Practical: Continuous Assessment	10% ot total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorial	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
27	15	0	44	11	54	109	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

ISOLATION & ANALYSIS OF SUBSTANCES USED IN MEDICINES

Year 2 (Senior Freshman) **Course Code: PH2003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. F. Boylan, Asst. Prof. J. Quigley (JQ), Asst. Prof. A. Sasse (AS)

Coordinator: Asst. Professor Fabio Boylan

AIMS: to reinforce the concepts of quality, together with appropriate regulatory frameworks and guidance, and the application of analytical techniques to pharmaceutical materials (this is a continuation of the course given at JF level). Herbal drugs used as human medicines are introduced as is pharmaceutical spectroscopy in preparation for the instrumental analysis component at JS level.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Demonstrate competence in obtaining and interpreting data in relation to standard pharmacopoeial monographs.
- Have the ability to verify the identity of synthetic and crude herbal drug material by reference to the chemical, chromatographic, macroscopic or microscopic characteristics;
- Discuss the regulatory framework for specifications of drug substances and products, including those from herbal sources.
- Be proficient in the application and utilisation of chromatographic or chemical techniques to quantify synthetic or herbal drugs in crude samples, formulated products or clinical samples.
- Discuss the theory and evaluate the application of spectroscopic techniques in pharmaceutical analysis (e.g. IR, UV, NMR and MS).

COURSE OUTLINE:

LECTURES

Methods in Pharmacognosy (11 Lectures) (Asst. Prof. Fabio Boylan)

1 Herbal drugs/medicines–Pharmacopoeial definitions & methods
2-3 Cell inclusions & vacuolar contents used in pharmacy (e.g. starch)
4-6 Cell types and tissues used in the identification of herbal drugs
6-7 Leaf-derived herbal drugs of pharmaceutical/ Ph Eur importance
8 Bark-derived herbal drugs of pharmaceutical/ Ph Eur importance
9 “Root”-derived herbal drugs pharmaceutical/ Ph Eur importance
10-11 Pharmacopoeial methods used in the Quality Control of herbal drugs

Specifications and regulatory outline (3 lectures) (Asst. Prof. Astrid Sasse)

12 Introduction to analysis: objectives, terminology, guidance
13 Setting specifications for drug substances and products: ICHQ6A
14 Impurities: ICHQ3A; Residual Solvents: ICHQ3C

Pharmaceutical spectroscopy (24 Lectures) (Asst. Prof. Astrid Sasse)

15-20 UV-Vis Spectroscopy and Fluorescence: theory and application in pharmaceutical analysis
21-24 Infrared Spectroscopy (IR): theory and application in pharmaceutical analysis
25-30 Nuclear Magnetic Resonance Spectroscopy (NMR): theory and application in pharmaceutical analysis
31-36 Mass Spectrometry (MS): theory and application in pharmaceutical analysis
37-38 Miscellaneous methods; general problems and solutions in pharmaceutical spectroscopy

PRACTICALS

Part 1: First Semester:

1. Plant cell inclusions,
2. Plant cells and tissues
3. Examination and qualitative methods used for standardisation of leaves/herbs used in pharmacy
4. Examination and qualitative methods used for standardisation of leaves/herbs used in pharmacy
5. Examination and qualitative methods used for standardisation of leaves/herbs used in pharmacy
6. Quality Evaluation of a herbal drug

Part 2: First Semester:

1. Assay of ferrous fumarate/ferrous gluconate tablets. Iodine/Thiosulphate titimetry
2. Assay of ferric ammonium sulphate*
3. Iodine displacement titrations*
4. Determination of the iodine value of an oil*
5. To determine the % w/v Ca as Ca^{+2} in Calcium gluconate injection. To determine the % w/v of zinc in zinc gluconate mouthwash/injection.
6. To determine the % w/w aluminium in sample provided. To determine the %w/w Bismuth in Bismuth carbonate

Practicals *** 2 hours each, otherwise 3 hours**

TUTORIALS

Tutorials (6 tutorials, 2 hrs each) arranged to complement the lecture theory and practical programme

DIRECTED READING

- *European Pharmacopoeia.*
- *Introductory Plant Biology. Stern. McGraw-Hill, 9th edition, 2003.*
- *Plant Anatomy. An Applied Approach. Cutler, Botha and Stevenson. Blackwell Publishing, 2008.*
- *Pharmacognosy. Trease & Evans. Elsevier, 15th edition, 2002.*
- *ICH Q6A, Q3A, Q3C http://www.ich.org*
- *Lampman, Kriz, Spectroscopy, 4th Edition, Brooks/Cole CENGAGE Learning 2010.*
- *Watson, Sparkman, Introduction to Mass Spectrometry, 4th Edition, Wiley, 2007.*

ASSESSMENT

	Weighting
• Written Paper (3 hours): Consists of 2 sections. [Section A 60%, Section B 40%] Section A: 3 Essay-type questions (ALL questions must be answered) Section B: 3 Short answer questions (ALL questions must be answered) and 10 MCQ's (ALL questions MUST be answered and half-negative marking to apply)	85% of the total
• Practical Examination (3 hours):	10% of the total
• Continuous assessment:	Practical Book Report 5% of the total

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided Study	Total	ECTS
38	36	12	85	28	80	193	10

N.B. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40%) of the practical examination) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to supplement in the practical examination only.

FORMULATION AND PHARMACEUTICAL TECHNOLOGY

Year 2 (Senior Freshman) **Course Code: PH2004**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. A.M. Healy (AMH) Asst. Prof. M.J. Santos-Martinez (MS), Asst. Prof. L. Tajber (LT)

Coordinator: Asst. Professor Lidia Tajber

AIMS: To provide a continuation course in the formulation of some common pharmaceutical dosage forms, together with aspects of unit operations related to the production of effective medicines.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe theoretical and practical aspects of colloids and colloidal preparations
- Outline therapeutical relevance of pharmaceutical nanomaterials
- Discuss physical stability problems associated with production of stable pharmaceutical emulsions
- Describe the manufacture stable pharmaceutical suspensions, solubilised preparations, ointments, creams, and emulsions
- Explain the mass and heat transfer processes of pharmaceutical importance
- Discuss the various unit processes used in the manufacture of pharmaceutical materials and formulations
- Describe the operation of various types of equipment used in unit processes
- Outline the importance of particle size, particle size analysis and powder flowability of pharmaceuticals and discuss different techniques to characterise powder size and flow
- Discuss the steps involved in pharmaceutical preformulation studies in the context of production of solid dosage forms
- Describe the formulation, production and characterisation of compressed tablets

COURSE OUTLINE

LECTURES

Unit PH2004A: FORMULATION – COLLOIDS AND EMULSIONS		**Lecturer**
1.	Terminology and classification of emulsions, emulsion-based drug delivery systems	LT
2.	Thermodynamics of emulsions, primary and secondary emulgents, HLB classification	LT
3.	Major emulgent types, emulsion formulation by HLB method	LT
4.	Factors affecting emulsion stability, pickering emulsions, preparation of emulsions	LT
5.	Creams and other topical formulations	LT
6.	Colloids and pharmaceutical nanotechnology	LT
7-8.	Introduction to nanomedicine	MS
9.	Classification of colloids, lyophobic and lyophilic colloids	LT
10.	Kinetic, optical and electrical properties of colloids, physical stability of colloids.	LT
11.	Micellar colloids, solubilisation by micelle formation, ternary phase diagrams	LT
12.	Liposomes and liposomal drug delivery systems	LT

Unit PH2004B: PHARMACEUTICAL UNIT PROCESSES		
13.	Introduction to mass transfer processes, mass transfer in still/stagnant gases	AMH
14.	Mass transfer in moving fluids, interfacial mass transfer, examples of mass transfer options	AMH
15.	Heat transfer by conduction and convection, heat transfer through walls and across pipes and tubes, heat exchange between fluids across a solid boundary. Heat transfer to boiling liquids.	AMH
16-17.	Comminution	AMH
18-19.	Mixing	AMH
20-21.	Filtration	AMH
22-23.	Drying	AMH
24-25.	Evaporation	AMH
26-27.	Distillation	AMH

Unit PH2004C: MICROMERITICS

28.	Microscopy as a technique for particle size analysis	AMH
29.	Sieving as a technique for particle size analysis	AMH
30.	Particle size analysis using sedimentation techniques	AMH
31.	Electrical sensing zone (Coulter Counter) method for particle size analysis	AMH
32.	Particle size analysis using laser light scattering techniques - laser diffraction particle size analysis and photon correlation spectroscopy	AMH
33.	Surface area measurement techniques - gas adsorption and permeametry	AMH
34.	Methods of presentation and interpretation of particle size analysis results	AMH
35.	Particulate solids in bulk - fundamental and derived properties, factors affecting the flow properties of powders	AMH
36.	Assessment of powder flow, angle of repose and friction, Carr's index, use of glidants, flow of solids in hoppers and through orifices, the behaviour of powders in the fluidised state	AMH

Unit PH2004D: TABLETTING

37.	Introduction to tabletting terminology, types of tablets	LT
38.	Preformulation testing of drugs for compressed tablets	LT
39-40.	Formulation of compressed tablets	LT
41.	Tablet presses, tooling and mechanism of tablet compression	LT
42.	Direct compression	LT
43.	Dry and moist granulation procedures	LT
44.	Coating of tablets	LT
45.	Processing problems	LT
46.	Tablet evaluation	LT

PRACTICAL CLASSES / CONTINUOUS ASSESSMENT

1. Colloidal and solubilised preparation (3 hours)
2. Ointments (3 hours)
3. Emulsifying waxes, ointments and creams (3 hours)
4. Creams continued
5. Oral emulsions (3 hours)
6. Dilutions (3 hours)
7. Revision and repeat (3 hours)
8. Powder mixing (3 hours)
9. Tablet production using a direct compression base (DCB) (3 hours)
10. Tablet evaluation – pharmacopoeial tests (3 hours)

TUTORIALS: Two tutorials on pharmaceutical formulation and calculation (2 hours) (LT)

DIRECTED READING

European Pharmacopoeia
British Pharmacopoeia
United States Pharmacopoeia
Martindale
Florence, A.T and Attwood, D., Physicochemical Principles in Pharmacy.
Ed. Aulton M.E. Pharmaceutics. The Design and Manufacture of Medicines 3rd,
Churchill Livingstone (2007)
Ed. Winfield A.J. and Richards R.M.E. Pharmaceutical practice
Marriott J.F., Wilson K.A., Langley, C.A. and Belcher D. Pharmaceutical Compounding and Dispensing

ASSESSMENT	Weighting
Written theory paper: 3 hours; 5 questions (no choice)	70% of total marks
Practical examination: 2.5 hours; 3 questions (no choice)	20% of total marks
Continuous assessment of practical classes, including a calculation test	10% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorial	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
46	30	2	78	45	92	215	10

NB. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for the module is 40%. Students who obtain an overall mark of less than 40% will be required to sit the Supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) in the annual examination, but who obtain a Class II.2 (50%) or better in the practical examination will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e., less than 50% in the practical examination) of the annual examination, but who obtain a Class III (40%) or better in the written section will be ungraded and will be required to supplement in the practical examination only.

MICROBIOLOGY AND BIOCHEMISTRY

Year 2 (Senior Freshman) **Course Code: PH2005**

Lecturers:
Dept of Microbiology: Profs. J Geoghegan (JG), R. Russell (RR); K. Roberts (KR), A. Bell (AB).
Dept of Clinical Microbiology: Profs. F. Falkiner (FF), T. Rogers (TR), S. Smith (SS).
Dept. of Biochemistry and Immunology: Assist. Prof. T. Mantle (TM), Assoc. Prof. A. Molloy (AM), Assoc. Prof. G Davey (GD)

Coordinators: Profs. Angus Bell (Microbiology, abell@tcd.ie), Andrew Bowie (Biochemistry)

AIMS
PH2005A (MI2005): To enable the student to appreciate how microbiology impinges on many aspects of Pharmacy

PH2005B (BI2005): To provide an overview of biochemical aspects of metabolism

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Describe microbial structure, culture and identification
- Describe medically significant bacteria and fungi and protozoa and their pathogenic mechanisms
- Explain the mechanisms of action of the major antimicrobial drugs
- Discuss infectious-disease epidemiology and zoonoses
- Discuss the determinants of the immune response, autoimmunity, immunocompetence & immunotherapy
- Describe viral structure, multiplication and viral diseases
- Discuss nutrition and metabolism – intermediary and alcohol

COURSE OUTLINE

LECTURES

UNIT PH2005A (MI2005) MICROBIOLOGY		**Lecturer**
(Michaelmas Term: subject to minor changes)		
1-4	Microbial Pathogenicity	JG
5-8	Immunology	RR
9	Vaccines	RR
10-12	Viruses	KR
13	Urinary tract infections	FF
14	Gastrointestinal infections	FF
15	Hospital acquired infections	FF
16	Respiratory infections	TR
17	Meningitis/septicaemia	SS
18	Fungi & antifungal therapies	TR
19	Protozoal infections	AB

PRACTICAL CLASSES (8 hrs)

1	Identifying and staining bacteria
2	Aseptic Technique/Nutritional and atmospheric requirements
3	Differential and selective media
4	Enumeration of bacteria
5	Antibiotics
6	Identification of bacteria
7	Virology

DIRECTED READING
Hugo and Russell, Pharmaceutical Microbiology 7th ed. (2011) and other material to be advised by the lecturers.

MICROBIOLOGY ASSESSMENT

Written Paper: 2 hours	Weighting
Multiple-choice, 30 questions	40%
4 short questions (no choice)	40%
Practical assessment (reports, attendance, lab book)	20%

SUMMARY OF HOURS

Lectures	Practicals	Total contact	Pr. Write-ups	Guided Study	Total	ECTS
19	8	27	5	30	62	3

UNIT PH2005B (BI2005) BIOCHEMISTRY

LECTURES: (Biochemistry with JF Med/SF RT)	**Lecturer**
1-4 Intermediary metabolism (lipids)	TM
5-8 Intermediary metabolism (amino acids)	TM
9-13 Nutrition – anaemias, iron, folate & B12	AM
14-15 Alcohol metabolism	GD

BIOCHEMISTRY ASSESSMENT

MCQ examination (1 hour)

SUMMARY OF HOURS

Lectures	Practicals	Total contact	Pr. Write-ups	Guided Study	Total	ECTS
15	-	15	-	20	35	2

PLEASE NOTE:
Students must pass each unit of this module. The pass mark for each unit is 40%.

PRACTICE OF PHARMACY II

Year 2 (Senior Freshman) **Course Code**: **PH2006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. M. Henman (MH), Asst. Prof. S. Ryder (SR), Assoc. Prof. C. Roche (CR), Assoc. Prof. T. Grimes (TG), Assoc. Prof. I. Hook (IH), Asst. Prof. F. Boylan (FB)
Teacher-Practitioner: K. Rossi (KR)

Coordinator: Asst. Professor Sheila Ryder

AIMS: Students will appreciate the impact of nutrition on health and illness, the importance of nutritional support for specific patients, and the different forms of nutrient delivery. They will also develop an understanding of appliances and dressings, expand their knowledge of pharmacy legislation and develop their clinical skills in responding to symptoms and prescribed therapy.

PRE-REQUISITES: See general pre-requisites for Senior Freshman year (page 42). Exceptions may be made in individual cases for students who have transferred from a pharmacy degree programme in another university, including one-year international students.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the components of adequate nutrition and their role in maintaining health.
- Explain the provision of energy by the body in response to trauma and illness and discuss the role of nutritional support in patients.
- Describe the characteristics of oral, enteral and parenteral nutrition and their role in supporting patients who have undergone surgery or have ongoing illness
- Describe the types and uses of ostomy appliances and vascular support hosiery and related materials.
- Explain the significance of dietary supplements of lipids and of chemoprevention.
- Tabulate the poisonous properties of certain plants and food contaminants.
- Describe common oral and dental conditions and their treatment.
- Illustrate wounded skin and the healing process.
- Tabulate the actions and uses of different dressing types.
- Outline the provisions of the Medicinal Products (Prescription and Control of Supply) Regulations, the controls on unlicensed medicines and the requirements for dispensing prescriptions.
- *Systematically collect and apply knowledge about patients, their conditions and their medicines, in order to provide and justify treatment recommendations and patient counselling, in a diverse range of patient case studies.*
- Dispense mock prescriptions in accordance with legal, clinical, administrative and ethical requirements.
- Devise a care plan to identify, prevent and manage drug-related problems.
- Demonstrate the principles of academic writing by presenting a structured dissertation on an assigned topic.

COURSE OUTLINE:

LECTURES (36 hours)		**Lecturer**
1	Clinical skills and dissertation	MH
2-6	Medicinal Products (Prescription and Control of Supply) Regulations	SR
7	Unlicensed medicines (legislative controls)	SR
8-9	Nutrition and dietetics in health and disease	MH
10	Oral supplements	MH
11-12	Enteral and parenteral feeding and nutrition: principles, compounding, additives, stability	TG
13	Complications of artificial feeding	TG
14-17	Vitamins	TG
18	Lipids as dietary supplements	IH
19	Poisonous food constituents	IH
20	Chemoprevention	FB
21	Patient factors in drug treatment	MH
22-24	Clinical laboratory tests: Urea and electrolytes (U&E), renal function, full blood count (FBC)	TG

25 Adverse drug reactions (ADRs)	TG
26-28 Ostomy	KR
29-30 Vascular support hosiery and surgical hosiery	KR
31-32 Dental health	KR
33-36 Wound types, healing, wound dressings; bandages	KR

PRACTICAL CLASSES / WORKSHOPS (31 hours)

Nutrition: Delivery devices and products (2h)	TG
Nutrition: Disorders of absorption and special foods (2h)	MH
Surgical dressings (2h)	KR
Ostomy and vascular support hosiery (2h)	KR
Clinical skills 2.1: Responding to requests for prescription only medicines (3h)	MH
Clinical skills 2.2: Responding to requests for OTC medicines (3h)	MH
Clinical skills 2.3: Responding to symptoms (3h)	MH
Clinical skills 2.4: Drug interactions (3h)	TG
Dispensing and patient care 2.1: Prescription and control of supply regulations (2h)	SR/KR/CR/TG
Dispensing and patient care 2.2: Emergency supply (2h)	SR/KR/CR/TG
Dispensing and patient care 2.3: Primary-secondary care interface (2h)	SR/KR/CR/TG
Dispensing and patient care 2.4: Unlicensed and extemporaneous medicines (2h)	SR/KR/CR/TG
Dispensing and patient care 2.5: Hospital dispensing (2h)	SR/TG/CR/TG
Dispensing and patient care 2.6: Practical examination (1h; examination duration: 50 mins)	SR/KR/CR/TG

TUTORIALS (3 hours)

Dispensing and patient care 2.1 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 2.2-2.3 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 2.4-2.5 feedback (1h)	SR/KR/CR/TG

DISSERTATION

Literature review and critical analysis of topic associated with the SF course (25h)	MH/guided study

ASSESSMENT

Each component must be passed (see notes below)	Weighting
Written examination: 1.5 hours. 1 essay (from choice of 2) and 40 MCQs (no choice, negative marking)	75% of total marks
Dispensing and patient care – worksheets : practical exam (70:30) Minimum 60% in worksheets, and Minimum 60% in practical exam (50 mins, 2 cases, no choice)	10% of total marks
Clinical skills, nutrition and dietetics assessments	5% of total marks
Dissertation	10% of total marks

NB: Students will be expected to draw upon clinical skills gained in this module when undertaking the Clinical Pharmacy Assessment that forms part of the evaluation for modules PH3009A, PH3010 and PH3011. Pharmacy legislation and all aspects of clinical skills/dispensing/patient care are also examinable in 4th year (XPH40061; dispensing and patient care evaluation).

