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ST. JAMES'S
HOSPITAL

MSc Clinical Chemistry

Student Handbook
2021/22





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In the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in programme or local handbooks, the provisions of the General Regulations in the Calendar will prevail.

www.tcd.ie/calendar/graduate-studies-higher-degrees/complete-part-III-hl.pdf

Introduction

Background

Clinical Chemistry or Clinical Biochemistry is a sub-discipline of pathology which is represented in virtually every clinical hospital laboratory in the State. Staffed by a mix of medical scientists, clinical biochemists and medical staff (chemical pathologists) these laboratories carry out a wide range of biochemical investigations in ever increasing numbers, in a complex specialised and computerised working environment.

The key to safeguarding the quality of investigations, and hence patient safety and care, is to have a highly educated and motivated workforce with a detailed understanding of the underlying medical science and biochemistry, analytical technology, computer systems and automation. Clinical Biochemistry Departments are also frequently involved in clinical trials work, audit and research and so require a detailed knowledge of the effects of disease on biochemical measurements.

Most trainee medical scientists and clinical biochemists holding service posts in a hospital laboratory choose to pursue a postgraduate qualification in order to improve their knowledge and further their career prospects.

There is an increasing trend towards mono-specialisation within the pathology disciplines and this has led to demand for an MSc Course in Clinical Chemistry at an advanced level. Even with the ongoing development of core blood sciences laboratories, the need for specialist discipline-specific knowledge will continue.

It is also intended that the MSc, which requires four academic terms in a two year cycle, will assist eligible candidates in their subsequent preparation for Fellow of the Royal College of Pathologists in Clinical Biochemistry.

Clinical Chemistry - the discipline

Clinical Chemistry/Clinical Biochemistry is the discipline of pathology (or laboratory medicine) that is concerned with the detection and measurement of biochemical changes in disease. Virtually every hospital in-patient will require biochemical investigation and it is common to investigate for the presence of disease with panels of biochemical tests e.g. for renal disease, electrolyte disturbances, drug levels and toxic agents, blood gas and acid-base status, bone disease, diabetes, coronary heart disease risk and dyslipidaemia, liver disease, inflammation, endocrine and metabolic disorders, or inborn errors of metabolism. Biochemistry Laboratories are highly technologically advanced and computerised and are an essential component of all pathology laboratories.

The discipline is also represented academically on medical school undergraduate and postgraduate curricula. Scientific staff in clinical biochemistry laboratories come from two different streams: medical scientists and clinical biochemists who differ in their mode of entry (both are graduate entry). Medical practitioners in the discipline are known as chemical pathologists. They work closely with endocrinologists and other physicians, and are often clinically responsible for patients with a range of metabolic disorders.

Clinical Chemistry/Clinical Biochemistry at TCD

An academic Department of Clinical Biochemistry has existed at TCD within the Division of Laboratory Medicine for many years. The present staff consists of four part-time lecturers (Prof Gerard Boran, Dr Vivion Crowley, Dr Ann Leonard and Prof William Tormey), assisted by 3 clinical tutors. The current MSc Course Director is Prof Gerard Boran. There is an Executive Officer and Dr Ann Leonard is the course coordinator. The Clinical Biochemistry Office is located in Room 1.19 on the first floor of the Trinity Health Science Centre at Tallaght University Hospital, Tallaght, Dublin 24.

Further information about TCD biomedical research is available on the course web site www.medicine.tcd.ie/clinical-biochemistry. The postgraduate prospectus can be found at the postgraduate web site [www.tcd.ie/Graduate Studies](http://www.tcd.ie/Graduate_Studies). Further information about TCD biomedical research is available on the course web site.

Information about the Institute of Biomedical Science

The Institute of Biomedical Science (IBMS) is the largest professional body for scientists in pathology and laboratory medicine in the United Kingdom, providing support and guidance to students and professionals at every stage of their career.

Working in collaboration with students, the IBMS has developed an eStudent membership to support biomedical science students throughout their studies. Please note however that if a student is already a member of the IBMS in a corporate grade (Licentiate) they would not be eligible for eStudent membership.

IBMS eStudent members will receive benefits including a year e-subscription to the profession's leading journal, The Biomedical Scientist, a weekly eNewsletter featuring the latest news and developments in the field and access to members-only web content including; eCPD, IBMS forums, and placement and careers guides. A range of bursaries, awards and grants are also available to IBMS eStudent members, as well as access to the IBMS Additions member discount scheme. eStudent membership of the IBMS will connect you to a 20,000 strong network of biomedical science professionals and provide you with additional tools to expand your knowledge and develop your skills. Please visit the eStudent website for more information (<https://www.ibms.org/estudents>).

Upon graduation with your MSc you will be eligible for Membership of the Institute if you have two years professional experience. However please note that the MSc is not a suitable qualification for HCPC registration.

Information about the Academy of Clinical Science and Laboratory Medicine

The Academy of Clinical Science and Laboratory Medicine is the professional body for Medical Scientists in Ireland. The academy functions as the designated authority with the approval of the Minister for Health and Children, in evaluating the education and training necessary to practise as a Medical Scientist in Ireland. Membership or eligibility for membership of the Academy of Clinical Science and Laboratory Medicine is a requirement to practise as a Medical Scientist in Ireland

Please visit the website for further information:

<https://www.acslm.ie/>

Programme Management and Support

Course Committee

Professor Gerard Boran, Course Director
Dr Ann Leonard, Course Coordinator
Dr Vivion Crowley
Professor William Tormey
Dr Ingrid Borovickova
Dr Gerard O'Connor
Dr Paula O'Shea
Professor Patrick Twomey
Catriona Duffy, International Student Liaison Officer
Alison Collie, Course Executive Officer

Course Executive Committee

The Course Executive Committee oversees the day-to-day smooth operation of the programme. It consists of the Course Director, Coordinator and Executive Officer

All members of the Course Executive Committee can be contacted via email or telephone as below:

Email: clinchem@tcd.ie

Telephone: (01) 896 3721.