SUMMARY OF HOURS

Lectures	Practicals/ Workshops	Tutorials	Contact hours	Practical reports	Guided Study	Total	ECTS
36	31	3	70	5	50	125	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

Continuous assessment exercises for this module must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose where applicable. Work submitted late will not be assessed unless a

valid reason is provided, and permission for late submission should be obtained in advance of the submission deadline from the staff member responsible for the continuous assessment component. Where late work is accepted for assessment, the marks available may be capped at the pass mark.

In common with other modules for the pharmacy degree, attendance at all scheduled classes for this module is compulsory. A student who is unable to attend a class for any reason must notify his/her tutor of the reason for absence without delay, and present certification as appropriate. However, <u>all</u> continuous assessment components must be completed even if the student is absent for a valid reason. It is the student's responsibility to obtain details of the assessment for the missed class(es) from the relevant staff member without delay, and to complete it on a self-study basis. The deadline for submission of the completed assessment to the relevant staff member is five days from the student's return to College (return date notified to staff member by tutor, based on certification as appropriate) unless otherwise agreed in advance with the relevant staff member. Where feedback on the assessment has already been provided to the class prior to submission, marks may be capped at the pass mark. See above for late submissions.

Students must satisfy the examiners in each component of the module independently. Examination marks may be withheld and/or a student may be refused permission to progress with his/her class until he/she has satisfied the examiners in all components of the module. This may necessitate sitting a supplemental examination and/or repetition/(re)submission of one or more continuous assessment components (including submission of one or more alternative exercises that have been set to replace failed/missed continuous assessment components). In such circumstances, the marks available for the supplemental examination and/or continuous assessment component(s) may be capped at the pass mark.

Furthermore, students who have not fulfilled the module requirements with regard to attendance and/or coursework may be reported to the Senior Lecturer as non-satisfactory for one or more terms. Students reported as non-satisfactory for the Michaelmas and Hilary terms may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat the year.

Because of the importance accorded to this aspect of the course by the PSI, who accredit the degree, it is not possible to compensate in this module.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities *etc*.).

PROFESSIONAL DEVELOPMENT AND CAREER PLANNING

Year 2 (Senior Freshman) **Course Code: PH2007**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof M. Henman (MH); K. Rossi (KR)
External staff: Selected external speakers (Ext);
Staff of Careers Advisory Service: Ms S. Ryan (SRy)/ Ms F. Hayes (FH)

Coordinators: Assoc. Professor Martin Henman

N.B. This module may be substituted with a Broad Curriculum module. In the case where a student is taking a Broad Curriculum module the work placement requirement (see below) must still be fulfilled and attendance at lectures, submission of curriculum vitae and completion of the online self-evaluation tools (Gradireland Career Report® etc. provided by CAS) are strongly recommended.

AIMS: The students will acquire an understanding of the purpose and potential value of work experience within the undergraduate degree programme. Students will consider the relative merits of Continuing Education and of Continuous Professional Development for Pharmacists in Ireland and their relation to Fitness-to-Practice requirements. Students will acquire a knowledge of and practice the skills needed for self-development and career planning.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the role and functions of various bodies responsible for postgraduate education for pharmacists in Ireland
- Compare and contract Continuing Education and Continuing Professional Development in the Health Professions
- Describe the requirements for re-certifications and Fitness-to-Practice in the Health Professions in Ireland
- Describe the different skills required to practice in different branches of pharmacy
- Describe the facilities offered by the Careers Advisory Service
- Develop a curriculum vitae and practice interviewing techniques
- Describe the process of undergraduate education and professional registration of selected health care professional in Ireland
- Reflect upon work experience to develop their professional competencies
- Use a self-reflective approach to analyzing their personal motivation, values, interests and skills and to devising a plan to meet their personal development goals

COURSE OUTLINE

LECTURES		LECTURER
1	Pharmacy Education and Continuous Professional Development	MH
2	Career Planning	SRy
3	Community Pharmacy	KR + Ext
4	Hospital Pharmacy	NMcM+Ext
5	Industrial Pharmacy	MH + Ext
6	Postgraduate Research	MH+PG
7	Regulatory Careers	MH + Ext.
8	Curriculum vitae	SRy
9	Work Experience, Internships and MPharm	Ext. + MH
10-11	Interview techniques & Career Progression	SRy

WORKSHOPS & ROLE PLAY	CAS
Interview skills (2hrs)	
Presentation of group research projects to class (3hrs)	MH/CAS

ASSIGNMENT: Group project to determine skill set and research career opportunities in one of a number of areas.

WORK EXPERIENCE: Students are required to undertake one week of practice experience in a community or hospital pharmacy setting and to complete a report. The student's report on their work experience completed during the summer vacation must be submitted before the start of the JS academic year. Their report will be graded as satisfactory/unsatisfactory.

ASSESSMENT

Submission of a curriculum vitae and its revision. Satisfactory/Unsatisfactory

Development and submission of a Personal Reflection on your Course and Career Planning –

Satisfactory/Unsatisfactory

Student will be given the opportunity to gain practical experience and the write up of this experience Will be submitted for assessment as satisfactory/unsatisfactory.

SUMMARY OF HOURS

Lectures	Seminars/ Tutorials	Presentation	Total Contact	Guided Study	Practice experience	TOTAL	ECTS
12	4	3	19	24+20	38	101	5

PHARMACEUTICAL BIOTECHNOLOGY I

Year 2 (Senior Freshman) **Course Code: PH2008**

Staff of School of Pharmacy & Pharmaceutical Sciences: Dr. D. Finlay (DF), Prof. M.J. Meegan (MM), Asst. Prof. L. O'Driscoll (LOD), Asst. Prof. A. Sasse (AS)
Staff from Biochemistry: Prof. A. Bowie (AB), Assoc. Prof. D. Zisterer, (DZ).

Coordinator: Asst. Professor Astrid Sasse

AIMS: Students will study the characteristics of proteins and carbohydrates and their components and will be provided with an introduction to Pharmaceutical Biotechnology including gene structure and expression, genetic engineering and upstream processing.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Explain the term 'pharmaceutical biotechnology'
- Discuss the basic principles of gene transcription and translation.
- Describe the process of genetic engineering.
- Describe techniques routinely used when genetically engineering mammalian cells for recombinant protein production.
- Describe the structure and properties of amino acids, peptides, nucleosides and carbohydrates and discuss the source, preparation and use of representative examples of therapeutically important peptides.
- Illustrate the hierarchy of carbohydrates and protein structure and some of the characteristics of carbohydrates and proteins relevant to medicines production and use.
- Explain and illustrate stereochemistry, chemical reactivity and medical use of carbohydrates.

COURSE OUTLINE:

LECTURES		**Lecturer**
1	Gene structure and expression – DNA structure	AB
2	Gene structure and expression – DNA Replication	DZ
3-4	Gene structure and expression – Transcription	AB
5	Gene structure and expression – Translation	DZ
6	Introduction to Pharmaceutical Biotechnology	DF
7-8	Genetic Engineering; the recombinant process	DF
9-11	Upstream processing	DF
12	α-Amino acids; structure, sources and pharmaceutical uses	MM
13	α-Amino acids; chemistry, bioorganic chemistry and production methods	MM
14-15	Physical properties and ionization of α-Amino acids	MM
16	Pharmaceutical peptides: primary structure and physicochemical characteristics	MM
17	Production of pharmaceutical peptides: solid phase synthesis	MM
18	Chemical and physical stability of pharmaceutical peptides	MM
19	Pharmaceutical peptide sequencing methods	MM
20	Peptide drugs, design and pharmaceutical properties	MM
21	Pharmaceutical proteins; tertiary structure and physico-chemical properties	MM
22	Classification and stereochemistry of carbohydrates	AS
23	Identification reactions for carbohydrates	AS
24	Reactivity and degradation of carbohydrates	AS
25	Mono- and disaccharides: structure and physico-chemical characteristics	AS
26-27	Glycoproteins – biosynthesis and physiological function	AS
28	Polysaccharides, aminoglycosides	AS
29-30	Introduction to laboratory techniques used throughout the process of gene cloning, genetic engineering, and assessing the success of subsequent recombinant protein production.	LOD

The following practicals from BIOCHEMISTRY accompany this pharmaceutical biotechnology course.

PRACTICAL CLASSES (4 hours each)

1. Introduction to safety in the lab, Good Laboratory Practice
2. Subcellular Fractionation (Part 1)
3. Subcellular Fractionation (Part 2)
4. Protein purification
5. Detecting Polymorphisms (Part 1)
6. Detecting Polymorphisms (Part 2)
7. Oxidative Phosphorylation

Practical Tutorials (2x2 hrs)

DIRECTED READING

- Alberts, Johnson, Walter, Lewis; Molecular Biology of the Cell; 5th revised Edition, Garland Publishing Inc, 2008.
- Berg, Tymaczko, Stryer; Biochemistry; 6th revised Edition, WH Freeman & Co., 2006.
- Voet, Voet, Pratt; Principles of Biochemistry; 3rd Edition, Wiley, 2008.
- Crommelin, and Sindelar (eds.); Pharmaceutical Biotechnology: Fundamentals and Applications; 3rd Edition, Informa Healthcare, 2007.
- Lemke and Williams; Foye's Principles of Medicinal Chemistry; 7th Edition, Wolters Kluwer, Lippincott Williams & Wilkins, 2012.

ASSESSMENT	Weighting
Theory written paper: 2 hours; 5 questions out of 5 to be answered (some internal choice may be available)	80% of total marks
Continuous assessment of practical work	20% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
30	28	4	62	10	48	120	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component), but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only.

GENERAL PRINCIPLES OF PHARMACOLOGY

Year 2 (Senior Freshman) **Course Code: PH2009**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc Prof. A. Harkin (AH)

Coordinator: Assoc. Professor Andrew Harkin

AIMS: To introduce the student to the basic principles of pharmacology, drug development and experimental techniques used in pharmacology.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this course the student will be able to:

- State the variety of targets to which drugs bind in the body and illustrate their transduction and cell signalling mechanisms
- Define agonist (full, partial and inverse), antagonist (competitive and non-competitive) and recall selected examples of each
- Analyse receptor binding experiments and deduce the receptor binding parameters B_{MAX} and K_D
- construct dose response curves and calculate drug potency of both agonists and antagonists
- Illustrate the principles of drug absorption, distribution, metabolism and excretion and define the terms, pKa, bioavailability, volume of distribution, clearance, half life, and Kel.
- Illustrate the organisation and mode of neurotransmission within the sympathetic, para sympathetic, enteric and somatic nervous systems
- Describe the mechanisms of action and clinical uses of cholinergic and adrenergic drugs within the peripheral nervous system
- Define the key steps associated with excitatory and inhibitory neurotransmission in the brain and provide selected examples of drugs which influence these steps
- Describe the various stages of drug discovery, development and the clinical trials process

COURSE OUTLINE:

LECTURES (AH)

1 Introduction to Pharmacology
2 Targets of drug action.
3 Receptors (ligand gated ion channels)
4 Receptors (G protein coupled, kinase linked and intracellular receptors)
5-6 Dose response; agonism and antagonism
7 Therapeutic and toxic doses
8 Overview of pharmacokinetic processes; absorption and distribution
9 Drug metabolism and excretion
10 Pharmacokinetic modelling
11 Neurotransmission
12 Autonomic nervous system
13 Cholinergic transmission
14 Cholinergic agents; anticholinesterases
15 Muscarinic blockers; ganglionic blockers
16 Adrenergic transmission
17 Direct/indirect sympathominetics; α/β stimulants
18 NANC transmitters
19 Somatic system and skeletal neuromuscular blocking agents
20 Excitatory neurotransmitters in the central nervous system
21 Inhibitory neurotransmitters in the central nervous system
22-23 Monoaminergic neurotransmission
24 Peptide transmitters
25-26 Drug design, development and testing

PRACTICAL CLASSES (3 hours each)

- Drug targets and receptor transduction
- Introductory Pharmacokinetics Workshop. Computer simulated experiments and data analysis
- Dose response – the guinea pig ileum preparation. Computer simulated experiments and data analysis
- Quantifying Antagonist Activity – the $_{P}A2$ scale: Computer simulated experiments and data analysis
- Receptor Binding Workshop – saturation binding: Laboratory demonstration
- Receptor Binding Analysis
- Blood Pressure

TUTORIALS: (1 hour)
Course review.

DIRECTED READING:
Rang and Dale's Pharmacology (6th edition) by H.P. Rang, M.Maureen Dale, James M. Ritter, Rod Flower .
Brody's Human Pharmacology: Molecular to Clinical 4th Edition by Kenneth P. Minneman
The Biochemical Basis of Neuropharmacology 8th Edition, by Jack R. Cooper, Floyd E. Bloom, Robert H. Roth

ASSESSMENT:	Weighting
Written Examination: 2 hours	
Part 1, answer 3 questions out of 5	54% of total marks
Part 2, 20 multiple choice questions, answer all questions; negative marking scheme	36% of total marks
Continuous assessment practicals (5 Assignments carrying 2% each)	10% of total marks

SUMMARY OF HOURS

Lectures	Tutorials	Practicals	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
26	1	21	48	25	46	119	5

MOLECULAR AND CHEMOTHERAPEUTIC PHARMACOLOGY

Year 2 (Senior Freshman) **Course Code: PH2010**

Staff of the School of Pharmacy and Pharmaceutical Sciences: Prof. M. Radomski (MR); Asst. Prof. M.J. Santos-Martinez (MS); Asst. Prof. N. Frankish (NF); Asst. Prof. C. Medina (CM)

Coordinators: Asst. Professor Neil Frankish

AIMS: To allow the student to understand how chemical mediators modulate the body's response to injury and infection; to enable the student to appreciate how microbiology impinges on many aspects of Pharmacy; to acquire a knowledge of the mode of action of antibiotics, anti-parasitic drugs and anti-viral agents.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
Recall the various chemical mediators of inflammation and their physiology and pathology

- Identify the mechanism of action of the different classes of anti-inflammatory drugs, their clinical use, cautions and side effects.
- Identify the mechanism of action of the different groups of antibiotics as a basis for their selective toxicity.
- Recall the clinical use of antibiotics, their side effects and cautions to use.
- Recall the nature of antibiotic use and the means to reduce antimicrobial resistance.
- Recall the epidemiology of zoonoses and fungal infections
- Identify the mechanism of action of antifungal drugs, their clinical use and side effects
- Classify determinants of the immune response, autoimmunity, immunocompetence & immunotherapy
- Identify viral structure, mechanisms of viral multiplication and viral diseases
- Identify the mechanism of action of the different classes of antiviral drugs, their clinical use and side effects

COURSE OUTLINE: The Module is divided into two Units.

Unit PH2001A CHEMICAL MEDIATORS AND DISEASE

LECTURES		**Lecturer**
1-2	Inflammation and inflammatory mediators	MR
3-4	Nitric Oxide	MR
5-6	Aspirin & Non-selective COX inhibitors	MR
7	Selective COX inhibitors	MS
8-9	Corticosteroids	MS
10	DMARDS	MR
11	Anti-lymphocyte agents	MR
12	Anti-cytokine drugs	MR

SEMINAR (2 hours)

Clinical pharmacology and treatment of selected inflammatory diseases MR

DIRECTED READING

Reference material supplied

UNIT PH2010B – CHEMOTHERAPY OF INFECTIOUS DISEASE

LECTURES		**Lecturer**
1	Antimicrobials: mechanism of action of main antibiotics	NF
2	Antimetabolite	NF
3	Cell wall Inhibitors	NF
4	Drugs acting at the cell membrane	NF
5-6	Inhibitors of DNA/Protein synthesis	NF
7-8	Tuberculosis and antitubercular drugs	NF
9-10	Fungal Diseases and antifungal agents	NF
11	Endotoxin shock	NF
12-13	Protozoal & Parasitic diseases in man and their treatment	NF
14-17	Antivirals	CM

SEMINAR (2 hours)

Drug resistance & strategies to counteract it	NF

DIRECTED READING

Manual of antibiotics and infectious diseases: treatment and prevention / John E. Conte, Jr.. Philadelphia, Pa. ; London : Lippincott, Williams & Wilkins, c2002.
The antimicrobial drugs., Scholar, Eric M. Oxford University Press, 2000.
Shakespeare M. Zoonoses. 2002. Pharmaceutical Press, UK.

ASSESSMENT

Part A: 1 hr 50 MCQ questions
Part B: 1 hr 50 MCQ questions

SUMMARY OF HOURS

	Lectures	Seminars	Total contact	Guided Study	TOTAL	ECTS
Unit PH2010A	12	2	14	36	50	2.5
Unit PH2010B	17	2	19	31	50	2.5
Total	29	4	33	67	100	5

JUNIOR SOPHISTER (3rd Year)

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*
- *Reports, continuous assessments and laboratory notebooks must be presented for assessment by the date specified by the examiner.*
- *Reports, continuous assessments and laboratory notebooks submitted after the specified date will not be assessed unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

PRE-REQUISITES: COMPLETION OF THE SENIOR FRESHMEN YEAR (YEAR 2)

MEDICINAL AND PHARMACEUTICAL CHEMISTRY III

Year 3 (Junior Sophister) **Course Code: PH3002**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M. J Meegan (MM); Asst. Prof. J. Quigley (JQ), Asst. Prof. J. F. Gilmer (JG); Asst. Prof. A. Sasse (AS)

Coordinator: Professor Mary J. Meegan

AIMS: To develop an understanding of the theory and practice of medicinal chemistry in the context of pharmacy and to provide an understanding of analysis and characterisation of pharmaceutical materials in a regulatory context.