Course Director

Professor Gerard Boran

Room 1.19, Trinity Centre for Health Sciences, Tallaght University Hospital, Dublin 24.

Course Coordinator

Dr Ann Leonard

Room 1.03, Trinity Centre for Health Sciences, Tallaght University Hospital, Dublin 24.

Course Executive Officer

Alison Collie

Room 1.13, Trinity Centre for Health Sciences, Tallaght University Hospital, Dublin 24

Student Representatives

The class will elect two student representatives after Orientation Week, one from each year.

If a group of students wishes to raise a concern that affects the class they should do this through their class representatives, who will in turn discuss the issue with the Course Director or Course Administrator.

Student Feedback

Students should always feel free to give feedback directly to the Course Director and the rest of the team. Student feedback is taken seriously and is perceived as vital to the future development of this MSc programme. These evaluations are analysed and discussed by teaching staff at course committee meetings.

Students should be aware that evaluations are used not only by those directly involved in teaching on the programme, but may also be used by the School for staff appraisal or in quality assurance exercises or as part of the academic promotions procedure.

External Examiner

The current external examiner is Professor Joy Ardill, BSc Biochemistry (QUB), PhD Faculty of Medicine (QUB), MRCPPath, FRCPath, BD (QUB), Consultant Clinical Scientist Belfast Trust.

She is appointed according to the guidelines set out in the Graduate Studies Prospectus and acts as an independent assessor to ensure that the grading system is fair and equitable and to assist the Course Committee and the Court of Examiners reach a decision regarding the progression of students to the award of the degree of MSc Clinical Chemistry of the University of Dublin, Trinity College.

Quality Assurance

In addition to the above, quality assurance on the MSc is also ensured through the following mechanisms:

- Court of Examiners' Reports
- Self-Evaluation and Critical Review Reports
- Student Feedback and Evaluations

We recognise that students on this MSc programme may face many challenges. We endeavor to provide maximum support and assistance to students to enable them to successfully complete the course. To this end, we are continuously improving the programme to meet our students' needs. We welcome any information or feedback that will improve the quality of the MSc Clinical Chemistry programme.

Dignity and Respect Policy

Trinity College Dublin is committed to supporting a collegiate environment in which staff, students and other community members are treated with dignity and respect. Bullying and harassment (including sexual and racial harassment) are not tolerated in Trinity. The Dignity and Respect Policy lays out:

- Roles and responsibilities
 - Sources of help and support
 - Informal and formal procedures for addressing any bullying or harassment issues that may arise.
- Mediation is also available.

School of Medicine and other college contacts

Head of School	Professor Michael Gill 01 896 1476 mgill@tcd.ie
Dean of Graduate Studies	Professor Martine Smith 01 896 2722 dean.gradsecretary@tcd.ie
Director Postgraduate Teaching & Learning (Interim)	Professor Lina Zgaga 01 896 4180 postgradmedicine@tcd.ie
Postgraduate Administrator	Dara O'Mahony 01 896 3557 omahoned@tcd.ie
Postgraduate Executive Officer	Teresa Fox 01 896 3556 Teresa.fox@tcd.ie
Academic Registry	01-896 4500 academic.registry@tcd.ie
IT Services	01 896 2000 itservicedesk@tcd.ie -

Teaching and Learning Strategies

In our course our teaching and learning strategy emphasises the acquisition and development of lasting clinical laboratory skills. It is necessary, of course, to impart a complex detailed and advanced body of knowledge to the students and this is provided through the lectures delivered by a panel of national and international lecturers who are experts in their chosen field. It is widely acknowledged however that detailed knowledge is not retained for prolonged periods following academic courses. However, we teach our students the skills of presenting and interpreting laboratory data through a series of face to face workshops for both clinical and laboratory techniques. We allow students practice their newly acquired clinical presentation and interpretive skills in real life situations in the class on a regular basis. These skills are enduring and will not be forgotten years later even when the detailed technical knowledge requires revision or updating.

This course has been approved by the TCD Council and validated by the Institute of Biomedical Science (IBMS) and the Academy of Clinical Science and Laboratory Medicine (ACSLM).

Admission Requirements

General Requirements

Application for admission to the course should be made through the TCD Faculty of Health Sciences office (<http://www.tcd.ie/courses/postgraduate/>), to be received normally not later than 30th June for the proposed year of entry. Late applications (up to the end of July) will be considered provided places are available, but candidates are urged to get their applications in as early as possible.

Applications will be accepted from those who satisfy ONE or more of the following criteria:

- a) hold an honours degree (first or second class) in any health sciences or biomedical discipline, or a medical, dental or nursing degree, OR
- b) are Members or are eligible for Membership of the Academy of Clinical Science and Laboratory Medicine OR
- c) have two years current or previous work experience in clinical biochemistry or medical scientist posts

Applicants under (b) should provide documentary evidence, such as a letter from the Academy of Clinical Science and Laboratory Medicine, confirming their Membership or eligibility for Membership. Applicants under (c) should provide full details of their current and previous experience with their application. Applicants meeting these criteria will be required to attend for interview to assess knowledge and aptitude.

Language Policy on admission

TCD requirements apply and stipulate that students whose first language is not English must provide evidence of competency in this language through one of the well-established international standard tests:

Liaison with Employers

Students are normally expected to do their assignments and research project in the hospital laboratory where they are employed. They need to nominate a supervisor in their hospital laboratory. The management team on the course will liaise with nominated supervisors to discuss student progress and obtain feedback on course. Most of our students work in clinical laboratories accredited by Irish National Accreditation Board (INAB) and have well established clinical services. From time to time we arrange laboratory placements/secondments to Tallaght University Hospital or St. James's Hospital when it is necessary to provide more experiences for case interpretation or performance of clinical projects. Students who are not in full time employment and require a Laboratory placement will be subject to an annual bench fee. Exposure to specialist areas is provided through laboratory visits.