PRE-REQUISITES: Pharmaceutical properties of Materials used in Medicines (PH2001); Physico-chemical Aspects & Specifications of Substances used in Medicines II (PH2002); Isolation, Separation & Analysis of Substances used in Medicines (PH2003)

LEARNING OUTCOMES: On successful completion of this module the student will be able to**:**

- Apply and interpret Quantitative Structure - Activity Relationship studies (QSAR) in pharmaceutical applications.
- Explain the function of receptors, agonists and antagonists together with the action of drugs at selected receptors
- Describe the medicinal chemistry of selected major therapeutic classes of drugs which act as enzyme inhibitors e.g. NSAIDs, ACE inhibitors and various antibiotics
- Demonstrate competence in the practical laboratory techniques used in the analysis and characterisation of pharmaceutical materials
- Demonstrate ability to interpret and evaluate a research paper in a topic in pharmaceutical chemistry

COURSE OUTLINE

LECTURES

Unit PH3002A: Techniques in Drug design and optimization
Quantitative Structure Activity Relationships; Physical organic chemistry of drugs (JQ)

1. Biological Activity and Physicochemical Properties
2. Electronic Parameters: The Hammett Constant
3. Resonance Contributions, Inductive Substituent Constants; Structure/Activity Studies
4. Lipophilic Parameters: The Partition Coefficient, The Hansch-Fujita Substituent Constant
5. Determination of the Partition Coefficient
6. Empirical Approaches to Estimation of Log P
7. Complications in QSAR due to Ionization
8. The Fragmentation Constant
9. The Additivity Concept; Structural explanation of deviations observed
10. Structure/Activity Studies: Linear & Nonlinear dependence
11. The Hansch Kinetic Model (multicompartmental analysis), log P_0
12. Steric Parameters: Taft & STERIMOL Parameters

Unit PH3002B: Enzyme Inhibitors (JG, MM)

1. Overview of enzyme inhibitors in pharmacy
2. Kinetic models of enzyme inhibition 1
3. Kinetic models of enzyme inhibition 2
4. Methods and prospects in enzyme inhibitor drug design
5. Case history: the development of the ACE inhibitors
6. COX-1 inhibitor medicinal chemistry, SAR, MOA
7. COX-2 inhibitors, development SAR and biological effects
8. Inhibitors of acetylcholinesterase I
9. Inhibitors of acetylcholinesterase II

Unit PH3002C: Chemotherapeutics, Antibiotics and Antimicrobial Agents (MM)

1. Molecular targets for antibiotics: Penicillin and cephalosporin antibiotics: structure and clinical examples; Molecular mechanism of action of penicillins;
2. Characterisation and chemical stability properties of penicillins
3. Production methods for 6-APA and semisynthetic penicillins
4. Broad spectrum semisynthetic penicillins; SAR and clinical prodrugs
5. Cephalosporins; structures, characterization and chemical reactivity
6. Production methods for 7-ACA; SAR for semisynthetic cephalosporins
7. Case study development of a semisynthetic cephalosporin
8. Beta-lactamase inhibitors; structure and clinical role of betalactamase inhibitors
9. Macrolides, aminoglycosides, glycopeptide, oxazoladinones and quinolones: structures, clinical examples and mechanism of action

Unit PH3002D: Drugs as Receptor Agonists and Antagonists (AS)

1. Classification of receptors as targets for drugs
2. Drugs, receptors and drug-receptor interactions

Unit PH3002E: Drugs acting at Nuclear Receptors: Steroid Drugs (AS)

1. Steroid drugs: Introduction to steroid drug structure and stereochemistry
2. Androgens: Steroids derived from testosterone
3. Estrogens: Steroids derived from estrogen and SERM
4. Progestins: Steroids derived from progesterone
5. Adrenocorticoids; Structural modification and activity
6. Case study and review

Unit PG3002F: Drugs acting at Cholinergic and Adrenergic receptors (MM)

1. Cholinergic receptor structure: The role of acetylcholine as a neurotransmitter
2. Cholinergic agonists
3. Cholinergic antagonists
4. Adrenergic receptor antagonists

Unit PH3002G: H_2 Receptor antagonist design: (JQ)

1. Histamine: protonation, tautomerism, ionisation & conformation
2. Chemical evidence of active form at H_1 & H_2 receptors
3. The lead compound - N^{α}-guanylhistamine; Isothiourea analogue
4. Thiourea derivative (pure antagonist); development of burimamide
5. Development of metiamide (pK_a of the imidazole ring)
6. Analogues of cimetidine; Effect of pK_a of substituent
7. Conformational isomers of cimetidine
8. Keteneaminals
9. Desolvation and dipole orientation of derivatives wrt activity

Unit PH3002H: H_1 Receptor antagonist design: (JG)

1. Imidazoles and pyridines: histamine, and the H_1 antagonists 1.
2. Imidazoles and pyridines: histamine, and the H_1 antagonists 2.

PRACTICAL LABORATORY CLASSES: (3 hours each)

1. UV Spectroscopy
2. Quality Specifications
3. Quantitation by Extraction
4. Stability Study of Nifedipine
5. Hydrolysis of Aspirin
6. Polarimetry, Identification of Carbohydrates
7. HPLC-Fluorescence
8. Infrared Spectroscopy
9. Aquametry
10. Gas Liquid Chromatography (GLC)
11. pH Measurements, Diazotitration
12. NMR & NIR

RESEARCH PRESENTATION
Oral presentation (15 minutes) of a "cutting edge" research paper on a topic in the area of pharmaceutical chemistry (total seminar time 2 hours)

SEMINARS AND TUTORIALS: 1x2 hour seminar (AS)
Seminar based on assigned topics in Pharmaceutical Analysis

DIRECTED READING
Principles of Medicinal Chemistry; Foye, Lemke and Williams; 7th Edn. Lippincott Williams & Wilkins; 2012.
Pharmaceutical Analysis, D.G. Watson, Elsevier, 3rd Ed. 2012.
Medicinal Chemistry, G. Thomas, Wiley, 2000.
An Introduction to Medicinal Chemistry, G. L. Patrick , 4th Edn, Oxford University Press, 2009.

ASSESSMENT	Weighting
Written Paper: 3 hours, 5 questions out of 5 to be answered (some internal choice may be available)	70% of total marks
Practical: Based on continuous assessment (5%), Final report (10%), Research presentation (5%) Written test (MCQ and short questions) (10%)	30% of total marks

Students are required to take a written test in Hilary Term. This Examination comprises short questions or multiple choice questions based on the theory underlying the practical class in the Junior Sophister year.

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

SUMMARY OF HOURS

Lectures	Practicals	Seminars	Total Contact	Practical write-ups	Guided + private study	TOTAL	ECTS
53	36	2	91	18	139	248	10

NATURAL SOURCES OF DRUGS AND SUBSTANCES USED IN MEDICINES

Year 3 (Junior Sophister) **Course Code: PH3003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. J. Walsh (JW), Asst. Prof. H. Sheridan, (HS), Asst. Prof. F. Boylan (FB) and Assoc. Prof. I. Hook (IH)

Coordinator: Asst. Professor John J. Walsh

AIMS: To provide the student with an understanding of the sources and properties of those drugs and related pharmaceutical materials used in medicine, which are produced from natural sources.

PRE-REQUISITES Isolation, Separation and Analysis of Substances used in Medicines (PH2003)

LEARNING OUTCOMES: On successful completion of this module students should be able to:

- Describe the biosynthetic pathways employed by plants and fungi to produce compounds of pharmaceutical importance
- Identify and describe the sources and general properties of key phytochemical groups especially alkaloids, anthranoids, phenolics, cardiac glycosides, saponins, mono-, di- and sesquiterpenes
- Recognise and explain methods for the isolation of natural products
- Use both analytical and structural techniques to determine the purity and identity of compounds from natural sources
- Outline the different types, sources and properties of lipids, including fatty acids, and explain their importance in living systems and their influence on health and disease
- Outline the types and importance of analytical procedures used to identify and determine the quality of lipids used in the preparation of medicines and nutraceuticals (dietary supplements)
- Advise on and critically assess the importance of lipid types in the diet and their use in medicine formulations
- Describe the types of toxic and allergenic constituents produced by plants, animals and microorganisms occurring naturally in the environment and food, identify the risks associated with their occurrence, together with their treatment and/or prevention
- Recognise the importance of biodiversity prospecting as well as being aware of biodiversity preservation
- Recognise and describe several approaches to screening natural materials for bioactivity and when is appropriate to apply each one of these different approaches.

COURSE OUTLINE

LECTURES		**Lecturer**
1-8	Module overview and Plants as phytochemical laboratories	JW
9-14	Biodiversity prospecting	FB
15-20	Alkaloids – general properties and phytochemistry	HS
21-24	Key alkaloid groups (tropane, quinoline, isoquinoline, indole)	HS
25-28	Glycosides (general properties), anthranoids, simple and complex phenolics.	FB
29	Plant polysaccharides	FB
30-34	Dietary lipids (simple & complex): isolation, composition, uses.	IH
35-39	Phytotoxicology, mycotoxins, allergens.	IH
40-48	Terpenoids including steroid glycosides; their origin and uses.	JW

PRACTICALS

1. ***Part 1***: Glycoside-Containing Plants (Incl. *Digitalis* species) Isolation, Identification.
   Part 2: Opium Alkaloids and *Papaver* species.
2. Studies on the Cinchona alkaloids
3. Senna Preparations, Extraction, Colorimetric Assay.
4. Examination of Caffeine containing Products and Beverages.
5. Isolation of Valtrate from *Centranthus ruber.* Analysis of Commercially Available Valerian Preparations
6. Workshop on Plant poisons
7. Evaluation of the Antioxidant Activity of Biologically Active Flavonoids using the DPPH methodology: An Introduction to Structure Activity Relationships.
8. Qualitative/Quantitative Analysis of Galantamine-containing preparations by TLC,UV,NMR and MS.

DIRECTED READING

European Pharmacopoeia
Trease & Evans' *Pharmacognosy* 15th Edn. WC Evans (Ed), Elsevier Ltd.
Pharmacognosy-Phytochemistry, Medicinal Plants. 2nd Edn., J. Bruneton, Intercept Ltd.
Pharmacognosy & Pharmacobiotechnology. Robbers J, Speedie M, Tyler V., Williams & Wilkins
Medicinal Natural Products 2nd Edn., PM Dewick, John Wiley & Sons, Ltd.

ASSESSMENT	Weighting
Written paper: 3 hours; 3 Sections; 7 questions, 5 to be answered - one from each Section**	90% of total marks
Practical Book reports: continuous assessment	10% of total marks

****Failure to comply with the instruction will result in a requirement to sit the Supplemental examination in Michaelmas term.**

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact Write-up	Practical private study	Guided +	Total	ECTS
48	36	0	84	24	96	204	10

STERILE PRODUCTS
Year 3 (Junior Sophister) **Course Code: PH3004**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. D. D'Arcy (DD), Asst. Prof. L. Tajber (LT), Dr. Krzysztof Paluch (KP).

Coordinator: Asst. Professor Deirdre D'Arcy

AIMS: To provide a continuation course in formulation and production, concentrating on sterile medicinal product and radiopharmaceuticals.

PRE-REQUISITES: Introduction to Pharmaceutics and Formulation module (PH1004), Formulation and Pharmaceutical Technology module (PH2004), Microbiology and Biochemistry module (PH2005)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Discuss the requirement for sterility for certain classes of pharmaceutical products.
- With respect to the formulation of the major classes of sterile products, such as injections, infusion fluids and eye drops, explain the necessity for certain classes of excipients (and packaging), and perform appropriate calculations in the formulation of these products.
- Describe the main sterilization methods relevant to pharmaceuticals; define the common terms used when describing sterilization kinetics.
- Summarize common tests and parameters measured in assessing the microbial/particulate quality of a sterile product and its environment, and of the sterilization method used.
- Describe the main aspects of pharmaceutical clean room design, operation and environmental control, and summarize the applications of a clean room environment within a hospital/clinical pharmacy setting.
- Access and interpret basic compatibility information in the context of administration of parenteral products in a clinical setting.
- Discuss the testing and use of commonly used disinfectants and antiseptics
- Discuss the applications of and risks associated with production and use of radiopharmaceuticals.

COURSE OUTLINE

Unit PH3004A: INTRODUCTION TO FORMULATION, TESTING AND USE OF STERILE PRODUCTS

LECTURES		**Lecturer**
1.	Introduction; definitions; microbial limits for non-sterile pharmaceuticals; products required to be sterile; official categories in BP	DD
2.	Concept and requirement for isotonicity, Calculation of isotonicity	DD
3.	Vehicles for parenteral medicaments; aqueous/non-aqueous; water for injections - production and QC	DD
4.	Formulation of parenterals: buffers, antioxidants, preservatives	DD
5.	Electrolytes, LVP's LVP's – composition and use Particulate contamination: clinical consequences compatibility?	DD
6.	Labelling: SVP, LVP	DD
7.	Ophthalmic preparations: approaches to ophthalmic drug delivery, solutions, suspensions, excipients - viscosity	DD
8.	Ophthalmic preparations – excipients – tonicity, preservative, buffer, stabiliser	DD
9.	Preparation: drops, lotions, semi-solids; packaging: single-dose, multiple dose	DD
10.	Ophthalmic preparations – contamination concerns and labeling. Contact lens solutions and ophthalmic medical devices	DD

Unit PH3004B: PHARMACEUTICAL PROCESSING FOR STERILE PRODUCTS

11. Sterilization: Official procedures, kinetics, sterility concepts and resistance	DD
12. Moist heat sterilisation – steam lethality, autoclave design and operation	DD
13. Dry heat sterilization, equipment, use, applications, heat resistance	DD
14. Filtration sterilization, filter testing, blow-fill-seal	DD
15. Ionising radiation sterilisation	DD
16. Gaseous sterilization – introduction to validation	DD
17. Validation and process monitoring (physical and biological indicators)	DD
18. Sterility testing	DD
19. Tutorial	DD
20. Clean room: concept, sources of contamination, design	DD
21. Clean room: operation, validation, standards, monitoring	DD
22. Aseptic services – cytotoxic production	DD
23. Aseptic services – CIVAS and TPN	DD
24-26. Principles of disinfection 1-3	KP

UNIT PH3004C: RADIOPHARMACEUTICALS

27. Introduction to radiopharmaceuticals, modes of radioactive decay, radioactive units, calculation and use of decay constant/half life	LT
28. Production of radioisotopes of pharmaceutical importance, instrumentation for measuring radioactivity	LT
29. Gamma cameras, theory and use of generators for short-lived radioisotopes	LT
30. Radionuclidic and radiochemical purity determination, radioimmunoassay	LT

Note: due to timetabling constraints the order in which the lectures delivered may differ from the list above.

ADDITIONAL DIRECTED READING:

This will involve the student being directed towards specific reference sources and the following topics are covered by the student outside of direct lectures. These topics are examinable.

1. Endotoxins/pyrogens; pyrogen/endotoxin tests, limits
2. Packaging: glass, plastic, elastomeric closures
3. Principles of preservative efficacy test
4. Particulate tests – visible, subvisible, PhEur, BP

PRACTICAL CLASSES (3 hours each)

1. Sterile Products 1 Introduction, Packaging labelling
2. Sterile Products 2 Introduction to preservatives and multi dose preparations
3. Sterile Products 3
4. Sterile Products 4
5. Sterile Products 5
6. Sterile Products 6
7. Revision lab before practical exam
8. Gaseous and radiation sterilization-(rotation)
9. Aseptic procedures –broth transfer trial (Aseptic Suite rotation)

Sterile Products 3-7 examine aspects of parenteral and ophthalmic formulation, quality control tests and heat sterilization methods.

DIRECTED READING

European Pharmacopoeia
British Pharmacopoeia
Martindale
Pharmaceutical Codex, 12th Edition.
Micromedex
Aulton's Pharmaceutics. The Design and Manufacture of Medicines 3rd Edition, M E Aulton, editor, Churchill Livingstone (2007)
Pharmaceutical Practice, 3rd Ed, Winfield and Richards, editor Churchill Livingstone (2004)
Pharmaceutical Practice, 4th Ed, Winfield, Rees and Smith. Churchill Livingstone (2009).
Hugo and Russell's Pharmaceutical Microbiology, 2004, 7th edition, Denyer S., Hodges N.A. & Gorman S.P. (Eds.), Blackwell, Oxford.
Theobald, A.E. (ed). 1989. Radiopharmaceuticals using radioactive compounds in pharmaceuticals and medicine. Ellis Horwood Ltd.
FDA and EU guides to production of sterile products – as indicated in lecture notes.

ASSESSMENT	Weighting
Written paper: 2 hours, 20 MCQ (40%), 2 long questions (60%) (may be essay style or include several shorter questions as components of an overall long question).	70% of total marks
Practical Exam: 2 hours, 2 questions in 2 hours	20% of total marks
Practical Book reports: Continuous Assessment	10% of total marks

SUMMARY OF HOURS

Lectures	Practical	Tutorials	Total Contact	Practical Write-ups	Guided + Private study	Total	ECTS
30	27	1	58	20	122	200	10

NB. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for the module is 40%. Students who obtain an overall mark of less than 40% will be required to sit the Supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) in the annual examination, but who obtain a Class II or better in the practical examination will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e., less than 50% in the practical examination) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to supplement in the practical examination only. In addition to the practical exam, students are required to obtain at least 50% in the continuous assessment component of the course.

PHARMACEUTICAL DATA ANALYSIS AND BIOINFORMATICS

Year 3 (Junior Sophister) **Course Code: PH3005**

STAFF OF THE SCHOOL OF COMPUTER SCIENCE AND STATISTICS

Coordinator: Assoc. Prof. Eamonn Mullins

AIMS: Students will encounter statistical ideas and methods during their careers as pharmacists in many different settings: in community surveys, clinical trials, laboratory practice, academic research, drug development and manufacture, epidemiological studies. The aim of this course is to introduce students to these ideas and methods, using a broad range of real examples.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Discuss the importance of statistical variation in the data deriving from surveys, drug development studies, epidemiological investigations, clinical trials, measurement systems, and drug manufacture
- Apply the basic statistical methods that appear regularly in pharmaceutical and medical journals
- Discuss critically the statistical sections that appear in their professional journals
- Discuss the statistical issues that arise in the design of data collection exercises – for example, they should be able to discuss the determination of sample size, and the need for randomised allocation and blinding in clinical trials
- Carry out elementary analyses using the statistical package Minitab

COURSE OUTLINE:

- The central core of the course will be based on the following list of topics:
- Data summaries and graphs
- Statistical models
- Sampling distributions: confidence intervals and tests
- Simple comparative experiments: t-tests, confidence intervals, design issues
- Design and analysis of factorial studies of many system parameters simultaneously
- Counted data: confidence intervals and tests for proportions
- Cross-classified frequency data: chi-square tests
- Introduction to Regression Analysis
- Introduction to Analysis of Variance
- Statistical computing laboratories

Statistical Laboratories:

The material covered in the lectures will form the basis of a series of statistical laboratories, which will involve use of the statistical package Minitab. These will come towards the end of the semester, by which time a reasonable body of material will have been discussed in class. Most statistical packages produce essentially the same output, so students should be able to pick up very quickly other packages should they have need to do so in the future. Solutions to the classroom examples will be presented in the form of computer output, so, at the end of the course, students should have a strong grasp of how to interpret analyses presented in this way.

DIRECTED READING

The course will not be based on any one book; I will give extensive handouts during the semester. The following are, however, useful references for particular aspects of the course. They will also be useful as references where students need to go beyond the topics covered – for example, in their Senior Sophister reports/dissertations associated with other modules.

E. Mullins, Statistics for the quality control chemistry laboratory, Royal Society of Chemistry, 2003.
D.G. Altman, Practical statistics for medical research, Chapman and Hall, 1991.
L. Daly and G.J. Bourke, Interpretation and uses of medical statistics, Oxford : Blackwell Science, 2000.
J.E. De Muth, Basic statistics and pharmaceutical statistical applications, Chapman and Hall, 2006.

ASSESSMENT	Weighting
Written paper	90% of total marks
Continuous Assessment:	10% of total marks

Note: If results from the written paper only are higher than the combined mark of written and continuous assessment, the mark for the written paper only will be returned as the module mark.