Programme Overview

Programme Aims and Overall Objectives

The programme aims are:

- To provide a detailed knowledge and understanding of clinical chemistry in the laboratory investigation of disease, in laboratory management, and in quality assurance
- To provide a full understanding of the pre-analytical, analytical and post analytical issues of biochemical investigations
- To provide up to date knowledge and understanding of the underlying pathophysiology and clinical utility of these investigations and be able to critically discuss the interpretation of biochemical results with clinical and scientific colleagues
- To equip graduates with the tools and skills necessary to perform in routine and specialised areas within the clinical biochemistry laboratory
- To provide graduates with the skills necessary to evaluate processes within the laboratory and suggest changes based on current best practice
- To enable graduates to critically evaluate research articles and to design and complete scientific research projects
- To provide core management skills including quality management, audit and method validation
- To enable graduates to communicate effectively with scientific and clinical colleagues and society at large
- To provide learning skills that will enable the graduate to continue with self-directed study

The overall objectives of the course are as follows:

- To offer a high quality postgraduate Master's course dedicated to Clinical Biochemistry to professional laboratory staff including those from medical science, clinical biochemistry or medical backgrounds
- To offer a mix of theoretical knowledge, delivered in lecture format, combined with continuous development and assessment of clinical reasoning skills and practical knowledge of techniques as taught in workshops, case presentations, and "take-home" assignments in the candidate's own laboratory
- To offer a course structure which is feasible for full-time laboratory staff
- To give all students, regardless of their professional laboratory/medical/Health Sciences background, a comprehensive understanding and sound knowledge of the underlying clinical, scientific and technological principles of Clinical Biochemistry
- To provide students from a laboratory biomedical or scientific background a sound knowledge of the clinical principles underlying the application of Clinical Biochemistry investigations in human disease
- To foster an interest in quality systems, audit, research and development, and effective information management in the discipline
- To provide the framework for graduates to apply the skills learned on the MSc course to future learning and continuous personal education and development in laboratory medicine and management

Learning outcomes

Students will develop knowledge and understanding that is informed by the forefront of the field of Clinical Biochemistry and will be capable of applying these to developing new insights and to problem solving using knowledge and creativity. They will be able to demonstrate a range of standard and research skills and to effectively communicate findings and conclusions. They will develop learning skills that will allow them to continue with self-directed study and will have the opportunity for progression to other programmes such as a Doctoral Degree or FRCPATH.

At the end of the course students will

- Understand the medical, scientific and technological principles of Clinical Biochemistry and its interrelationship with other disciplines.
- Have a detailed knowledge of the applications of Clinical Biochemistry for the diagnosis and monitoring of human disease and its contribution to biomedical research.
- Be able to assess the effectiveness of individual tests, strategies and protocols for the investigation of disease
- Acquire a detailed knowledge of laboratory techniques, instrumentation and informatics
- Understand the principles of laboratory management
- Appreciate new trends including molecular diagnostics, robotics, point of care and self-testing
- Have developed an enduring set of practical, clinical, scientific and research skills for use in their laboratory work.

Knowledge

Students will develop knowledge and understanding;

- That is informed by the latest developments in Clinical Chemistry and will be capable of applying these to develop new insights and for problem solving using knowledge and creativity
- Of the medical, scientific and technological principles of Clinical Chemistry and its interrelationship with other disciplines
- Of the applications of Clinical Chemistry for the diagnosis and monitoring of human disease and its contribution to biomedical research.
- Of laboratory techniques, instrumentation and informatics
- Of the principles of laboratory management
- Of research methods and biostatistics
- Of new trends including molecular diagnostics, robotics, core laboratory point of care and self-testing

Related teaching and learning methods and strategies

The teaching strategy is a mixture of lectures, tutorials, workshops and case discussions. While the format of lectures is conventional; informal interaction is encouraged. Workshops, tutorials and case discussions involve extensive student participation. Short cases relevant to each module will be covered in the teaching sessions and will be complemented at the Clinical Laboratory Interface Workshops. Additional workshops will deal with both advanced laboratory techniques and the clinical laboratory interface.

Assessment

Summative assessment is through a combination of unseen written examinations, objective structured practical examination (OSPE), oral examination, marked assignments and project dissertation. Formative assessment is through presentations to class, practice OSPE's and class discussions with peer-evaluation and feedback provided on the day of presentation/assessment.

Skills and other attributes

Intellectual skills

- The ability to demonstrate knowledge of key concepts and topics within Clinical Chemistry
- The ability to select and apply appropriate techniques and processes
- The ability to critically evaluate the scientific and medical literature
- The ability to construct and develop logical arguments, with clear identification of assumptions and conclusions and to present arguments and conclusions with clarity and accuracy.

Related teaching and learning methods and strategies

Logical thinking is developed throughout the course. The ability to present arguments, both verbally and written, is developed through class discussions, presentations to class, practical reports and assignments. Problem analysis, formulation and solving are introduced in lectures and further developed through practical exercises. An assignment requires the student to present and review a journal article. Tutorials and practice on presentation skills are provided.

Assessment - Intellectual skills are assessed formatively through classwork and practical exercises and summatively in assignments and dissertation.

Professional skills

- The ability to demonstrate a range of standard and research skills and to effectively communicate findings and conclusions
- Learning skills that provide a framework for continuing self-directed study
- The ability to assess the effectiveness of individual tests, strategies and protocols for the investigation of disease
- The ability to employ management strategies to problems in the laboratory
- The ability to analyse data using appropriate statistical methods
- The ability to design and apply quality assurance strategies
- The ability to debate ethical issues

Related teaching and learning methods and strategies

Professional skills will be developed through lectures, class discussions and demonstrations. A number of assignments allow students to work on practical issues requiring the skills outlined e.g. method evaluation, tendering, producing a business case.

Assessment - Professional skills are assessed formatively through class work and practical exercises and summatively in assignments and dissertation.

Transferable skills

- The ability to study and learn independently
- The ability to analyse and think critically about problems and their solutions
- Effective verbal and written communication and presentation skills including the ability to communicate scientific ideas
- Independent time management
- The ability to use library and World-Wide-Web resources
- Framework for future learning and continuous professional development in clinical biochemistry, quality systems and laboratory management

Related teaching and learning methods and strategies

The learning process requires students to assimilate and integrate material from several sources. Class discussions, presentations, assignment reports and lectures on presentation skills.

There is a requirement to produce substantial amounts of written work to strict deadlines

The use of library and World-Wide-Web resources is required throughout the course. Assessment - These skills are tested both formatively in the class work, practical exercises and presentations and summatively in the assignments, case presentations and dissertation.

Programme Resources

Key Locations

Teaching of modules will take place at the Trinity Centre for Health Sciences, Tallaght University Hospital, Tallaght, Dublin 24, St. James's Hospital, James's Street, Dublin 8 and the Children's University Hospital, Temple Street, Dublin 1.

In the Trinity Centre for Health Sciences at Tallaght, four seminar rooms of different sizes, and also various lecture theatres when required, are available. Private rooms are available for individual student discussions. The Meeting room is available for Committee meetings and the Court of Examiners meeting each year. On site restaurant and coffee shop facilities are available.

Students will have full access to the online services of the TCD library and facilities at Tallaght University Hospital. The TCD library is located close to the lecture rooms.

Administration

Course administration is undertaken by an Executive Officer (EO) who is responsible for all aspects of the smooth running of the course. The Course Office is located in Room 1.19 on the first floor of the Trinity Centre for Health Science at Tallaght University Hospital.

Student records are maintained by Trinity College. A portfolio of course work submissions for each student is kept in the Clinical Biochemistry Unit Office (Room 1.19), Trinity Centre for Health Sciences at Tallaght University Hospital.

Course Website and Blackboard elearning system

The course website for the MSc in Clinical Chemistry www.medicine.tcd.ie/clinical_biochemistry/ provides a valuable resource to students both current and prospective alike. Those thinking of applying will find essential information and there is also a useful guideline on the application process. For current students the Blackboard elearning system is the central focal point for the lecture timetable and course material. Coursework is also submitted via Blackboard.

Due to COVID-19 pandemic some teaching will be delivered online via Blackboard Collaborate in addition to face to face teaching.

Teaching Staff

Teaching staff will be provided from a panel of teachers consisting of chemical pathologists and other consultants, together with medical scientists and clinical biochemists in the Dublin teaching hospitals including Trinity Health Ireland Hospitals and The Children's University Hospital Temple Street. Other national and international lecturers will be included as required.

Induction to the programme

There is a half day induction program each year for all students. The new first years and second years are introduced to each other. Students are given an outline of the course requirements and details on course assignments, case log book, deadlines, research projects as well as information on use of library, accessing materials and IT. Students are directed to the TCD website for further information on relevant TCD policy documents.

Student Handbook

A student handbook is available online and also available in hard copy from the Programme Office. This contains all details on the course that apply to them over the following two years.

Student Placements

It may be possible to arrange supernumerary attachments for applicants wishing to study in Ireland at accredited clinical laboratories in University Teaching Hospitals. In order to facilitate these arrangements the Clinical Biochemistry Department may be required to charge a bench fee per annum to cover training and research costs.

Programme Content

Overview of Curriculum/ Mode of Delivery

The course is offered only for entry via the MSc register. Students on the MSc register can have an exit option via a Postgraduate Diploma. Students who choose to exit with a diploma may return to complete the research component within a five year period. This is only in cases where the student has reached the required standard in the taught component and they must rescind the Diploma to do so. They will need to register and pay fees for another year. The award of a Diploma is graded at either Pass or Distinction level.

The programme commences each year in Michaelmas Term and will extend over a period of 2 years for the MSc degree. Instruction will be class-based, supported by on-line course material on TCD Blackboard. Students for the MSc will be required to obtain credit for all of the following activities: - five Instruction Modules delivered over 2 years, a log book of 8 cases of which 4 must be submitted each year, 6 assignments and the project dissertation. There are also regular workshops and presentations throughout the course which includes site visits to specialist clinical services (e.g. ICU, Dialysis Unit, Sweat Test, Newborn Screening) and specialist laboratory services (e.g. molecular diagnostics, tandem MS, atomic absorption and porphyria).

The course is assessed by a written examination and an OSPE at the end of each module. There are also marks for the assignments and log book of cases. Revision sessions will be provided each year.

The course includes a series of Techniques Workshops and Clinical Laboratory Interface Workshops. The Techniques Workshops will provide practical instruction and demonstrations of selected techniques including research methods and statistical tools. The Clinical Laboratory Interface Workshops will consist of instruction in the interpretation of clinical laboratory data, techniques for case presentation and report writing, and the conduct of clinical audits using laboratory data. Each student will be required to submit six written assignments on a regular basis over the two years. Assignments may include case reports, essays, or a short report on a clinical audit or analytical topic requiring some analysis in their base laboratory.

A Research Dissertation is required on a topic relevant to the practice of Clinical Chemistry/Clinical Biochemistry. The project proposal must be submitted by the 31st October in Year 1 and must be signed by the head of the laboratory and by the student's supervisor. This should be submitted no later than 30th June of the final year. Students are requested for updates on chosen project throughout the course.