SUMMARY OF HOURS

Lectures	Pract/Tuts	Total Contact	Guided study	Total	ECTS
31	5	36	72	108	5

PRACTICE OF PHARMACY III

Year 3 (Junior Sophister) **Course Code: PH3006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. M. Henman (MH), Asst. Prof S. Ryder (SR), Assoc. Prof. C. Roche (CR), Assoc. Prof. T. Grimes (TG)
Teacher-Practitioner: K. Rossi (KR)

Coordinator: Asst. Professor Sheila Ryder

AIMS: To develop students' understanding and knowledge of pharmacy practice particularly in epidemiology and public health, pharmacovigilance and pharmacoepidemiology, health economics and the principles of evidence-based assessment. To introduce students to the legislation concerning drugs that may be misused and animal remedies, and to the practical requirements in supplying and using medicines containing those drugs.

PRE-REQUISITES: See general pre-requisites for Junior Sophister year (page 65). Exceptions may be made in individual cases for one-year international students.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe epidemiology, the sources of data, the incidence of common conditions and their relationship to public health in Ireland.
- Explain the global burden of disease and role of international bodies in recording and responding to this challenge.
- Describe the research methods used in epidemiology, in clinical pharmacology and in assessing interventions.
- Discuss drug utilization and the monitoring and follow up of adverse drug reactions in Ireland and the EU.
- Describe key methods for estimating risk.
- Explain the different types of clinical trials, the importance of blinding and randomisation.
- Describe the use of 'number needed to treat' (NNT) data and the evidence-based approach to drug evaluation.
- Outline the significance of the scarcity of resources and the importance of accurate estimation of costs in economics and health economics.
- Distinguish between the various approaches to the evaluation of benefits including health-related quality of life (HRQoL).
- Describe the different methods of analysis used in health economics and pharmacoeconomics.
- Critically discuss legislation relating to drugs of abuse, clinical trials, animal remedies, poisons, health and safety, and data protection.
- Demonstrate the appropriate use of ophthalmic, nasal and aural medicinal products.
- Systematically collect and apply knowledge about patients, their conditions and their medicines, in order to provide and justify treatment recommendations and patient counselling, in a diverse range of patient case studies.
- Dispense mock prescriptions in accordance with legal, clinical, administrative and ethical requirements.
- Create and present a dissertation on an assigned topic that demonstrates critical assessment of relevant literature.

COURSE OUTLINE:

LECTURES (33 hours)		**Lecturer**
1	Clinical skills and dissertation	MH
2-5	Misuse of drugs legislation	SR
6-8	Animal remedies legislation	SR
9-10	Poisons legislation	SR
11	Data protection legislation	SR
12	Clinical trials legislation	SR
13-14	Health and safety legislation	SR
15-17	Dispensing procedures, medication errors and risk management	KR
18	Epidemiology and descriptive data	MH
19	Epidemiology, causation and investigative methods	MH

20	Public health and antibiotic usage, resistance and policies	MH
21	Case studies and case control studies	MH
22	Cohort studies	MH
23	Clinical trials	MH
24	Clinical trials and meta-analysis	MH
25	Risk estimation	MH
26	Pharmacoepidemiology and pharmacovigilance	MH
27	Health service organisation and drug use control	MH
28	Evidence-based assessment of information	MH
29	Pharmacy, pharmaceutical and medicines databases, and JS dissertation	MH
30-33	Pharmacoeconomics and health economics: costs, benefits and analysis techniques	TG

PRACTICAL CLASSES / WORKSHOPS (35 hours)

Health economics and pharmacoeconomics (2h)	TG
Dispensing and patient care 3.1: Controlled drugs (2h)	SR/KR/CR/TG
Dispensing and patient care 3.2: Methadone and emergency supply of controlled drugs (2h)	SR/KR/CR/TG
Dispensing and patient care 3.3: Veterinary prescriptions and requisitions (2h)	SR/KR/CR/TG
Dispensing and patient care 3.4: Veterinary cascade, midwife's written order, data protection (2h)	SR/KR/CR/TG
Dispensing and patient care 3.5: Hospital dispensing (2h)	SR/KR/CR/TG
Dispensing and patient care 3.6: Compliance devices and promotion of compliance (3h)	CR/KR
Dispensing and patient care 3.7: Ophthalmic, nasal and aural medicinal products (2h)	CR
Dispensing and patient care 3.8: Quality, safety and risk management (2h)	CR
Dispensing and patient care 3.9: Practical examination (1h; examination duration: 50 mins)	SR/KR/CR/TG
Clinical skills 3.1 – Counselling patients on POMs (3h)	TG
Clinical skills 3.2 – Counselling patients on OTCs (3h)	MH
Clinical skills 3.3 – Clinical interviewing and responding to symptoms (3h)	MH
Clinical skills 3.4 – Integrated clinical case studies (3h)	TG
Preparation for objective structured clinical examination (OSCE) (2h)	MH/SR/KR/CR/TG
Assessment by OSCE (1h)	MH/SR/KR/CR/TG

TUTORIALS (3 hours)

Dispensing and patient care 3.1 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 3.2-3.3 feedback (1h)	SR/KR/CR/TG
Dispensing and patient care 3.4-3.5 feedback (1h)	SR/KR/CR/TG

DISSERTATION

Literature review and critical analysis of topic associated with the JS course (3,000 word essay)	MH/guided study

EXTRA-CURRICULAR COURSE WORK

Work placement – Students are required to undertake four weeks of practice experience in a community or hospital pharmacy setting and to complete a report for submission before the start of the following academic year.

ASSESSMENT

Each component must be passed (see notes below)	Weighting
Written examination: 1.5 hours. 1 essay (from choice of 2) and 40 MCQs (no choice, negative marking)	70% of total marks
Dispensing and patient care – worksheets : practical exam (70:30) Minimum 60% in worksheets and Minimum 60% in practical exam (50 mins, 2 cases, no choice)	10% of total marks
Dissertation	20% of total marks
Clinical skills evaluation – satisfactory/unsatisfactory	---
Health economics/pharmacoeconomics evaluation – satisfactory/unsatisfactory	---
OSCE and reflection – satisfactory/unsatisfactory	---
Work placement report – satisfactory/unsatisfactory	---

NB: Students will be expected to draw upon clinical skills gained in this module when undertaking the Clinical Pharmacy Assessment that forms part of the evaluation for modules PH3009A, PH3010 and PH3011. Pharmacy legislation and all aspects of clinical skills/dispensing/patient care are also examinable in 4th year (XPH40061; dispensing evaluation).

SUMMARY OF HOURS (Excludes work placement)

Lectures	Practicals/ workshops	Tutorials	Total contact	Practical reports	Guided study	TOTAL	ECTS
33	35	3	71	15	39	125	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

Continuous assessment exercises for this module must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose where applicable. Work submitted late will not be assessed unless a valid reason is provided, and permission for late submission should be obtained in advance of the submission deadline from the staff member responsible for the continuous assessment component. Where late work is accepted for assessment, the marks available may be capped at the pass mark.

In common with other modules for the pharmacy degree, attendance at all scheduled classes for this module is compulsory. A student who is unable to attend a class for any reason must notify his/her tutor of the reason for absence without delay, and present certification as appropriate. However, all continuous assessment components must be completed even if the student is absent for a valid reason. It is the student's responsibility to obtain details of the assessment for the missed class(es) from the relevant staff member without delay, and to complete it on a self-study basis. The deadline for submission of the completed assessment to the relevant staff member is five days from the student's return to College (return date notified to staff member by tutor, based on certification as appropriate) unless otherwise agreed in advance with the relevant staff member. Where feedback on the assessment has already been provided to the class prior to submission, marks may be capped at the pass mark. See above for late submissions.

Students must satisfy the examiners in each component of the module independently. Examination marks may be withheld and/or a student may be refused permission to progress with his/her class until he/she has satisfied the examiners in all components of the module. This may necessitate sitting a supplemental examination and/or repetition/(re)submission of one or more continuous assessment components (including submission of one or more alternative exercises that have been set to replace failed/missed continuous assessment components). In such circumstances, the marks available for the supplemental examination and/or continuous assessment component(s) may be capped at the pass mark.

Furthermore, students who have not fulfilled the module requirements with regard to attendance and/or coursework may be reported to the Senior Lecturer as non-satisfactory for one or more terms. Students reported as non-satisfactory for the Michaelmas and Hilary terms may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat the year.

Because of the importance accorded to this aspect of the course by the PSI, who accredit the degree, it is not possible to compensate in this module.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, *etc*.).

PHARMACEUTICAL BIOTECHNOLOGY II

Year 3 (Junior Sophister) **Course Code: PH3008**

Staff of School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof C. Ehrhardt (CE), Asst. Prof J.F. Gilmer (JG), Asst. Prof F. Boylan (FB), Asst. Prof S. Ryder (SR), Asst. Prof L. O' Driscoll (LOD), Dr. D. Finlay (DF)

Coordinator: Asst. Professor Lorraine O' Driscoll (LOD)

AIMS: To enhance the students understanding of the contribution of biotechnology to the development of therapeutics, outlining how bio-therapeutics are derived in the context of associated safety and quality systems. This course also considers the delivery and pharmacology of key bio-therapeutics, providing an overview of the bio-therapeutics value chain i.e. the route from discovery to the patients.

PRE-REQUISITES: Pharmaceutical Biotechnology I (PH2008),Pharmaceutical Analysis (PH2003), Cell and Molecular Biology (BY1101)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Demonstrate an understanding of the major therapeutic applications and categories of biopharmaceuticals
- Explain how biotech products work in the body and their disposition and dosing
- Recall how therapeutic proteins are purified and formulated
- Explain how biological products are defined in law, regulated and qualified for release
- Demonstrate knowledge of specific professional issues arising in the use of biotech products in pharmacy practice
- Outline potential future directions in this rapidly changing area.

COURSE OUTLINE

LECTURES		**Lecturer**
1	Biotherapeutics: value chain from discovery to pharmacological intervention.	LOD
2	Development of antibodies as diagnostics & therapeutics	LOD
3	Examples of Clinical Application of mAbs & their pharmacology	LOD
4-8	Downstream processing	DF
9-10	Formulation	CE
11	Delivery of biotherapeutics	CE
12	Pharmacology of recombinant proteins I (examples: hormones)	LOD
13	Pharmacology of recombinant proteins II (examples: ILs; GFs)	LOD
14	Enzymes: production & pharmacology	LOD
15	Vaccines: production & pharmacology	LOD
16	Other areas of therapeutic biotechnology & associated pharmacological implications (incl. cell therapy; stem cells) and pharmacology of biotherapeutic agents)	LOD LOD
17	Regulatory process for biotechs, definitions, biosimilars	JG
18	ICHQ6B Protein Specification-, Protein ID, content	JG
19	Heterogeneity, purity & analytical approaches	JG
20	Safety- viral safety/contamination Q5A	JM
21-22	Plant biotechnology	FB
23	Pharmaceutical Biotechnology: Roadmap	LOD
24	Pharmaceutical Biotechnology: Future Prospects	LOD

Factory Visit to Wyeth Biopharma

Clinical Use Tutorial SR

ASSESSMENT
Written paper - 2hrs - essay-type questions, short questions and MCQ's

DIRECTED READING
Pharmaceutical Biotechnology, 2nd ed.,Crommelin DJA, Sindelar RD
Medical Biotechnology, ed. Pongracz J, Keen M
Biopharmaceuticals-Biochemistry and Biotechnology, 2nd ed., Walsh G
Crommelin, et al 'Pharmaceutical evaluation of biosimilars*. Eur. J Hosp Pharm Sci* 11 (1): 11-17, 2005

SUMMARY OF HOURS

Lectures	Factory Visits	Tutorials	Total Contact	Visit write-ups	Guided + private study	Total	ECTS
24	3	3	30	3	72	105	5

ENDOCRINE & REPRODUCTIVE PHARMACOLOGY AND VETERINARY PHARMACY

Year 3 (Junior Sophister) **Course Code: PH3009**

Staff of School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. M. Henman (MH), Asst. Prof F. Boylan (FB), Asst. Prof. L. O' Driscoll (LOD), Asst. Prof N. Frankish (NF), Assoc. Prof T. Grimes (TG), Assist. Prof. M.J. Santos-Martinez (MS)
External contributors: Ms C. Garvan (CG), Mr. G. Barrett (GB), Prof. P. Deasy (PBD)

Coordinator: Asst. Professor Lorraine O' Driscoll (LOD) (PH3009A);
Assoc. Professor Anne Marie Healy (PH3009B)

This module consists of two separate units:

PH3009A: Endocrine & Reproductive Pharmacology

AIMS: To provide the student with a knowledge of the health sciences relevant to the use of drugs and medicines in endocrinology and reproductive endocrinology.

PH3009B: Veterinary Pharmacy

AIMS: To provide a review of aspects of veterinary physiology and pharmacology, veterinary formulation and use of veterinary medicines.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Discuss the abnormal functioning of the endocrine system, the tests and procedures used to assess those conditions and the role of drugs in the treatment of endocrine-related conditions
- Describe the pathology/symptoms, test & treatment for the different forms of diabetes
- Explain the use of show an ability to use, the drug delivery devices and monitoring devices associated with the treatment of diabetes
- Describe normal bone metabolism, of osteoporosis, Paget's disease and hypercalcaemia, and their treatment
- Discuss the physiology and pathology of the reproductive system, including the actions and uses of drugs in the treatment of menstrual disorders, infertility, menopausal symptoms and as contraceptive preparations
- Apply knowledge to individual patient case studies
- Demonstrate delivery of pharmaceutical care as a member of a team
- Describe comparative anatomy & physiology & veterinary pharmacology
- Discuss formulation aspects of selected veterinary medicinal products
- Discuss aspects of veterinary Pharmacy in practice

PH3009A

LECTURES		**Lecturer**
1	Introduction to Endocrinology	LOD
2	Mechanisms of hormone action	LOD
3-5	Hypothalamus & pituitary gland; abnormalities, test and treatment	LOD
6	Thyroid & parathyroid glands; abnormalities, test and treatment	LOD
7-8	Bone metabolism & metabolic disease	FB
9-10	Reproductive endocrinology	FB
11	Endocrine pancreas	LOD
12	Type 1 diabetes: including symptoms & test	LOD
13	Type 2 diabetes: including symptoms & test	LOD
14	Insulins: formaulations & delivery	LOD
15	Oral hypoglycaemics	LOD
16-17	Growth & Growth Hormone; abnormalities, test and treatment	LOD
18-19	Adrenal gland; abnormalities, test and treatment	LOD
20	Hormones of the GI; abnormalities, test and treatment	LOD
21	Hormones of the pineal gland; abnormalities, test and treatment	LOD
22-23	Hormonal contributions to malignancy & associated treatment	LOD

SEMINARS (2 hours)

Drugs & devices for treatment of Diabetes	MH

CASE STUDIES (16 hours total)

Clinical Case Study 1	TG/FB
Clinical Case Study 2	TG/LOD
Clinical Case Study 3	TG/FB
Clinical Case Study 4	TG/LOD

TUTORIALS (4 hours total)

Feedback on case study 1	TG/FB
Feedback on case study 2	TG/LOD
Feedback on case study 3	TG/FB
Feedback on case study 4	TG/LOD

DIRECTED READING – will be indicated, as relevant at each lecture

ENDOCRINE & REPRODUCTIVE PHARMACOLOGY ASSESSMENT

(i) Continuous assessment –assignments. (20%)
(ii) Clinical Pharmacy Assessment* (10%)
(iii) Written paper (70%)- 2hrs including both:
Essay-type questions (choice 2 questions out of 3 to be answered; 40%) + 15 MCQ questions (no choice; 30%)

*Clinical Pharmacy Assessment (Coordinator: Asst. Prof. M.J. Santos-Martinez)

This assessment will take place in Hilary Term. It is an "open book" examination that includes case studies based on topics covered in all Pharmacology modules (PH3009A, PH3010 and PH3011). Students are required to demonstrate knowledge and understanding of the case study (including clinical pharmacology and practice of pharmacy: management and goals of therapy for a given disease state; parameters to be monitored/assessed; mechanism of action, side effects, contra-indications and/or interactions of therapeutic agents; patient/carer counselling).
The pass mark for each Pharmacology module is 40%. The pass mark for the Clinical Pharmacy Assessment is 40%. It is a requirement to pass both the written examination in each module and the Clinical Pharmacy Assessment. The Clinical Pharmacy Assessment contributes 10% to the final mark for each module.

SUMMARY OF HOURS

Lectures	Seminars	Case Studies	Tutorials	Total contact	Guided study	Total	ECTS
23	2	16	4	45	55	91	4

PH3009B
COURSE OUTLINE: & LECTURER

1-2	Comparative anatomy & physiology	NF
3-7	Veterinary pharmacology	NF
8-9	Formulation of pharmaceutical veterinary preparations	PBD
10	Veterinary medicines legislation	CG

SEMINARS

Veterinary Pharmacy in community practice	GB

DIRECTED READING

Veterinary Pharmacy, Kayne SB & Jepson MH, Pharmaceutical Press, 2004

VETERINARY PHARMACY ASSESSMENT

MCQ/short answer question examination (1 hr paper, no choice)

NB. Veterinary medicines legislation is also examinable in modules PH3006 and PH4006.

SUMMARY OF HOURS

Lectures	Tutorials	Seminars	Total Contact	Guided + private study	TOTAL	ECTS
10	-	1.5	11.5	12.5	24	1

Please note: students must pass each unit of this module. The pass mark for each unit is 40%.

RESPIRATORY AND GASTROINTESTINAL PHARMACOLOGY

Year 3 (Junior Sophister) **Course Code: PH3010**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. C. Medina (CM), Asst. Prof. M.J. Santos-Martinez (MS), Assoc. Prof. T. Grimes (TG)

Coordinator: Asst. Professor Carlos Medina & Assoc. Professor Tamasine Grimes

AIMS: Students will learn basic pathophysiological principles of inflammatory, gastrointestinal and respiratory tract diseases and acquire the knowledge of pharmacological use of drugs used in these conditions.

PRE-REQUISITES: Completion of Year 2

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the basic anatomy and physiology of lungs and gastrointestinal tract
- Demonstrate the ability to recognise respiratory and gastrointestinal clinical symptoms
- Differentiate and classify several respiratory and gastrointestinal diseases
- Explain the mechanism of action of the different drugs used for the treatment of all those conditions
- Apply knowledge in advising and counselling patients with respiratory and gastrointestinal symptoms and make appropriate responses to presented symptoms
- Apply knowledge to individual patient case studies.
- Demonstrate deliver pharmaceutical care as a member of a team.