A Diploma exit option is also available in exceptional circumstances. Students will be required to register at the outset for the MSc. Students will be strongly encouraged to study for the MSc and participate in all of the Lecture Modules and Workshops as well as submit the Dissertation. Registration for the MSc at the outset will allow early planning and preparatory work for the dissertation in the first year of the course as well as ensure full library rights. Note that a full MSc rather than a Diploma is normally required for career progression purposes in the health services. Students for the Diploma will not be required to submit a research dissertation.

The MSc course will be run on a part-time basis on Friday mornings and afternoons during term times in the first and second year with a total of 8 contact hours per week. These will consist of a mixture of lectures, tutorials/group teaching, and laboratory work. Adequate breaks will be provided.

Module content

The course will be run on a modular basis, each module consisting of lectures, tutorials/group discussions and laboratory work. Each module will be completed during one term. Programme content will be at an advanced level (at least 75%) in keeping with a Masters course. While each topic will include a brief review of fundamental knowledge (no more than 25%), the major portion of each topic will deal with knowledge at the forefront of the subject and address current problems and developments.

The following table illustrates the schedule of taught modules for 2019-2021 and their ECTS credits. Detailed descriptors for each Module are in Appendices 4a-e.

Module	Module Descriptor	Availability (2019-2021)	ECTS Credits
CM7801	Clinical Chemistry I	Michaelmas Term 2019	15
CM7802	Clinical Chemistry II and General Paediatric Biochemistry	Hilary Term 2020	15
CM7803	Endocrinology and Metabolism I	Michaelmas Term 2020	10
CM7804	Endocrinology and Metabolism II and Inborn Errors of Metabolism	Hilary Term 2020	10
CM7805	Quality Assurance and Laboratory Management	Michaelmas Term 2019/ Hilary Term 2020	10
Total			60

The course will be delivered over two years with the opportunity for a new intake of students each year.

Given the potential heterogeneity of the intake, it may be necessary to provide additional lectures to bring everyone to the same level. Students will be required to successfully complete all modules to be eligible for the award of the Diploma or MSc. Each Module is also associated with a number of Techniques Workshops and Clinical Laboratory Interface Workshops, which are designed to develop practical skills and case reasoning/presentation/interpretation skills respectively.

Research Dissertation Guidelines

Students will be required to submit titles and outline proposals for their project at the end of 31st October in their first year of the course. A local project supervisor must be nominated. The project proposal must be signed off by the Head of Department and by the Supervisor at the student's base laboratory).

Supervisor

The supervisor will normally be a senior member of the laboratory scientific or medical staff. The supervisor may be contacted by the MSc team to determine progress on the project. Each project submission must be accompanied by a signed letter from the supervisor stating they have reviewed the thesis submission and the thesis is suitable for submission. Supervisor will be required to participate in the employer liaison group. This will involve three contacts a year which can usually be done by email or teleconference, and completion of a survey for continual improvement purposes. Assessing suitability of students' laboratory: Students will normally be working in an ISO 15189 accredited laboratory.

A number of meetings will be held throughout the two years of the course, particularly in the first year, to discuss the project requirements and progress with students. Students are required to produce a substantive contribution to the scientific literature and are encouraged to publish their work either during or after the award of the MSc. Projects which assist with local clinical and laboratory research needs in the student's institution are welcome, but students are advised that routine method comparisons are often insufficient. All project proposals are assessed internally and then forwarded to the External Examiner for comment in November of the first year.

It is particularly important to ascertain that support for the project will be forthcoming from the student's own institution, including financial resources, access to laboratories, and availability of patient specimens from clinicians. The project plan should be discussed with clinical and laboratory colleagues and this should commence as early as possible to secure timely access to facilities, and patient specimens. A careful literature search should be conducted, and reported in the dissertation. A proposal to the local hospital ethics committee should be prepared and submitted as soon as possible. Statistical advice should be sought at the project planning stage in order to ensure that the study design and statistical power, including patient numbers, are correct. The project planning and ethics approval should be completed as early as possible, but not later than the end of the first term and the work itself should be completed and ready for submission not later than 30th June in the second year in accordance with college requirements.

Each project submission is sent to an Internal Examiner and the External Examiner for grading. Instructions on the preparation of dissertations are available from TCD. Mentoring will be available for students on the project and other aspects of the course from academic staff whom students may contact for advice. The suggested word count is no longer than approximately 12,000 words.

Two soft-bound copies (e.g. using a ring binder or similar simple binding; must open flat) of the dissertations and an electronic copy should be submitted, not later than the 30th June of their final year. A 1-page abstract should be included in the bound copy. The student must await the decision of the examiners before making the final binding arrangements. Note that any extension beyond 30th June is at the discretion of the Dean of Postgraduate Studies to whom applications for any extension should be made. Applications for extension must include a letter from the project supervisor outlining the reasons for extension and support of the same. Applications should be made through the Clinical Biochemistry unit, Room 1.19, Trinity Centre for Health Sciences, Tallaght University Hospital. The Department of Clinical Biochemistry will then make a formal application to the Dean of Graduate studies. The Dean may then award a short extension ("Dean's Grace") to the student. Applications for Dean's Grace are facilitated through the MSc Clinical Chemistry co-ordinator/EO. Students should ascertain their liability for additional fees for any extension beyond the Dean's Grace period.

Guidelines for Writing Dissertation

The final Project Proposal must be submitted by 31st October in the first year of the course. Students should choose a project that can be achieved ideally within 1 year. This will allow sufficient time to present and discuss preliminary results with the course director and obtain guidance on selection, presentation and write-up in good time.

Students should discuss their project and dissertation with their Project Supervisor on a regular basis throughout. The dissertation must be submitted to the supervisor for corrections and approval well in advance of the submission deadline to allow sufficient time for changes.