COURSE OUTLINE:	**LECTURER**
1. Introduction to respiratory pharmacology	MS
2. Bronchodilators I	MS
3. Bronchodilators II	MS
4. Cromones and corticosteroids	MS
5. Leukotriene antagonists and omalizumab	MS
6. Anti-histamines and decongestants	MS
7. Allergen immunotherapy	MS
8. Antitussives, mucolytics, expectorants and pulmonary surfactants	MS
9. Asthma	MS
10. COPD	MS
11. Introduction to clinical case studies	TG
12. Introduction to gastrointestinal pharmacology	CM
13. Control of acid secretion	CM
14. Cytoprotective agents	CM
15. Antacids	CM
16. Histamine receptor antagonists	CM
17. Proton pump inhibitors	CM
18. Peptic ulcer disease	CM
19. NSAIDs-related ulcers	CM
20. GORD	CM
21. Anti-emetics	CM
22. Constipation	CM
23. Diarrhoea	CM
24. Irritable Bowel Syndrome	CM
25. Inflammatory bowel disease I	CM
26. Inflammatory bowel disease II	CM
27. Coeliac disease	CM
28. Alimentary Allergies & Lactose intolerance	CM
29. Liver pharmacology I	CM
30. Liver pharmacology II & Haemochromatosis	CM
31. Pancreas and biliary tree	CM
32. Cystic fibrosis	CM
33. Pharmacological Research	CM

CASE STUDIES (20 hours total)

Gastrointestinal pharmacology	TG
• Upper GI	
• Lower GI	
• Liver & Pancreas	
Respiratory pharmacology	TG
• Asthma	
• COPD	

TUTORIALS (5 hours total)

Feedback on case study 1	TG
Feedback on case study 2	TG
Feedback on case study 3	TG
Feedback on case study 4	TG
Feedback on case study 5	TG

DIRECTED READING – will be indicated, as relevant at each lecture

ASSESSMENT	Weighting
MCQs	40% of total marks
Essay questions	30% of total marks
Continuous assessment	20% of total marks
Clinical Pharmacy Assessment*	10% of total marks

*Clinical Pharmacy Assessment (Coordinator: Asst. Prof. M.J. Santos-Martinez)
This assessment will take place in Hilary Term. It is an "open book" examination that includes case studies based on topics covered in all Pharmacology modules (PH3009A, PH3010 and PH3011). Students are required to demonstrate knowledge and understanding of the case study (including clinical pharmacology and practice of pharmacy: management and goals of therapy for a given disease state; parameters to be monitored/assessed; mechanism of action, side effects, contraindications and/or interactions of therapeutic agents; patient/carer counselling).
The pass mark for each Pharmacology module is 40%. The pass mark for the Clinical Pharmacy Assessment is 40%. It is a requirement to pass both the written examination in each module and the Clinical Pharmacy Assessment. The Clinical Pharmacy Assessment contributes 10% to the final mark for each module.

SUMMARY OF HOURS

Lectures	Case Studies	Tutorials	Total contact	Guided study	Total	ECTS
33	20	5	58	50	108	5

BLOOD, CARDIOVASCULAR AND RENAL PHARMACOLOGY

Year 3 (Junior Sophister) **Course Code: PH3011**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M. Radomski (MR), Asst. Prof. N. Frankish (NF), Assoc. Prof. T. Grimes (TG), Asst. Prof M.J. Santos-Martinez (MS)

Coordinator: Asst. Professor Neil Frankish

AIMS: The student will acquire a knowledge of pharmacology relevant to the use of drugs and medicines in cardiovascular and thrombotic conditions and oedematous states.

PRE-REQUISITES: Completion of Year 2

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the underlying pathology and aetiology of the varying forms of cardiovascular disease.
- Explain the various risk factors and how lifestyle behaviour can influence cardiovascular disease.
- Classify drugs used to treat cardiovascular disease and
- Describe their mechanism of action, their adverse effects and potential drug interactions and their clinical use.
- Describe the pathophysiology of the different forms of anaemia and their treatment
- Describe pathology and treatment of renal diseases and the use of diuretics
- Describe the physiology of lipid metabolism, the role of lipids in atherosclerosis and how drugs modify lipid metabolism and the clinical outcomes of atherosclerosis
- Describe pharmacology and clinical treatment of diseases associated with vascular thrombosis
- Apply knowledge to individual patient case studies.
- Demonstrate delivery of pharmaceutical care as a member of a team.

COURSE OUTLINE:

CARDIOVASCULAR PHARMACOLOGY

LECTURES		**Lecturer**
1.	Basic cardiovascular pharmacology	NF
2.	Renin-angiotensin system	NF
3.	Circulation and cardiac function	NF
4.	Circulation and cardiac function	NF
5.	Dysrhythmias	NF
6.	Dysrhythmias	NF
7.	Angina	NF
8.	Angina	NF
9.	Antihypertensive drugs	NF
10.	Antihypertensive drugs	NF
11.	Hypertension	NF
12.	Drugs used to treat congestive heart failure	NF
13.	Drugs used to treat congestive heart failure	NF
14.	Anaemia	NF
15.	Anaemia	NF
16.	Anaemia	NF
17.	Renal physiology and pathology	MR
18.	Diuretics	MR
19.	Diuretics	MR
20.	Lipids	MR
21.	Lipid-lowering drugs	MR
22.	Lipid-lowering drugs	MR
23.	Haemostasis and thrombosis	MR
24.	Anti-platelet drugs	MR
25.	Anticoagulants and fibrinolytics	MR
26.	Antithrombotics: clinical case studies	MR
27.	Platelet research	ANO

CASE STUDIES (8 hours total)

Cardiovascular pharmacology: case studies 1	TG
Cardiovascular pharmacology: case studies 2	TG

SEMINARS (4 hours total)

Renal function and diuretics	MR
Anti-thrombotic therapy case studies.	MR

TUTORIALS (4 hours total)

Feedback on CV case study 1	TG
Feedback on CV case study 2	TG
Feedback on Renal function case study	TG
Feedback on Anti-thrombotic case study	TG

DIRECTED READING – will be indicated, as relevant at each lecture

ASSESSMENT

Written examination - 2 hours (100 MCQ questions)	70% of total marks
Continuous Assessment	20% of total marks
Clinical Pharmacy Assessment*	10% of total marks

*Clinical Pharmacy Assessment (Coordinator: Asst. Prof. M.J. Santos-Martinez)
This assessment will take place in Hilary Term. It is an "open book" examination that includes case studies based on topics covered in all Pharmacology modules (PH3009A, PH3010 and PH3011). Students are required to demonstrate knowledge and understanding of the case study (including clinical pharmacology and practice of pharmacy: management and goals of therapy for a given disease state; parameters to be monitored/assessed; mechanism of action, side effects, contra-indications and/or interactions of therapeutic agents; patient/carer counselling).
The pass mark for each Pharmacology module is 40%. The pass mark for the Clinical Pharmacy Assessment is 40%. It is a requirement to pass both the written examination in each module and the Clinical Pharmacy Assessment. The Clinical Pharmacy Assessment contributes 10% to the final mark for each module.

SUMMARY OF HOURS

Lectures	Seminars	Case Studies	Tutorials	Total contact	Guided study	Total	ECTS
27	4	8	4	43	65	108	5

SENIOR SOPHISTER (4th Year)

Module details may be subject to corrections/amendments.

- *It is each students responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*

- *Reports, continuous assessments and laboratory notebooks must be presented for assessment by the date specified by the examiner.*

- *Reports, continuous assessments and laboratory notebooks submitted after the specified date will not be assessed unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

PRE-REQUISITES: Completion of the Junior Sophister Year (Year 3)

MEDICINAL AND PHARMACEUTICAL CHEMISTRY IV:
Year 4 (Senior Sophister) **Course Code: PH4002**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M.J. Meegan (MM); Asst. Prof. J. Quigley (JQ), Asst. Prof. J. Gilmer (JG), Asst. Prof. A. Sasse (AS); Dr. C. O'Donohoe (CO'D)

Coordinator: Professor Mary J. Meegan

AIMS: The aims of this course are to provide the student with an understanding of the role of pharmaceutical chemistry in contemporary drug design, discovery and development. The course provides a comprehensive overview of the concepts of modern medicinal chemistry as applied to selected major therapeutic drug classes and an introduction to the concepts and uses of prodrugs for enhanced delivery of drugs.

PRE-REQUISITES: Medicinal & Pharmaceutical Chemistry III (PH3002) and Natural Source of Drugs and Medicines (PH3003)

LEARNING OUTCOMES: On successful completion of the module the student should be able to:
- Discuss the general principles and applications of modern drug design
- Explain the pharmaceutical chemistry basis of current prodrug design and use
- Describe the molecular mechanism of action of antiviral and anticancer drugs and process of new drug development in these areas
- Summarise the regulatory requirements for characterization and specification of pharmaceutical materials
- Explain the relevance of pharmaceutical chemistry in the pharmaceutical industry and in drug development
- Demonstrate competence in specialised practical laboratory techniques used in the analysis of pharmaceutical products.

COURSE OUTLINE

LECTURES

Unit PH4002A: Drug discovery and design; Advanced quantitative structure-activity relationships and related topics: 7 lectures (JQ)
1. The Bilinear Model; Introduction, The McFarland Model
2. log P_0 (π_0)/ Transport Rate Constants
3. Three-dimensional Structure : topological Indices
4. Craig Plots
5. The Topliss scheme
6. Principal Component Analysis
7. The Free-Wilson Method

Unit PH4002 B: Prodrugs: 7 lectures (JQ)
1. Carboxyl Groups; Ampicillin prodrugs, Butyric acid prodrugs, Cytodifferentiation in neoplastic cells, examples
2. Hydroxy derivatives: Timolol prodrugs, Introduction
3. Timolol Prodrugs: degradation Kinetics
4. N-Mannich bases: Structural effects on decomposition
5. N-Hydroxyalkyl and N-Acyloxyalkyl derivatives
6. Prodrugs of 5-fluorouracil: examples
7. Prodrugs of 5-fluorouracil: Lipophilicity & solubility data

Unit PH4002C: Agents acting on DNA; Medicinal chemistry of antiviral and anticancer pharmaceuticals: 10 lectures (MM)
1. Nucleoside and non-nucleoside antiviral agents active against DNA viruses
2. Production and stability of agents active against DNA polymerase
3. Nucleoside antiviral agents active against RNA viruses

4. Design, structure and function of clinical antiretroviral agents
5. Mechanism of action of protease inhibitors and antisense oligonucleotides
6. Mechanism of action and molecular targets for anticancer drugs; Alkylating agents and related drugs; stability and analogue design
7. Cisplatin and related organometallic agents
8. Intercalating agents, topoisomerase targeting and DNA chain cutting agents
9. Antimetabolite and hormone based anticancer agents
10. Antimitotic agents; current clinical drugs and future potentially useful drugs

Unit PH4002D: Drug Development and Regulatory Affairs (AS, JG, JQ, MM) (10 lectures)
Regulatory affairs: Stability of drug substances and drug products (AS) (6 lectures)
1. ICH Q1 – Stability testing
2. Developing a stability indicating analytical method
3. Prediction of degradation pathways of drugs
4. Stress testing & forced degradation
5. Evaluation of stability data
6. Photostability testing

Advanced spectroscopic characterisation methods for drug substances (JG, AS), (2 lectures)
Methods in drug discovery: Ligand and Structure based drug design: (MJM), (1 lecture)
Computer aided drug design: molecular modeling and review of calculation of molecular properties (JQ/CO'D), (1 lecture).

PRACTICALS (12 hours)
1. Analytical methods for penicillins (MJM)
2. Structure/activity case studies: Determination of partition and transport rate constants for drugs (JQ)
3. Insulin studies (JG)
4. Product evaluation (AS)

DIRECTED READING
The organic chemistry of drug design and drug action. Silverman, Richard B. 2nd Ed. Amsterdam; London : Elsevier Academic Press, Second Edition, 2004.
Principles of Medicinal Chemistry; Foye, Lemke and Williams; 6th Edn. , Lippincott Williams & Wilkins, 2008
An Introduction to Medicinal Chemistry, G. L. Patrick , 4th Edn, Oxford University Press, 2009

ASSESSMENT	Weighting
Written Examination Paper: 3 Hours; 5 questions to be answered out of 5 (Some internal choice may be available)	75% of total marks
Practical:	25% of total marks

The practical mark is based on final reports (15%) and practical test (10%).
The practical test of 1 hour duration is held in the Michaelmas Term and takes the form of short answer or true/false questions based on the theory underlying the relevant practical classes of the Junior Sophister and Senior Sophister years.

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

SUMMARY OF HOURS

Lectures	Seminars/ Practicals	Total contact	Practical write-ups	Guided Study	TOTAL	ECTS
34	12	46	8	60	114	5

ECTOPARASITICIDES, NATURAL REMEDIES AND COMPLEMENTARY MEDICINE

Year 4 (Senior Sophister) **Course Code: PH4003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof F. Boylan (FB), Asst. Prof. A.Sasse (AS), Asst. Prof. H. Sheridan (HS)

External Contributors: Practitioners of CAM

Coordinator: Asst. Professor Helen Sheridan

Aims: *In section A* of this module the students will learn about human ectoparasite infestation (lice, scabies), the products used to treat infestation and the community response to infection outbreak. They will also learn about the significance of ectoparasite infection and disease transmission in the global context. *In Section B* of this module will provide the students with a detailed knowledge of Alternative Medicines and Traditional Herbal Medicines. The students will learn the differences between conventional medicines and complementary alternative medicines (CAM). In addition this course also provides the students with an overview of The European regulatory framework for Herbal Medicinal Plants (HMP's), the importance of traditional Medicine in Global Health and the Millennium Development Goals (MDGs), the TRIPs agreement and bio-piracy as relating to traditional Medicinal Knowledge. The students will also be receiving three workshops to support the lectures they have received, including a practical Introduction to Yoga and Meditation.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Explain the main types of human ectoparasite infestation.
- Advise on and critically assess the products used to treat and protect against ectoparasite infection.
- Analyse and critically assess the procedures for the control of infestation in residential care and acute hospital settings.
- Understand the importance of ectoparasite control in the context of disease transmission.
- Explain the conceptual differences between conventional medicine and CAM.
- Describe the nature of therapies such as Reiki, Shiatsu, Naturopathy etc.
- Discuss the concepts underlying Homoeopathy.
- Explain differences between Medical Herbalism and Rational Phytotherapy.
- Evaluate the phytochemical, phytopharmacological and clinical evidence base for the efficacy of Herbal Medicinal Products (HMPs) used in Rational Phytotherapy.
- Evaluate the evidence base for the safety of HMPs, including drug-herb interactions.
- Understand current legislation relating to HMPs.
- Be familiar with the increasing importance of Traditional Medicine and its position in The Millennium Development Goals.
- Be aware of the importance of the TRIPs agreement and bio-piracy in Traditional Medicine.

COURSE OUTLINE

LECTURES	**Lecturer**
PH4003: Section A	
ECTOPARASITICIDES	
Introduction	HS
Human ectoparasites: Head lice, body lice and pubic lice (2)	HS
Human ectoparasites: Treatment and control of human ectoparasites.	HS
Scabies: Treatment and control	HS
Veterinary aspects of ectoparasite control	HS
Ectoparasites and Transmission of disease	HS
Insect repellents	HS

PH4003: Section B
NATURAL REMEDIES, COMPLEMENTARY MEDICINE

Rational phytotherapy: Central Nervous System	FB
Rational phytotherapy: The Respiratory System	FB
Rational phytotherapy: The Digestive System	FB
Rational phytotherapy: The Cardiovascular System	FB
Rational phytotherapy: The Urinary System	FB
Case studies in phytotherapy (1, 2)	FB
CAM: definitions, types and concepts	FB
CAM: uses	FB
CAM: Clinical evidence for the different types of CAM.	FB
Evidence base of ADR's (1, 2)	FB
The European regulatory framework (HMP's 1, 2)	HS
Traditional Medicine, Global Health and MDG's	HS
The TRIPS agreement and Bio-piracy	HS

WORKSHOPS

Workshop on Preventive Medicine:		
An Introduction to Yoga and Meditation	(2 hours)	AS
Workshop on an aspect of CAM.	(2 hours)	External
Workshop on an aspect of CAM.	(2 hours)	External

DIRECTED READING

Ectoparasiticides: Selected reading material will be given to students.
Kayne SB *Complementary Therapies for Pharmacists*. Pharmaceutical Press, London, 2002
Ernst E, Pittler M, Wider B. *The Desktop Guide to Complementary and Alternative Medicine – an Evidence-based Approach.* 2nd Edn. Mosby Elsevier, 2006
Kayne SB *Homeopathic Pharmacy*. 2nd Edn., Elsevier Edinburgh, 2006
Barnes J, Anderson L & Phillipson JD. *Herbal Remedies*. 2nd Edn., Pharmaceutical Press, London, 2002
HMP's, TRIPs, MDG's: Selected reading material will be given to students.

ASSESSMENT

Two and a half hour exam in Semester 2: Short essay type questions and MCQ's

SUMMARY OF HOURS

Lectures	Workshops/Practicals	Total contact	Guided study	TOTAL	ECTS
23	6	29	71	100	5

ADVANCED DRUG DELIVERY

Year 4 (Senior Sophister) **Course Code: PH4004**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. C. Ehrhardt (CE), Assoc. Prof. A. M. Healy (AMH), Asst. Prof. D. D'Arcy (DD), Asst. Prof. L. Tajber (LT), Prof. M.J. Meegan (MM)

Coordinator: Assoc. Professor Carsten Ehrhardt

AIMS: To provide an overview on advanced drug delivery strategies, alternative routes of drug absorption for local and systemic delivery, including nucleic acid delivery. To familiarise the students with the anatomical and patho(physiological) particularities of those pathways, and *in vitro* models mimicking the respective biological barriers. To give an introduction to molecular pharmaceutics, including drug transporter biology and metabolic enzymes.

LEARNING OUTCOMES: On successful completion of this module, the student will be able to:

- Appreciate the impact of drug transporters and metabolic enzymes on limiting/enhancing drug bioavailability
- Recall alternative routes of systemic drug delivery
- Recall of the anatomical and patho(physiological) particularities of epithelial barriers of the skin, gastrointestinal tract and respiratory system.
- Appreciate basic principles of nucleic acid therapy and delivery.
- Recall the use of advanced polymers in drug delivery science.
- Recall the biopharmaceutical, formulation and manufacturing aspects of advanced delivery systems

PRE-REQUISITES: Pharmaceutical Biotechnology I-II, Anatomy and Physiology, JF-, SF-, JS-Pharmacology

COURSE OUTLINE:		**LECTURER**
1-4	Design of drug delivery systems	DD
5, 6	Advanced polymers, polymers as drug carrier systems	MM
7-9	Particle manufacture in the design of advanced solid dosage forms	LT
10	Anti-sense technology	MM
11-14	Gene therapy	CE
15	*In vitro* methods for drug absorption studies	CE
16	Drug disposition after oral administration	CE
17-18	Drug transporters and efflux pumps	CE
19	Metabolic enzymes	CE
20	Biopharmaceutics Classification System	CE
21-23	Transdermal drug delivery	CE
24	Nasal drug delivery	CE
25-26	Pulmonary drug delivery	CE
27	Mucosal (buccal, vaginal) drug delivery	CE
28	Ocular drug delivery	CE
29-32	Inhalation aerosols	AMH

DIRECTED READING (A selection from the following)

- Williams AC *Transdermal and topical drug delivery*, Pharmaceutical Press, London, 2003
- Physicochemical Principles of Pharmacy, Florence and Atwood, 4th Edition, Pharmaceutical Press.
- Martin's Physical Pharmacy and Pharmaceutical Sciences 5th Ed. LWW
- *Pharmaceutics* 3rd Edition, ME Aulton (ed.), Churchill Livingstone, 2007
- Tukker JJ *In vitro* methods for the assessment of permeability, in JB Dressman and H Lennernas (ed.) *Oral drug absorption - prediction and assessment*, Marcel Dekker,2000

ASSESSMENT

Written theory paper: 2 hours; MCQ and short answer questions; all to be answered

SUMMARY OF HOURS

Lectures	Practicals	Total contact	Guided study	TOTAL	ECTS
32	0	32	70	102	5

PHARMACOKINETICS, PHARMACODYNAMICS, BIOPHARMACEUTICS AND DRUG METABOLISM

Year 4 (Senior Sophister) **Course Code: PH4005**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M. J. Meegan, (MM), Asst. Prof D. D'Arcy (DD)

Coordinator: Asst. Professor Deirdre D'Arcy

AIMS: To provide a course on pharmacokinetics with its implications for the design and usage of medicines.