Ethical approval must be obtained from the local hospital Ethics Committee as required. A statement of Ethical approval must be included, or an explanation as to why ethical approval was not required if this is the case.

The expected dissertation length is approximately 12,000 words

Before the main Chapters, you should include the following sections

1. Cover Page with Title
2. Table of Contents
3. List of Figures, Tables
4. Declaration
5. Acknowledgements (and any Dedications)
6. Abbreviations

List of Abbreviations (Abbreviations must all be listed at the front of the thesis. The full term, followed by the abbreviation in brackets, must be used the first time the abbreviation is introduced in the text. Thereafter, the abbreviation should be used consistently. All abbreviations, including units, must be explained and listed.)

7. Abstract

An Abstract at the beginning of the thesis should summarise your dissertation, preferably 1 page in length. Please note that a well-written abstract is vital. It is most important to get this right as it sets a good impression for the rest of the dissertation. It is the first thing your internal and external examiner will read.

In your abstract, you should summarise precisely and concisely your entire project including background, aims, methods, results, and conclusion. Read abstracts from key journals to get a feel for what a good abstract contains. Don't use abbreviations. In your methods, make sure to say how many patient and control subjects (n=) you studied, if appropriate. In your results, make sure that you include your actual findings for your analyte concentration (+/- SD) and measurement units of same for each study group. It is not sufficient to say your results were "significant/not significant" or just to give a percentage change or a statistic. You must give your results concisely and precisely, then give any relevant statistics (e.g. p values) and let the reader make their own mind up about your findings.

Of course you must state in your conclusion part of the abstract what you think is the conclusion from your results.

Chapter Headings should include:

Introduction

Literature review/background

Aims (including overall aims as well as specific objectives for the project including hypothesis statement)

Materials and methods (including patient group and size; controls; laboratory methods statistics, statement of ethical approval, etc.)

Results

Discussion

Conclusion
References

Font size of 11 or greater

Spacing of 1.5

Font and spacing must be consistent throughout the document

Any reasonable numbering system for chapters, sections and subsections is required (e.g. 1.0 Literature Review; sub-headings will be 1.1, 1.2, 1.3 etc; subsections within a sub-heading should be numbered 1.1.1, 1.1.2 etc or 1.2.1, 1.2.2 etc.)

Ensure all Tables and Figures are mentioned and properly referenced in the text throughout.

A common mistake in the Results section of the dissertation is to have a large number of complex tables with no text to explain what is in the Tables, finding by finding. Keep your tables and figures as simple and clear as possible and (especially in the results section) describe them carefully in the accompanying text.

In the discussion section, you need to discuss and compare your results/findings with other people's work. You will usually have mentioned many of these other workers already in your Introduction

For references use the Vancouver style and be consistent throughout. Make sure your reference list is correct. Websites, where referenced, must include a recent date accessed to confirm the address is still valid.

All information provided in the thesis must be properly referenced

Submission Guidelines

Two copies of the final version of the project dissertation and an electronic copy must be submitted no later than 30th June of the final year. The submitted document should be simply ring bound at this point (e.g. with a simple spiral binder) so that it opens flat and ideally printed on both sides of the paper.

The dissertation is examined by an internal examiner and the external examiner using the Grading system below. In cases where the two examiners return different grades, the lowest grade is acted on.

Before the final document is bound, it must receive a satisfactory grade from the course examiners, including the External Examiner. The Course Director will advise the grade awarded to the candidate together with any comments when reports are in from both examiners. Once corrections have been made within the stipulated time, the Course Director will issue a Pass (Grade 1) letter to the candidate which will include a request to prepare and submit the final hard bound-copy dissertation.

Commencing with students due to graduate in Summer 2020, the dissertations will now be marked out of 250 (with 10 of the marks assigned to the Project Proposal). Accordingly, the previous grading system (without marking) will be phased out.

Assessment and Examination

Explanation of ECTS Weighting

The European Credit Transfer and Accumulation System (ECTS) is an academic credit system based on the estimated student workload required to achieve the objectives of a module or programme of study. It is designed to enable academic recognition for periods of study, to facilitate student mobility and credit accumulation and transfer. The ECTS is the recommended credit system for higher education in Ireland and across the European Higher Education Area.

The ECTS weighting for a module is a measure of the student input or workload required for that module, based on factors such as the number of contact hours, the number and length of written or verbally presented assessment exercises, class preparation and private study time, laboratory classes, examinations, clinical attendance, professional training placements, and so on as appropriate. There is no intrinsic relationship between the credit volume of a module and its level of difficulty.

The European norm for fulltime study over one academic year is 60 credits. 1 credit represents 20-25 hours estimated student input, so a 10-credit module will be designed to require 200-250 hours of student input including class contact time, assessments and examinations.

ECTS credits are awarded to a student only upon successful completion of the programme year. Progression from one year to the next is determined by the programme regulations. Students who fail a year of their programme will not obtain credit for that year even if they have passed certain component. Exceptions to this rule are one-year and part-year visiting students, who are awarded credit for individual modules successfully completed.

European Credit Transfer and Accumulation System (ECTS) credits have been calculated for the various course modules and are shown in the table in the section on Module Content.

The MSc course rating is as a 90 ECTS course, with 60 ECTS assigned to the coursework/lectures and 30 ECTS for the dissertation.

Eligibility Criteria for Award of MSc

Students will be expected to register for the MSc option at the outset of the course.

Students for the MSc will be required to obtain credit for all of the following activities: -

- Five Instruction Modules consisting of lectures and case presentations delivered over 2 years and assessed by examination:
 - Year 1: End of module Written papers and OSPEs
 - Year 2: End of module Written papers, OSPEs and Viva Voce
- Participation in a series of Techniques Workshops and Clinical Laboratory Interface Workshops
- Each student will be required to submit course work over the 2 years of the course; six short assignments and 8 case reports. Each assignment may include essays, or a short report on a clinical audit or analytical topic requiring some analysis in their base laboratory. Case reports should be based on topics covered in the specified module.
- A Research Dissertation which must be passed. It will not be required of Diploma students. Students will be required to submit titles and outline proposals for their project by the 31st October in year 1 of the course. A local project supervisor must be nominated.

Students who are unable to submit a successful dissertation prior to 30th June of the final year, or anyone who submits an ill-prepared dissertation deemed unsuitable for examination by the internal examiners, will be required to register for a Third Year (unless submitted during Dean's Grace) in order to complete the dissertation and be awarded an MSc. A full years fee is payable in these circumstances.

Eligibility Criteria for Award of Diploma

Students for the Diploma will only be required to complete the Lecture Modules, the Techniques and Clinical Laboratory Interface Workshops and Course Assignments over 4 terms. The dissertation will not be required. Students wishing to avail of the Diploma exit option will be expected to register at the outset for the MSc. Students who have registered for the MSc but who fail to complete the dissertation may elect to be awarded the Diploma, subject to a pass in the Diploma Assessment.

This is expected to happen only in exceptional circumstances. Students who choose to exit with a diploma may return to complete the research component within a five year period. This is only in cases where the student has reached the required standard in the taught component and they must rescind the Diploma to do so. The award of a Diploma is graded at either Pass or Distinction level.

Assessment of taught modules

The schedule of Assessments and Examinations, with an indication of their weighting towards the final award, is shown in the table below. All components of both formative and summative assessment will have to be passed at the end of each year. This means achieving an overall pass mark of 50% or greater, with no individual component below 40%. In the case of a student not attaining a pass mark a Supplemental Examination will have to be taken and passed in order to progress to the next academic year or to graduate. The Supplemental Examination will consist of the component or components causing the failure.

Module Code/Title	Assessment	Marks	Weight	ECTs	
CM7801	Case 1	12	39 %	15	
Clinical Chemistry I	Case 2	12			
	Journal Article	25			
	Written Exam	44			35%
	OSPE	32			26%
	Total	125			
CM7802	Case 3	12	39%	15	
Clinical Chemistry II and General Paediatric Biochemistry	Case 4	12			
	Essay	25			
	Written Exam	44			35%
	OSPE	32			26%
	Total	125			
CM7803	Case 1	12	29%	10	
Endocrinology and Metabolism I	Case 2	12			
	Written Exam	37			45%
	OSPE	22			26%
	Total	83			
CM7804	Case 3	12	29%	10	
Endocrinology and Metabolism II and Inborn Errors of Metabolism	Case 4	12			
	Written Exam	37			45%
	OSPE	22			26%
	Total	83			
CM7805	Business Case	24	100%	10	
Quality Assurance and Laboratory Management	Audit Report	24			
	EQA	12			
	Method Evaluation	24			
	Total	84			
CM7806	Project Proposal	10	4%	30	
Research Dissertation	Dissertation	240	96%		
	Total	250			

The dissertation must be passed for a student to be awarded the MSc and no compensation is allowed with any other component.

Resubmission of Course Work

Resubmission of Formative Assessment Components: students will be offered one opportunity to complete or resubmit an assignment/case report if they fail the assignment/case report but the maximum marks available in this case is 50%.

Re-assessment of taught modules

Where a graduate student has failed on the coursework component, and feels that there are mitigating circumstances, he/she may make a request, in writing, to the Course Coordinator/Director for permission to repeat the examination(s) and/or assessment(s). The reasons for the request must be clearly stated and supported where necessary by documentary evidence. If the graduate student is granted a supplemental examination, the results of that examination will be considered to be final, i.e., repetition of the year or module will not be permitted.

Internal Compensation

Compensation within each module is allowed between marks for the Written/OSPE Examinations and course work components in the event that an individual component is failed providing a mark of at least 40% is obtained in the component for which compensation is required.

Progression from Year 1 to Year 2

All components of examinations and course work for each module will have to be passed by the end of each year. This means achieving an overall pass mark of 50% with no individual component below 40%. In the case of an examination not being passed a Supplemental Examination will have to be taken for the component failed, or for the whole examination if more than one component is failed, and passed in order to progress to the next academic year or to graduate.

Absence from Examinations

Postgraduate students who consider that illness may prevent them from attending an examination (or any part thereof) should consult their medical advisor and request a medical certificate for an appropriate period. If a certificate is granted, it must be presented to the student's Course Coordinator/Director within three days of the beginning of the period of absence from the examination. Such medical certificates must state that the student is unfit to sit examinations.

Medical certificates will not be accepted in explanation for poor performance; where an examination has been completed, subsequent withdrawal is not permitted.

Postgraduate students who consider that other grave cause beyond their control may prevent them from attending an examination (or any part thereof) must consult and inform their Course Coordinator/Director. The Course Co-ordinator/Director will then make representations to the Dean of Graduate Studies requesting that permission be granted for absence from the examination.

The acceptance of medical disability is entirely at the discretion of the Dean of Graduate Studies, who may ask for a report from the medical officers in charge of the Student Health Service. The report will be strictly confidential to the Dean of Graduate Studies.

Further details on regulations for absence from lectures and exams Calendar, Part II, General Regulations and Information

<http://www.tcd.ie/calendar/undergraduate-studies/general-regulations-and-information.pdf>

Criteria for Distinction

Distinction can only be awarded when marks of 70% or more are separately achieved in both the taught modules (with no component requiring compensation) and the dissertation (which must be submitted on time). A distinction cannot be awarded if a candidate has failed any credit during the period of study.