PRE-REQUISITES: Introductory Pharmaceutics (PH1004), SF and JS modules in Pharmaceutics & Pharmaceutical technology, Pharmaceutical chemistry and Pharmacology

LEARNING OUTCOMES:

Learning outcomes PH 4005A. On successful completion of this module the student will be able to:
- Explain the rationale for employing different pharmacokinetic models to interpret biopharmaceutical data.
- Employ appropriate pharmacokinetic equations to calculate basic pharmacokinetic parameters when presented with appropriate data.
- Describe basic approaches to pharmacodynamic modelling

Learning outcomes PH 4005B. On successful completion of this module the student will be able to:
- Describe methods used to investigate and determine bioavailability and bioequivalence
- Interpret the relevance of biopharmaceutical aspects of a drug or dosage form in a physiological context

Learning outcomes PH4005C. On successful completion of this module the student will be able to:
- Relate the principles of pharmacokinetics to the role of the pharmacist in provision of patient care
- Identify common clinical situations where therapeutic drug monitoring principles should be applied
- Apply provided empirical pharmacokinetic equations to selected clinical scenarios to optimise dosing regimens with an emphasis on clinical outcomes.

Learning outcomes PH 4005D. On successful completion of this module the student will be able to:
- Describe the common metabolic processes of drugs
- Predict the metabolic products formed by drugs
- Discuss the role of metabolism in the modern drug discovery process

COURSE OUTLINE

LECTURES

		Lecturer
Unit PH4005A: **Basic Pharmacokinetics**		
1.	Introduction 1 compartment bolus	DD
2.	AUC trapezoidal rule, clearance	DD
3.	1 compartment infusion and multiple dosing	DD
4.	Extravascular 1 compartment single dose and multi-dose	DD
5.	Amount absorbed versus time plots: Wagner-Nelson method	DD
6.	Two compartment model. Bolus IV injection	DD
7.	Physiological modeling and NCA	DD
8.	Pharmacokinetics concepts continue	DD
9.	Tutorial	DD
10.	Pharmacodynamics	DD

Unit PH4005B: **Biopharmaceutics**

11	Bioavailability determination	DD
12	Dissolution, bioequivalence and BCS	DD
13	Design of bioequivalence studies	DD
14	In vitro in vivo correlation	DD
15	Biowaivers and measuring dissolution profiles	DD
16	Effects of food on absorption	DD

Unit PH4005C: Clinical Pharmacokinetics

17	Introduction to clinical pharmacokinetics	DD
18	Role of renal function in pharmacokinetics	DD
19	Worked examples - Digoxin	DD
20	Role of hepatic function in pharmacokinetics- clearance and interactions	DD
21	Role of hepatic function in pharmacokinetics- hepatic disease and PK	DD
22	Worked examples- theophylline	DD
23	Anti-epileptics and non-linear pharmacokinetics-clinical applications	DD
24	Effects of ageing on pharmacokinetics	DD

Unit PH4005D: Drug Metabolism

25	The process of drug Metabolism and ADME; metabolic enzymes	MM
26	Phase I metabolism of drugs; the role of cytochrome P450;	MM
27	Phase II metabolism of drugs; conjugation and detoxification	MM
28	Metabolism studies in drug design and development	MM

PRACTICAL CLASSES

1 Basic Pharmacokinetics and Biopharmaceutics 1
2 Basic Pharmacokinetics and Biopharmaceutics 2
3 Basic Pharmacokinetics and Biopharmaceutics 3
4 Clinical Pharmacokinetics 1
5 Clinical Pharmacokinetics 2

TUTORIALS – One Tutorial on Pharmacokinetics

DIRECTED READING

Basic Pharmacokinetics, Jambhekar and Breen, Pharmaceutical Press 2009
Wagner, J.G. 1993. *Pharmacokinetics for the Pharmaceutical Scientist*. Technomic Publishing Company.

Clinical Pharmacokinetics, Dhillon and Kostrzewski, Pharmaceutical Press, 2006. Practically useful.
Clinical pharmacokinetics, Concepts and Applications, Rowland and Tozer, LWW. 4th ed 2011
Clinical pharmacokinetics handbook – Larry Bauer. McGraw Hill, 2006.
Concepts in Clinical Pharmacokinetics- 5th Ed., 2010, ASHP. **NB e-book Via Stat!Ref library database.**
British National Formulary – current edition
The pharmaceutical journal – 4 articles: 2004vol 272 pg. 769, pg.806, vol 273 pg. 153, pg. 188 (A Thomson).
Winter, M.E. *Basic Clinical Pharmacokinetics*. 5th Edition. Lippincott Wiliams & Wilkins.
Waiver of In Vivo Bioavailability and Bioequivalence Studies for Immediate-Release Solid Oral Dosage Forms Based on a Biopharmaceutics Classification System;
http://www.fda.gov/cder/guidance/3618fnl.htm
Chi-Yuan Wu and Leslie Z. Benet; Predicting Drug Disposition via Application of BCS; Pharm. Res. 22:11-23; 2005 Basic
EMEA, CHMP, London, 2010. Guideline on the investigation of bioequivalence.
Doc. Ref.: CPMP/EWP/QWP/1401/98 Rev. 1/ Corr **
FDA – Guidance for industry: Bioavailability and bioequivalence studies for orally administered drug products-general considerations
Amidon, GL, Lennernas, H, Shah, VP, Crison, JR. A theoretical basis for a biopharmaceutic drug classification: the correlation of in vitro drug product dissolution and in vivo bioavailability. Pharm Res., vol. 12, no. 3 1995
Relevant chapters of USP: 1088, 711.

FDA-Guidance for Industry-Dissolution testing of immediate release solid oral dosage forms (CDER 1997)
FDA-Guidance for Industry-Extended Release oral dosage forms: development, evaluation and application of in vitro in vivo correlations
FDA-Guidance for Industry-SUPAC-MR: modified release solid oral dosage forms
FDA-Guidance for Industry-SUPAC-IR: Immediate release solid oral dosage forms
EMEA-Note for guidance on quality of modified release products: A Oral dosage forms B Transdermal dosage forms Section 1 (Quality)
Pharmacokinetic and Pharmacodynamic data analysis: Concepts and applications 4th ed. Gabrielsson and Weiner. Swedish Pharmaceutical Press, 2000.
Gibaldi, M. 1990. *Biopharmaceutics and Clinical Pharmacokinetics.* 4th Edition. Lea & Febiger (UK) Ltd. Kent.
Wagner, J.G. 1979. *Fundamentals of Clinical Pharmacokinetics.* Drug Intelligence Publications.
Derendorf, H. & Meibohm, B. 1999. Modeling of Pharmacokinetic/Pharmacodynamic (PK/PD) Relationships: Concepts and Perspectives. *Pharmaceutical Research*. 16(2).

ASSESSMENT

Theory written paper: 3 hours, 3 questions to be answered out of 3 plus 20 MCQ to be answered	Weighting 80% of total marks
Continuous assessment of practical work	20% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Practical write-ups	Guided study	TOTAL	ETCS
28	15	1	44	8	65	117	5

PRACTICE OF PHARMACY IV-1

Year 4 (Senior Sophister) **Course Code: PH4006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof M. Henman (MH), Asst. Prof S. Ryder (SR), Assoc. Prof C. Roche (CR), Assoc. Prof T. Grimes (TG)
Teacher Practitioner: K. Rossi (KR)
External contributors: C. Keane (CK), E. Deasy (ED), J. Murray (JM)

Coordinator: Asst. Professor Sheila Ryder

AIMS: To bring together key topics in the Practice of Pharmacy and to provide the range of understanding and practical knowledge necessary for the student both to practice satisfactorily under present circumstances and to respond to changes in the requirements of the health service and the profession.

PRE-REQUISITES: See general pre-requisites for Senior Sophister year (page 88). This module is not available for selection by one-year international students.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Critically discuss the provisions of IMB legislation, medicinal products legislation, the Pharmacy Act and Pharmaceutical Society of Ireland Regulations, the law governing family planning, medical devices and methylated spirits, and relevant EU legislation.
- Explain the general principles of tort and of contract law.
- Integrate changes in legislation covered earlier in the degree course with his/her existing knowledge, and critically discuss their content and implications for pharmacy practice.
- Systematically collect and apply knowledge about patients, their conditions and their medicines, in order to provide and justify treatment recommendations and patient counselling, in a diverse range of patient case studies.
- Supply medicines in accordance with mock prescriptions and other appropriate documents, identifying and managing the legal, clinical, administrative, ethical and communication problems that are presented or that may arise after dispensing.
- Critically evaluate the ethical concepts underpinning professional dilemma scenarios, differentiate between professional and unprofessional action options, discuss the likely intentions underpinning questionable behaviours by pharmacists, and engage in collaborative learning, team work and group decision-making through a profession-specific dilemma.

COURSE OUTLINE:

LECTURES (19 hours)

1-6	Medicinal Products legislation and IMB Act	SR
7-11	Pharmacy Act, PSI Rules/Regulations, EU legislation	SR
12	Family planning legislation, methylated spirits legislation	SR
13-14	Legislation update	SR
15-16	Review and integration of legislation	SR
17	Law of contract	JM
18	Tort of negligence	JM
19	Ethics: Introduction to Intermediate Concept Measures (ICMs)	CR

PRACTICAL CLASSES / WORKSHOPS (16 hours)

Dispensing and patient care 4.1: Review (2h)	SR/KR/CR/TG
Dispensing and patient care 4.2: Review (2h)	SR/KR/CR/TG
Dispensing and patient care 4.3: Review (2h)	SR/KR/CR/TG
Dispensing and patient care 4.4: Review (hospital) (2h)	SR/KR/CR/TG
Dispensing and patient care 4.5: Review (2h)	SR/KR/CR/TG
Dispensing and patient care 4.6: Mock exam (1h; examination duration: 50 mins)	SR/KR/CR/TG
Ethics and professionalism: ICMs and the professional reasoning process (2h)	CR
Ethics and professionalism: Intentions and influences (1h)	CR
Ethics and professionalism: Exit DIT2, competencies and CPD (2h)	CR

TUTORIALS (7 hours)

Dispensing and patient care 4.1 feedback	SR/KR/CR/TG
Dispensing and patient care 4.2 feedback	SR/KR/CR/TG
Dispensing and patient care 4.3 feedback	SR/KR/CR/TG
Dispensing and patient care 4.4 feedback	SR/KR/CR/TG
Dispensing and patient care 4.5 feedback	SR/KR/CR/TG
Dispensing and patient care 4.6 feedback and open questions	SR/KR/CR/TG
Dispensing and patient care: open questions	SR/KR/CR/TG

CLINICAL ATTACHMENT (3 hours)

Clinical skills hospital attachment: medication history taking	MH/TG/ED/CK

ASSESSMENT

Each component must be passed	Weighting
Written examination:	80% of module marks
Section A - essay/extended response questions. Section B - MCQs. All questions are compulsory and students must independently pass both Section A and Section B.	
Dispensing and patient care – worksheets : practical evaluation (85:15)	10% of module marks
Minimum 60% in worksheets and	
Minimum 60% in dispensing and patient care practical evaluation	
Case presentation for clinical attachment – satisfactory/unsatisfactory	---
Ethics and professionalism assessments	10% of module marks

SUMMARY OF HOURS

Lectures	Practicals/workshops/ clinical attachment	Tutorials	Total contact	Practical reports	Guided study	TOTAL	ECTS
19	19	7	45	15	65	125	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

Continuous assessment exercises for this module must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose where applicable. Work submitted late will not be assessed unless a valid reason is provided, and permission for late submission should be obtained in advance of the submission deadline from the staff member responsible for the continuous assessment component. Where late work is accepted for assessment, the marks available may be capped at the pass mark.

In common with other modules for the pharmacy degree, attendance at all scheduled classes for this module is compulsory. A student who is unable to attend a class for any reason must notify his/her tutor of the reason for absence without delay, and present certification as appropriate. However, all continuous assessment components must be completed even if the student is absent for a valid reason. It is the student's responsibility to obtain details of the assessment for the missed class(es) from the relevant staff member without delay, and to complete it on a self-study basis. The deadline for submission of the completed assessment to the relevant staff member is five days from the student's return to College (return date notified to staff member by tutor, based on certification as appropriate) unless otherwise agreed in advance with the relevant staff member. Where feedback on the assessment has already been provided to the class prior to submission, marks may be capped at the pass mark. See above for late submissions.

Students must satisfy the examiners in each component of the module independently. Examination marks may be withheld and/or a student may be refused permission to progress with his/her class until he/she has satisfied the examiners in all components of the module. This may necessitate sitting a supplemental examination and/or repetition/(re)submission of

one or more continuous assessment components (including submission of one or more alternative exercises that have been set to replace failed/missed continuous assessment components). In such circumstances, the marks available for the supplemental examination and/or continuous assessment component(s) may be capped at the pass mark.

Furthermore, students who have not fulfilled the module requirements with regard to attendance and/or coursework may be reported to the Senior Lecturer as non-satisfactory for one or more terms. Students reported as non-satisfactory for the Michaelmas and Hilary terms may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat the year.

Because of the importance accorded to this aspect of the course by the PSI, who accredit the degree, it is not possible to compensate in this module.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities *etc*.).

PRACTICE OF PHARMACY IV^2 (INCLUDING ELECTIVES)

Year 4 (Senior Sophister) **Course Code: PH4007**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc. Prof. M. Henman (MH); Assoc. Prof. T. Grimes, Assoc. Prof. C. Roche

Teacher-Practitioners: Ms. K. Rossi (KR); Ms. E. Deasy (ED); Ms. N. McMahon (NMcM), Dr. C. McCrystal (CMC), Ms. M. Kinsella (MKi), Dr. K. O'Connor (KO'C); Ms. A. Nolan (AN)

External contributors: S. Kennedy (SK); Irish Heart Foundation; Diabetes Ireland (DI); Ms. J. Dougan (JD), Dr. K. O'Donnell (KOD), Dr. A. Spooner (AS), Mr. K. Catibusic (KC), Ms. C. Keane (CK)

Coordinators: Assoc. Prof Martin Henman

This module is divided into 4 units.

AIMS: To bring together key topics in the Practice of Pharmacy and to provide the range of understanding and practical knowledge necessary for the student to practice satisfactorily under present circumstances and to respond to changes in the requirements of the health service and the profession.

PRE-REQUISITES: Completion of Pharmacy Practice III (PH3006)

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Explain the roles and responsibilities of the Pharmacy Regulator and the implications of the Pharmacy Act 2007 for public safety and the development of the profession of pharmacy
- Understand the principles of management science and discuss how they may be applied to pharmacy practice
- Discuss the factors governing the financial control of a business and be able to analyse the financial statement of a business applying those factors
- Discuss the value of a systematic approach to service introduction and delivery in pharmacy, justify the need for audit of service provision in pharmacy practice and evaluate available audit tools.
- Appreciate the views of external stakeholders on the roles and responsibilities of pharmacists and pharmacy in the provision of health services and the care of patients
- Understand Irish Health Service policy and Medicines policy and review how they may influence pharmacy practice
- Understand the principles of communications skills and demonstrate the application of those skills to pharmacy practice
- Systematically collect and apply knowledge in order to make and justify treatment recommendations and patient counselling, individually and in groups, in patient case studies comprising a range of conditions and classes of medicines set in the context of various health care settings
- Understand the relationship between pharmaceutical care, evidence-based practice and patient care outcomes
- Demonstrate a knowledge of the methods used to manage the provision of medicines and discuss the prinicples of medication safety in the context of patient safety in Ireland
- Understand the principles of Programme Development and Health Services Research
- Demonstrate the ability to search and retrieve literature of all types, to paraphrase the arguments and evidence retrieved, to evaluate material in a critical fashion and to argue a personal view based upon that evaluation and present a Dissertation following the conventions of academic writing
- Understand and apply the skills particular to one of the three main branches of pharmacy - community, hospital or industrial pharmacy to common problem types faced in those branches of practice

Unit PH4007A: SOCIAL PHARMACY AND POPULATION HEALTH

LECTURES		**Lecturer**
1	Introduction to Practice of Pharmacy Course and Context of Practice	MH
2-7	Communications Skills 1-6	MH
8	Sociology and Health Sciences	MH
9	Psychology and Health Psychology	MH
10	Biomedical model of health and illness	MH
11	Biopsychosocial model of health and illness	MH
12	Patient Compliance and Concordance	CR
13	Health Care Professional Compliance	CR
14	Health Behaviour change	CR
15	Motivational Interviewing	CR
16	Health promotion	KR
17	Health education	KR
18	Evidence-based pharmacy practice 1	TG
19	Evidence-based pharmacy practice 2	TG
20	Evidence-based pharmacy practice 3	TG
22	Medicines management and safety 1	TG
23	Medicines management and safety 2	TG

Unit PH4007B: PHARMACEUTICAL CARE AND CLINICAL SKILLS

COURSE OUTLINE:

1. CaseInteract Assignments	JD

SEMINARS (12 hours)

Health Promotion & Health Service Policy (2 hours)	SK (Ext)
Health Promotion programmes in Community Pharmacy Practice (2 hours)	KR
Disease screening & Standards of Practice in Pharmacy Practice (2 hours)	CR
Pharmaceutical Care – patient support groups 1 (2 hours)	Aware (Ext)
Pharmaceutical Care – patient support groups 2 (2 hours)	DFI (Ext)
Pharmaceutical Care – patient support groups 3 (2 hours)	ICPA (Ext)

SEMINARS (14 hours)

Pharmaceutical Care & Therapeutics 1 (2 hours)	TG
Pharmaceutical Care & Therapeutics 2 (2 hours)	TG
Pharmaceutical Care & Therapeutics 3 (2 hours)	TG
Pharmaceutical Care & Therapeutics 4 (2 hours)	TG
Pharmaceutical Care & Therapeutics 5 (2 hours)	TG
Pharmaceutical Care & Therapeutics 6 (2 hours)	TG
Pharmaceutical Care & Therapeutics 7 (2 hours)	TG

Unit PH4007C: PHARMACEUTICAL POLICY AND STRATEGIC MANAGEMENT

LECTURES		**Lecturer**
1-6	Management Science applied to Pharmacy	AN (Ext)
7-9	Business Management skills in pharmacy	CMcC
10	Drug Distribution in Ireland	EC (Ext)
11	Pharmaceutical Industry in Ireland	AN (Ext)
12	Irish Medicines Board – Authorisation	MK (Ext)
13	Irish Medicines Board – Compliance	KOD (Ext)
14	Irish Medicines Board – Safety	AS (Ext)
15	Health Service: Department of Health & Children	MKi (Ext)
16	Health Service: HSE Policies & Programmes	KM (Ext)
17	PSI & MPharm Year	LH (Ext)
18	MPharm Year	RCSI (Ext)
19	PSI roles & responsibilities	KO'F (Ext)

Unit PH4007D: PRACTICE ELECTIVES (Hilary Term)

SEMINARS (9 hours)

Community pharmacy elective (small group – 9 hours)

Community Pharmacy 1	KR
Community Pharmacy 2	KR
Community Pharmacy 3	KR

Hospital pharmacy elective (small group – 9 hours)

Hospital Pharmacy 1	ED
Hospital Pharmacy 2	ED
Hospital Pharmacy 3	ED

Industrial pharmacy elective (small group – 9 hours)

Industrial Pharmacy 1	KO'C
Industrial Pharmacy 2	KO'C
Industrial Pharmacy 3	KO'C

Unit PH4007E: DISSERTATION

Dissertation Seminar: Health Informatics & Evidence-based literature review (3h)	MH
Dissertation (5,000 word minimum essay) literature review and critical analysis of topic linked to Elective choice i.e. Community, Hospital or Industrial Pharmacy (65h)	Guided study

ASSESSMENT

	Weighting
Written examination: 3 hours. 5 essays	60% of overall grade
Section A (PH4007A, PH4007B, and PH4007C): 4 essays out of 6	
Section B (PH4007D): 1 essay out of 6	
Dissertation (PH4007E)	35% of overall grade
[1]Communication skills – role play (PH4007A)	satisfactory/unsatisfactory
Coursework in *Pharmaceutical Care & Therapeutics* (PH4007B)	5% of overall grade
[1]Clinical Attachment (PH4007B)	satisfactory/unsatisfactory
Work placement report	satisfactory/unsatisfactory

SUMMARY OF HOURS

Lectures	Practicals/Tutorials/ Seminars	Total contact	Practical reports	Guided study	TOTAL	ECTS
42	37	79	9	110	198	10

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.
A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided.

[1]Students must satisfy the examiners in all practical components of Units PH4007A and PH4007B. However, the marks obtained do not contribute towards the overall Practice of Pharmacy grade for the year with the exception of coursework in *Pharmaceutical Care and Therapeutics* (see above).
Examination marks may be withheld and/or a student may be refused permission to rise with their class until they have satisfied the examiners in each of the continuous assessment components of the course.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, etc.)

ADDICTION PHARMACY

Year 4 (Senior Sophister) **Course Code: PH4008**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. F. Boylan (FB), Assoc. Prof. A. Harkin (AH), Asst. Prof. J. Gilmer (JG), Dr. D. Corrigan (DC), Assoc. Prof. C. Roche (CR), Dr. M.J. Santos-Martinez (MS)

External Practitioners: Marguerite Woods (MW), Ennis Ronney (ER), John Bourke (JB), Sheila O'Connor (SOC), Dennis O'Driscoll (DOD)

Coordinator: Asst. Professor Fabio Boylan

AIMS: To provide the student with an understanding of the nature, extent and causes of problem drug-taking in Ireland in order that they can undertake professional activities as pharmacists in the prevention and treatment of drug dependence and other drug-related problems.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Discuss the complexity of a drug taking problem.
- Describe neurochemical and psycopharmacological aspects of drug abuse.
- Discuss psychosocial aspects of drug abuse.
- Describe the role of the pharmacist in smoking cessation as well techniques available for same.
- Describe the main sources of drugs, and describe the pathophysiology of the major drug types.
- Discuss the National Drug Strategy and the role of the pharmacist in addressing Drug Misuse.
- Recall the misuse drugs acts, regulations and protocols (methadone).

COURSE OUTLINE:

LECTURES		**Lecturer**
1-3	Pharmaceutical Chemistry of the opioids, related peptides and receptors.	JG
4-6	Molecular and Cellular Mechanisms of Addiction Ethanol Abuse, Dependence and Withdrawal. Alcoholism pharmacotherapy Therapeutics for the treatment of cocaine and opiate addictions	AH
7-9	Cannabis, phytocannabinoids and pathophysiology of cannabis.	FB
10-11	Drug-related problems.	FB
12	Pharmacology of Smoking cessation	MS

WORKSHOPS AND SEMINARS (16 hours)

1.	Role of the Pharmacist in preventing and addressing Drug Misuse– **2 hours.**	CR
2.	Overview of the role of the pharmacist within the National Drug Strategy – **2 hours.**	DC
3.	Psychosocial aspects of problem drug taking. **2 hours.**	MW
4.	Role of the pharmacist in Harm Reduction. – **2 hours**	JB
5.	Role of the Pharmacist in smoking cessation **– 2 hours**	ER
6.	Role of the pharmacist in treatment – **2 hours**	SOC
7.	The Methadone Protocol in Practice-**2 hours**	DOD
8.	Brief interventions – skills development – **2 hours**	MW

LABORATORY CLASSES (3 hours each)

Identification of Drugs of Abuse I-Cannabis
Identification of Drugs of Abuse II-Narcotics

DIRECTED READING

Graham Patrick - *An Introduction to Medicinal Chemistry.* 3rd Edn, Chapter 21, Oxford University Press, 2005.
Wills S. *Drugs of Abuse* 2nd Edn, Pharmaceutical Press, London 2005
Anon. *Facts about Drug Misuse in Ireland*. 4th Edn., 2003, Health Promotion Unit, Dept. of Health and Children through www.drugsinfo.ie
Cathy Stannard, Michael H. Coupe, Anthony Pickering – *Opioids in Non-Cancer pain*. (Oxford Pain Management Library Series), 2008.
Karen Forbes – *Opioids in Cancer pain*. (Oxford Pain Management Library Series), 2008.

Kalant H. *Adverse Effects of Cannabis on Health*- An update of Literature since 1996. Progress in Neuropsychpharmacology & Biological Psychiatry, 2004; 28: 849-863 (Available on line)
Joy M & J. *Marijuana as Medicine. The Science beyond the Controversy*. National Academy Press, Washington DC., 2001
Ward J. et al. Role *of maintenance treatment in opioid dependence*. Lancet, 1999; 221-226 (Available on line)

ASSESSMENT

	Weighting
• Written Paper (2 hours): Consists of 2 sections. Section A: 3 Essay-type questions (Answer 2 of 3) – 60% Section B: 10 MCQ's (no choice and half-negative marking to apply) – 40%	60% of the total
• Seminar/Workshop reports and related group exercise.	30% of the total
• Lab Class Reports	10% of the total

NB. Controlled drugs legislation is also examinable in Practice of Pharmacy Paper 2 (XPH40061) and the Dispensing and Patient Care evaluation.

SUMMARY OF HOURS

Lectures + Seminars/ Workshops	Practicals	Total contact	Practical write-ups	Guided Study	TOTAL	ECTS
12+16	6	34	6	60	100	5

NEUROPHARMACOLOGY
Year 4 (Senior Sophister) **Course Code: PH4009**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Assoc Prof A. Harkin (AH)

Coordinator: Assoc. Professor Andrew Harkin (AH)

AIMS: To teach the principles of neuropharmacology and drug therapies for disorders of the central nervous system.

PRE-REQUISITES: SF and JS Pharmacology modules

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Discuss the diagnostic criteria and symptom presentation, biological basis and drug treatment of affective and anxiety disorders, insomnia, schizophrenia, drug dependence, pain, epilepsy, Parkinson's and Alzheimer's disease.
- Describe the mechanisms of action and clinical uses of local and general anaesthetic drugs
- Identify the pharmacokinetic characteristics and adverse effects associated with antidepressant, mood stabilising, anxiolytic, hypnotic, analgesic, anaesthetic, anticonvulsant, anti-Parkinsonian and cognitive enhancing drugs
- Discuss the neurobiological theory of CNS disorders and neurobiological adaptation to psychotropic drugs
- Assess and evaluate recent advances in the drug treatment of CNS disorders and provide an up to date insight into CNS drug development.

COURSE OUTLINE

LECTURES (AH)

1,2	Depression (2 lectures)
3	Antidepressants
4	Mood stabilizers - Lithium
5	Anxiety disorders
6	Anxiolytics
7	Hypnotics
8	Schizophrenia
9,10	Antipsychotics (2 lectures)
11	Neuropharmacology of addiction and drug dependence – reward circuitry
12	Anaesthetics (Local)
13	Anaesthetics (General)
14	Neuropharmacology of addiction and drug dependence – drugs of abuse
15	Epilepsy
16,17	Anticonvulsant drugs (2 lectures)
18	Pain – nociception, spinal and supra spinal pain pathways
19,20	Narcotic analgesics and Other CNS acting analgesics (2 lectures)
21	Parkinson's disease
22	Anti-Parkinsonian drugs
23	Alzheimer's disease
24	Drug treatment of Alzheimer's disease
25	Brian ischemia and neuroprotection

TUTORIALS (4 x 2 hour) with Pharmaceutical Care and Clinical Skills (PH4007)
Tutorial 1: Pharmacotherapy of depression: focus on factors affecting choice of SSRI
Tutorial 2: Clinical use of analgesic drugs – choosing the right analgesic
Tutorial 3: Pharmacological strategies for the treatment of stroke
Tutorial 4: Neuropharmacology course review

DIRECTED READING

Rang and Dale's Pharmacology (6th edition) by H.P. Rang, M. Maureen Dale, James M. Ritter, Rod Flower.
Brody's Human Pharmacology: Molecular to Clinical (4th Edition) by Kenneth P. Minneman
The Biochemical Basis of Neuropharmacology (8th Edition) by Jack R. Cooper, Floyd E. Bloom, Robert H. Roth
Molecular Neuropharmacology: A Foundation for Clinical Neuroscience (second edition) by Eric J. Nestler, Steven E. Hyman, Robert Malenka
Fundamentals of Psychopharmacology by Brian Leonard

ASSESSMENT

Written Examination: 1.5 hours; to answer 4 out of 6 questions; 100% of marks

SUMMARY OF HOURS

Lectures	Tutorials/ Seminars	Total contact	Seminar write-ups	Guided Study	TOTAL	ECTS
25	8	33	-	83	116	5

MALIGNANT DISEASE, IMMUNOPHARMACOLOGY & PHARMACOLOGY OF THE EYE

Year 4 (Senior Sophister) **Course Code: PH4011**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Asst. Prof. C. Medina (CM), Asst. Prof. L. O'Driscoll (LOD), Prof. M. Radomski, (MR), Assoc. Prof. M. Henman (MH), Asst. Prof. N. Frankish (NF)

Coordinator Asst. Professor Carlos Medina

AIMS: The student will acquire knowledge of the health sciences relevant to the use of drugs and medicines in the treatment of malignancy, and immunological disorders. The student will acquire knowledge of the pharmacological factors relevant to the pharmaceutical care of patients with selected conditions.

PRE-REQUISITES: SF and JS Pharmacology modules

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Demonstrate the ability to recognise cancer symptoms
- Discuss the prevention of most frequent types of cancer in Ireland
- Discuss the principles of the chemotherapy of cancer and the approaches used to maximise efficacy
- Explain how side effects of cytotoxic drugs may be minimised
- Apply principles of palliative care when appropriate
- Explain the abnormal functioning of the immune system
- Describe the actions and uses of immunomodulators
- Describe the basic anatomy and physiology of skin and eyes
- Recognise skin and ocular symptoms
- Differentiate between eczema and psoriasis
- Describe the mechanism of action of the different drugs used for the treatment of skin and ocular disorders
- Advise and counsel patients with skin and ocular symptoms and make appropriate responses to presented symptoms

COURSE OUTLINE

The module is comprised of two Units:

Unit PH4011A: TREATMENT OF MALIGNANT DISEASE

LECTURES (13 hours)	**Lecturer**
1. Cancer Pathogenesis	LOD
2. General Principles of action of cytotoxic drugs	CM
3. Types of cancer: Solids and non-solids	CM
4. Main type of solid cancers in Ireland	CM
5. Alkylating agents	LOD
6. Anti-tumour antibiotics	LOD
7. Antimetabolites	LOD
8. Plant derivatives	LOD
9. Hormone therapy	CM
10. Biological response modifiers	CM
11. Treatment of side effects of Chemotherapy	CM
12. Palliative Care	CM
13. Cancer Research	CM

Unit PH4011B: IMMUNOPHARMACOLOGY

LECTURES (16 hours)	**Lecturer**
1. Drug hypersensitivity	MR
2. Treatment of drug hypersesntitvity	MR
3. Immunosuppression	MR
4. Immunotolerance	MR
5. Immunostimulation	MR
6. Dermatopharmacology I	MH
7. Dermatopharmacology II	MH
8. Eczema	MH
9. Psoriasis	MH
10. Ocular Pharmacology I	MH
11. Ocular Pharmacology II	MH
12. Ocular Pharmacology III	MH
13. Drug interactions I	NF
14. Drug interactions II	NF
15. Drug interactions III	NF
16. Course assessment and review	CM

SEMINARS/TUTORIALS

Mechanisms and adverse effects of Immunomodulators in transplantation	MR
Mechanisms of action & resistance in cancer chemotherapy	MH+Clinical
Combination drug treatment in eczema and psoriasis	MH

ASSESSMENT	Weighting
MCQs	60% of total marks
Essay questions	40% of total marks

SUMMARY OF HOURS

Lectures	Seminars/Tutorials	Total contact	Guided study	TOTAL	ECTS
29	6	35	70	105	5

SENIOR SOPHISTER RESEARCH PROJECT

Course Code: PH4012

Staff of the School of Pharmacy & Pharmaceutical Sciences: Academic staff will supervise projects and participate in the panels which will assess the write-ups and presentations.

Project Coordinators: Asst. Professor Carlos Medina / Asst. Professor Astrid Sasse

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Explain the background to the chosen research area
- With individual support from an academic supervisor formulate the hypothesis to be addressed and select the means by which it is to be tested
- Generate and/or retrieve data and analyse it appropriately
- Demonstrate research skills relevant to their chosen area of research
- Plan and carry out practical work carefully and to a high standard
- Evaluate their research findings in the context of the current understanding of that area of research, and to do so in a balanced and concise way
- Prepare a report of the project in the form of (i) a well organised and well argued report and (ii) an oral presentation, demonstrating comprehensive understanding and critical interpretation of methodologies and data to set the research in context.

COURSE OUTLINE:

Project options will be published at the beginning of September on the School Website. Students will rank ten favourite projects. Projects will be allocated according to preference and overall result in the JS year. Projects will take place in the first four weeks of Michaelmas Term. The four weeks will include both research and a large portion of the write-up. First drafts of the write-up are expected at the end of the four-week period. Each student will be required to give an oral presentation to the panel on their project which will be 10 minutes plus 5 minutes for questions.

Project write-up

- 5,000-10,000 words - higher end for non-lab-based and lower end for lab-based projects.

Oral presentation

- 15-minute Oral Presentation (10 mins for presentation + 5 mins for questions)

ASSESSMENT

	Weighting
Project Supervisor	50% of total
Attendance, commitment and engagement with project work	
Practical work	
Presentation: Project write-up	
Reference material employed for the project	
Analysis of data	
Conclusion and recommendations	
Panel	50% of total
Presentation: Project write-up	
Reference material employed for the project	
Analysis of data	
Conclusion and recommendations	
Oral Presentation	
	10 ECTS

GUIDELINES ON MARKING

YEAR 1 & 2 (FRESHMEN YEARS)

Guidelines on awarding grades for essays and examination answers in the freshmen years

Class	Mark Range	Criteria
I	70-100	Full understanding of concepts coupled with excellent knowledge of subject. Evidence of extra reading. A structured answer. Minor lapses of content or presentations tolerated at lower end of range.
II-1	60-69	Good understanding of concepts supported by broad knowledge of subject. A lapse of content or several lapses of detail are tolerated at lower end of range.
II-2	50-59	Understands basic concepts and has sound knowledge of subject. Suffers from more than one substantial omission, error or misunderstanding.
III	40-49	Limited understanding and knowledge of subject. Answer often lacks structure and suffers from omissions, errors and misunderstandings. Overall, a poor but adequate answer, or marginally adequate at bottom end of range.
F-1	30-39	Basic understanding and knowledge of subject is very poor. While some items of sound material may be presented the answer is inadequate.
F-2	0-29	Lacks understanding with little knowledge of subject. Answer contains few items related to question with many serious errors. Could also be taken as a response to the misinterpretation of the question.

GUIDELINES ON MARKING

YEAR 3 & 4 (SOPHISTER YEARS)

Guidelines on awarding grades for essays and examination answers in the sophister years

Class	Mark Range	Criteria
I	90-100	IDEAL ANSWER; showing insight and originality and wide knowledge. Logical, accurate and concise presentation. Evidence of reading and thought beyond course content. Contains particularly apt examples. Links materials from lectures, practicals and seminars where appropriate.
	80-89	OUTSTANDING ANSWER; falls short of the 'ideal answer either on aspects of presentation or on evidence of reading and thought beyond the course. Examples, layout and details are all sound.
	70-79	MAINLY OUTSTANDING ANSWER; falls short on presentation and reading or thought beyond the course, but retains insight and originality typical of first class work.
II-1	65-69	VERY COMPREHENSIVE ANSWER; good understanding of concepts supported by broad knowledge of subject. Notable for synthesis of information rather than originality. Sometimes with evidence of outside reading. Mostly accurate and logical with appropriate examples. Occasionally a lapse in detail.
	60-64	LESS COMPREHENSIVE ANSWER; mostly confined to good recall of coursework. Some synthesis of information or ideas. Accurate and logical within a limited scope. Some lapses in detail tolerated.
II-2	55-59	SOUND BUT INCOMPLETE ANSWER; based on coursework alone but suffers from a significant omission, error or misunderstanding. Usually lacks synthesis of information or ideas. Mainly logical and accurate within its limited scope and with lapses in detail.
	50-54	INCOMPLETE ANSWER; suffers from significant omissions, errors and misunderstandings, but still with understanding of main concepts and showing sound knowledge. Several lapses in detail.
III	45-49	WEAK ANSWER; limited understanding and knowledge of subject. Serious omissions, errors and misunderstandings, so that answer is no more than adequate.
	40-44	VERY WEAK ANSWER; a poor answer, lacking substances but giving some relevant information. Information given may not be in context or well explained, but will contain passages and words, which indicate a marginally adequate understanding.
F-1	30-39	MARGINAL FAIL; inadequate answer, with no substance or understanding, but with a vague knowledge relevant to the question.
F-2	0-29	FAILURE; Lacks understanding with little knowledge of subject. Answer contains few items related to question with many serious errors. Could also be taken as a response to the misinterpretation of the question.

GUIDELINES FOR STUDENTS AT EXAMINATIONS

General	1. The onus lies on each student to establish the dates, times and venues of their own examinations. No timetable or reminder will be sent to individual students by any office[1]. 2. You are expected to familiarise yourself with the location of every examination venue to which you have been assigned. 3. Mobile phones, or other electronic or communication devices, are not permitted in examination venues - if a phone rings or an alarm on a phone is heard, **or it is discovered in any other way in the venue** it will be confiscated. Confiscated materials may be retrieved from the Junior Dean's Office, East Theatre (Monday, Wednesday, Friday: 9.30am -11.30am) on payment of a €35 fine per item. **This fine is non-negotiable, and no appeals will be accepted by the Junior Dean or any of his Assistants.** 4. Students must follow the instructions given by the invigilators in a co-operative and respectful manner.
Before entering an examination venue	5. Find your seat number on the seating list displayed outside and read the accompanying notices. 6. Leave your personal belongings, including bags, coats, hats, etc at the designated place within or nearby your examination venue. Cloakrooms are available in the Arts and Hamilton Buildings for the safe-keeping of your personal belongings. 7. You will not be admitted to the examination after the first half-hour, and will not be allowed to leave during the last half-hour. If you arrive after the first half-hour, contact your College Tutor or his/her replacement as a matter of urgency. If your tutor is not available, contact the Senior Tutor's Office.
While in an examination venue	8. Once you have entered a venue, complete **SILENCE** must be maintained at all times. 9. Each student must be in possession of their student ID card for each examination session. You should place your student ID card on the right-hand side of your desk for the duration of each examination. 10. A '**Clean Desk**' policy applies for all formal examinations. In addition to pens, pencils, rulers, student ID card, etc. only materials permitted for an examination may be placed on the desk. Invigilators will be instructed to request students to remove any non-permitted items from their desk. Pencil cases and calculator covers are not permitted. Students are advised that random pocket searches may be conducted during an examination session. Upon request, students should remove all items from their pockets for scrutiny by an invigilator. Failure to empty pockets when requested is considered a disciplinary offence and will be referred to the Junior Dean. 11. Your attention is drawn to the '**CONDUCT OF EXAMINATIONS**' notice.
During an examination session	12. You should check the title of the paper on your desk to ensure that it is the correct examination paper for your course, and read carefully all the instructions given. 13. You are not allowed start your examination until instructed to do so by the invigilators. Please use any spare time at the start to fill in your answerbook cover(s), remembering to complete the section at the bottom right-hand corner as requested before sealing the flap on every anonymous booklet used. Write legibly in ink – pencils are only allowed for OMR forms. 14. You will be advised of the time thirty minutes and ten minutes before the end of the examination. 15. If you wish to leave the examination venue at any stage during the examination you **must** be escorted by an Invigilator. If necessary you will be accompanied to a bathroom by an Invigilator. 16. If you wish to leave before the end of the examination you must hand your booklet(s) to an Invigilator and ensure you hand up everything you wish to have marked. 17. If you are taken ill just before an examination and are unable to sit it, immediately contact your tutor or his/her replacement. If your tutor is unavailable, contact the Senior Tutor's Office. If you feel unwell during your examination, please inform an Invigilator - you will be asked if you wish to go to the College Health Centre and will be accompanied by an Invigilator. 18. Smoking breaks are not allowed during examination sessions. 19. Dictionaries and Programmable calculators are not permitted at examinations.
On completion of an examination session	20. You will be advised that: • you must immediately stop writing and hand up your booklets when instructed to do so by an Invigilator; • you should ensure that all of your answerbooks are labelled correctly with your examination number (where appropriate), seat number and all other required information; • it is your responsibility to hand in everything you wish to have marked by ensuring all materials are fastened securely with a treasury tag; • you must remain in your seat until all scripts have been collected; • you must not remove from the examination venue answer books, rough work, or other materials supplied.

[1] While every effort will be made to give due notice of major changes, the College reserves the right to amend the examination timetable.

www.tcd.ie/vpcao/administration/examinations/assets/pdf/guideexam.pdf

UNIVERSITY OF DUBLIN
Trinity College

CONDUCT OF EXAMINATIONS

Except as provided for below, candidates for examination are forbidden during an examination to do or to attempt to do, any of the following: to have in their possession or consult or use any books, papers, notes, memoranda, mobile phones or written or electronic material of any nature, or to copy from or exchange information with other persons, or in any way to make use of any information improperly obtained.

Where the examination is of such a nature that materials are provided to the candidates, or where the candidates are allowed by the rules of that examination to have materials in their possession, then candidates may of course make use of such materials, *but only of such materials*, and the general prohibition above continues to apply in respect of any and all other materials.

Where candidates have the prior written permission of the examiner(s), of the Senior Lecturer, or of the Disability Officer, to have materials in their possession during an examination, then candidates may of course make use of such materials, *but only of such materials*, and the general prohibition above continues to apply in respect of any and all other materials.

Where candidates are allowed to bring personal belongings into the examination venues upon condition that such belongings are stored in an area – such as the back of the venue – away from the area in which the candidates are sitting their examinations, then candidates may bring personal belongings into the hall, provided that they are placed in the indicated area a*nd are not returned to by the candidates* until they have finished their examinations and are leaving the hall.

Any breach of this regulation is regarded as a major offence for which a student may be expelled from the University.

Students must not leave the hall before the time specified for the examination has elapsed, except by leave of the invigilator.

Examinations or other exercises which are part of continuous assessment are subject to the same rules as other College examinations. Where submitted work is part of a procedure of assessment, plagiarism is similarly regarded as a major offence and is liable to similar penalties.

Senior Lecturer

www.tcd.ie/vpcao/administration/examinations/assets/pdf/guideexam.pdf

Instructions on how to complete the Multiple Choice Questions during an examination

Note: There are variations to the instructions per module exam and are not included in these general instructions.

1. Answer all questions.
2. Mark ***one box only*** to indicate the answer you consider correct for each question.
3. Answers to all questions are to be recorded on the multiple-choice forms, which accompany this examination paper in the format True/False ***or*** A-E.
4. Select only one answer to each question.
5. Mark your answers in **pencil** on the multiple-choice forms provided.
6. Do not bend, tear, or punch holes into the multiple-choice forms.

Rough calculations may be shown in an examination book.

Candidates must ensure that their
SEAT NUMBER AND EXAM NUMBER
is included on all multiple choice forms, answer booklets and this question paper, ALL of which must be presented to the supervisor at the completion of the examination.

https://pharmacy.tcd.ie/assets/docs/MCQ%20Instructions.pdf

Before the Exam:

Before filling in a multiple-choice sheet, you should read the following:

The sheets are not corrected by hand. They are processed through a machine called an *optical mark reader*. All it recognises are marks, so there's no point in writing comments; this could invalidate an answer sheet.

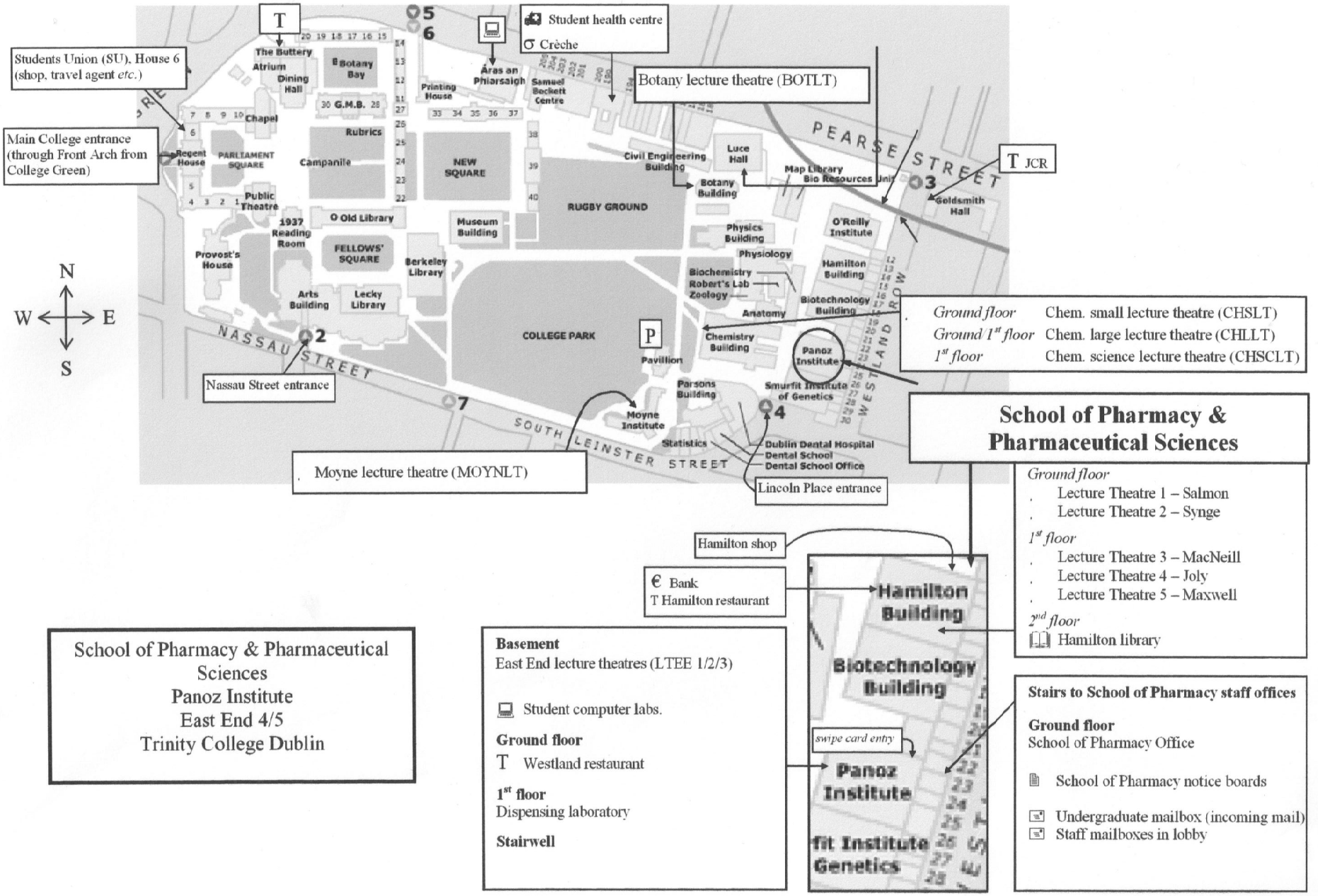
As it is a machine that processes the forms, the marks you enter must be good — see a good mark below. If you enter a bad mark, then humans may realise the intended answer but the optical mark reader won't. A good mark is a **dark**, horizontal stroke, filling *most / all* of the box.

In light of this the following points are vital:

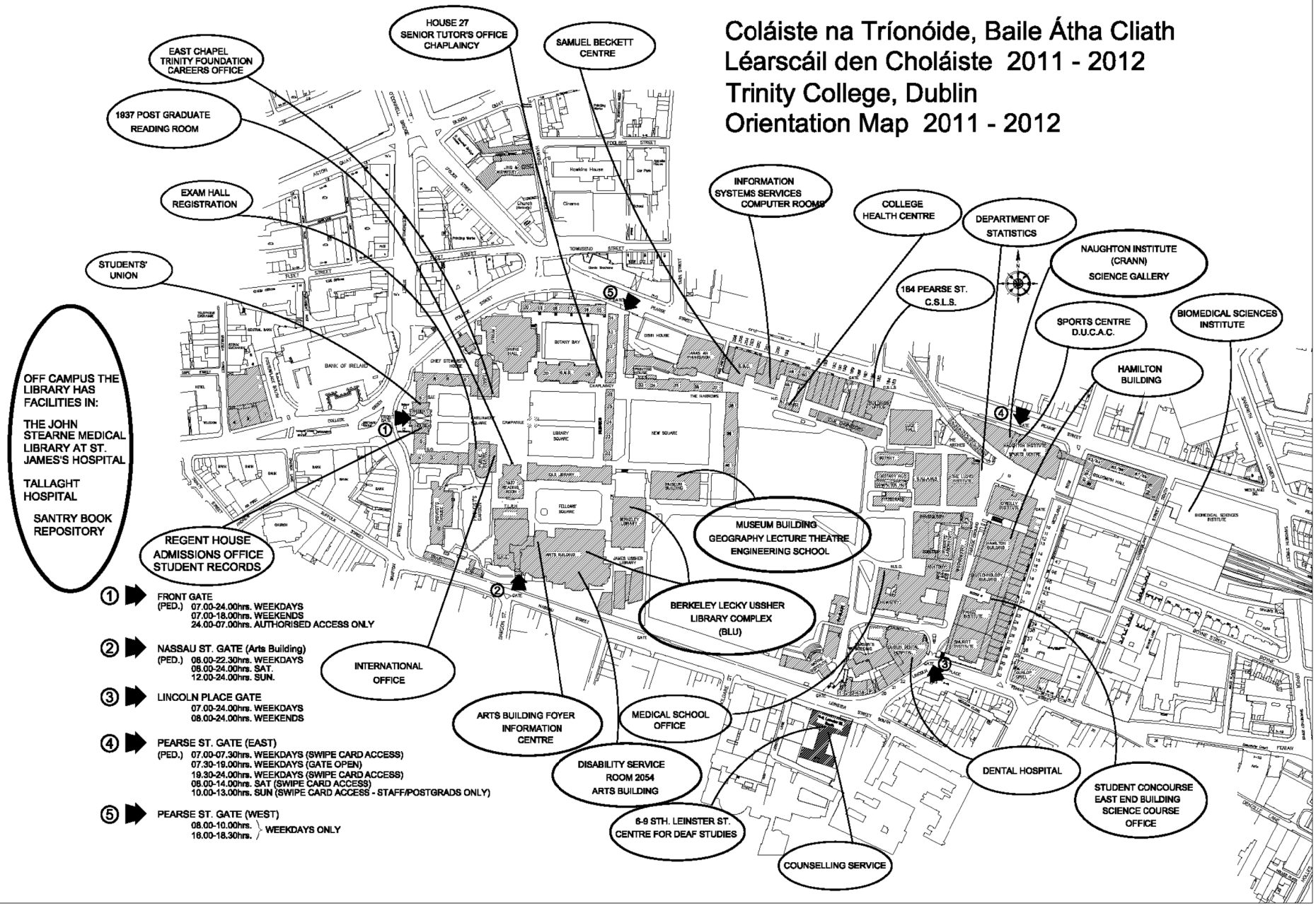
- **Always use a good sharpened pencil**.
- **Never use a biro.** A blue or black biro will produce marks that will be picked up, but they can't be erased. Red marks will not be picked up at all.
- **Have a good clean eraser.** Mistakes should be rubbed out completely. Don't leave smudges as a smudge may still be determined as a mark.
- **Have an extra pencil and/or a sharpener.**
- **Ensure that only machine recognizable marks are entered.**
- **You cannot enter more than one mark for a particular question**. If you do, the optical mark reader will reject it and will enter a blank mark for that question.
- **Always enter your name, subject and student number** (legibly) where asked at the top of the sheet – although the exam sheet calls this 'EXAMINATION NUMBER', what is required is your Student Number. If you are using a T/F (true/false) form, and both sides of the form are being used, your student number must be entered on both sides. As your student number and name are the only means of identification please ensure that your number and name are correct.

Remember: **a bad mark will be rejected;**
an answer sheet without a Student Number will be rejected.

https://pharmacy.tcd.ie/assets/docs/MCQ%20Instructions.pdf


T
Students Union (SU), House 6 (shop, travel agent *etc.*)
Main College entrance (through Front Arch from College Green)
Nassau Street entrance
Moyne lecture theatre (MOYNLT)
Student health centre
Crèche
Botany lecture theatre (BOTLT)
T JCR
Lincoln Place entrance
Hamilton shop
€ Bank
T Hamilton restaurant
The Buttery
Atrium Dining Hall
Botany Bay
Chapel
G.M.B.
Rubrics
Regent House
PARLIAMENT SQUARE
Campanile
NEW SQUARE
Public Theatre
1937 Reading Room
Old Library
Museum Building
Provost's House
FELLOWS' SQUARE
Berkeley Library
Arts Building
Lecky Library
COLLEGE PARK
Pavillion
RUGBY GROUND
Printing House
Áras an Phiarsaigh
Samuel Beckett Centre
Civil Engineering Building
Botany Building
Luce Hall
Map Library
Bio Resources Unit
Goldsmith Hall
Physics Building
O'Reilly Institute
Physiology
Biochemistry
Robert's Lab
Zoology
Anatomy
Hamilton Building
Biotechnology Building
Chemistry Building
Panoz Institute
Parsons Building
Smurfit Institute of Genetics
Moyne Institute
Statistics
Dublin Dental Hospital
Dental School
Dental School Office
PEARSE STREET
NASSAU STREET
SOUTH LEINSTER STREET
WESTLAND ROW
N
W
E
S
Ground floor Chem. small lecture theatre (CHSLT)
Ground/1st floor Chem. large lecture theatre (CHLLT)
1st floor Chem. science lecture theatre (CHSCLT)
School of Pharmacy & Pharmaceutical Sciences
Ground floor
Lecture Theatre 1 – Salmon
Lecture Theatre 2 – Synge
1st floor
Lecture Theatre 3 – MacNeill
Lecture Theatre 4 – Joly
Lecture Theatre 5 – Maxwell
2nd floor
Hamilton library
School of Pharmacy & Pharmaceutical Sciences
Panoz Institute
East End 4/5
Trinity College Dublin
Basement
East End lecture theatres (LTEE 1/2/3)
Student computer labs.
Ground floor
T Westland restaurant
1st floor
Dispensing laboratory
Stairwell
Hamilton Building
Biotechnology Building
swipe card entry
Panoz Institute
fit Institute Genetics
Stairs to School of Pharmacy staff offices
Ground floor
School of Pharmacy Office
School of Pharmacy notice boards
Undergraduate mailbox (incoming mail)
Staff mailboxes in lobby

Coláiste na Tríonóide, Baile Átha Cliath
Léarscáil den Choláiste 2011 - 2012
Trinity College, Dublin
Orientation Map 2011 - 2012



① FRONT GATE
(PED.) 07.00-24.00hrs. WEEKDAYS
07.00-18.00hrs. WEEKENDS
24.00-07.00hrs. AUTHORISED ACCESS ONLY

② NASSAU ST. GATE (Arts Building)
(PED.) 06.00-22.30hrs. WEEKDAYS
08.00-24.00hrs. SAT.
12.00-24.00hrs. SUN.

③ LINCOLN PLACE GATE
07.00-24.00hrs. WEEKDAYS
08.00-24.00hrs. WEEKENDS

④ PEARSE ST. GATE (EAST)
(PED.) 07.00-07.30hrs. WEEKDAYS (SWIPE CARD ACCESS)
07.30-19.00hrs. WEEKDAYS (GATE OPEN)
19.30-24.00hrs. WEEKDAYS (SWIPE CARD ACCESS)
08.00-14.00hrs. SAT (SWIPE CARD ACCESS)
10.00-13.00hrs. SUN (SWIPE CARD ACCESS - STAFF/POSTGRADS ONLY)

⑤ PEARSE ST. GATE (WEST)
08.00-10.00hrs. / 16.00-18.30hrs. \ WEEKDAYS ONLY