Any student who achieves outstanding overall performance with an overall mark of at least 70% will be recommended for the award of Pass with Distinction provided the following criteria are also met:

1. Marks of 70% or more are separately achieved in both the taught modules and the dissertation
2. Potential candidates must achieve a mark of 70% or more in a Distinction Viva Voce which will replace the standard Viva Voce. Potential candidates will be notified in advance.
3. No use of compensation
4. No Supplemental Examinations
5. All assignments and project delivered on time on the agreed date
6. Good attendance record and good behaviour throughout the course
7. Fees paid
8. Dissertation submitted on time and passed first attempt at Grade 1. However an initial Grade 2 ranking is also acceptable (i.e. minor corrections) provided the dissertation is resubmitted within the stipulated time (2 weeks) and the second submission is awarded a Grade 1 by the internal examiner. A ranking of Grade 3 (major revisions) or Grade 4 (fail) on the first attempt will preclude a Distinction.

Assessment of Project Dissertation (revised June 2019)

The thesis will be marked out of 100% according to the Thesis Assessment Rubric by the internal examiner in the first instance. The Mark for the Dissertation will be 250 marks in addition to the 500 marks allocated to the other course components. The dissertation must be passed. Compensation is not allowed between the dissertation and the rest of the coursework. The overall mark for the MSc will now be 750 marks. Distinction can only be awarded when marks of 70% or more are separately achieved in both the dissertation (250 marks) and in the remainder of the coursework (500 marks).

Well-written submissions

Well-written and presented dissertations which are awarded a pass mark or above by the internal examiners will be forwarded for marking to the external examiner, also according to the rubric. The final mark awarded will be the average of the internal and external examiners mark. The candidate will be provided with a commentary if any changes to the dissertation are recommended.

Poorly presented submissions

Dissertations which are submitted in a poorly presented and written or incomplete state or are otherwise deemed unsatisfactory from a scientific perspective or unsuitable for examination and which fail to reach a pass mark (50%) will be returned to the candidate for re-submission. A commentary will be provided. The candidate will be allowed a maximum of three weeks to improve the dissertation to an acceptable standard and re-submit.

The internal examiner will review the re-submitted dissertation to ensure a pass standard has been reached and will then forward it to the external examiner for review. The final mark for such dissertations will be capped at 50% and then only if the required improvements have been made. The examiners are unable to and will not provide a proof-reading service for such unacceptable submissions.

Late submissions

Late-submitted dissertations (or where revisions or corrections are received late) will have marks capped in the PASS (III) range.

Thesis Assessment Rubric

Result (Grade)	Mark Range	Criteria
Distinction (Class I)	85-100%	Marks in this category are reserved for truly exceptional and beyond excellent project reports. Extensive justification will be needed to award such marks, such as evidence of publication in a peer-reviewed international journal or presentation of the work at a major international conference.
	70-84%	An excellent project report showing evidence of wide reading, with clear presentation and thorough analysis of results and an ability to critically evaluate and discuss research findings. Significant insight and originality. A very competent, well-written and presented, and logically organised report overall.
Pass (II-1)	60-69%	A good project report which shows a good understanding of the problem and knowledge of the relevant literature. Sound presentation and analysis of results with only occasional lapses. Relevant interpretation and critical evaluation of results. Good general standard of presentation and organisation of the report.
Pass (III)	50-59%	A passable project report which shows some understanding of the problem but perhaps limited knowledge and appreciation of the relevant literature. Presentation, analysis and interpretation of the results may be at a basic level and showing little or no originality or critical evaluation. Satisfactory organisation and presentation of the report is required to pass.
Fail (F)	40-49%	A weak project report showing only limited understanding of the problem and superficial knowledge of the relevant literature. Results presented in a confused or inappropriate manner and incomplete or erroneous analysis. Discussion and interpretation of result severely limited, including some basic misapprehensions, and lacking any originality or critical evaluation. Unsatisfactory general standard of presentation and organisation of the report.
	20-39%	An unsatisfactory project containing substantial errors and omissions. Very limited understanding, or in some cases misunderstanding of the problem and very restricted and superficial appreciation of the relevant literature. Very poor, confused and, in some cases, incomplete presentation of the results and limited analysis of the results including some serious errors. Severely limited discussion and interpretation of the results revealing little or no ability to relate experimental results to the existing literature. Very poor overall standard of presentation.
	0-19%	A very poor project report containing every conceivable error and fault. Showing virtually no real understanding or appreciation of the problem and of the literature pertaining to it. Chaotic presentation of results, and in some cases incompletely presented and virtually non-existent or inappropriate or plainly wrong analysis. Discussion and interpretation seriously confused or wholly erroneous revealing basic misapprehensions.

Court of Examiners

The Court of Examiners consists of the Course Committee members, External Examiner, Director of Postgraduate Teaching & Learning, Associate Director of Postgraduate Teaching & Learning and Postgraduate Administrator. The Court of Examiners will be chaired by the Head of Department (or nominee). The Court will meet shortly after the final examination to assess the results and award students with a pass or, where appropriate, a distinction. Students requiring a Supplemental Examination will be identified. It will also recommend the award of the Diploma for Diplomat students (i.e. those who have indicated they will not be submitting a dissertation).

Appeal and Disciplinary Procedures

Appeal and Re-marking of Assessments

The grounds for appeal and re-checks against the decision of the Court of Examiners are specified in the TCD Examinations and General Assessment Regulations as laid out in the University of Dublin, Trinity College Calendar Part 3, Graduate Studies and Higher Degrees for a given academic year. Students will bring their appeal to the Course Committee in the first instance and, where they are not satisfied with the outcome, to the established appeal procedure for taught postgraduate programmes in TCD. All decisions are officially notified to the appropriate authorities.

Breaches of Regulations and Disciplinary Redress Process

All assessments for the MSc in Clinical Chemistry programme will be conducted in accordance with the regulations of the Graduate Studies Office of TCD. Where breaches of the assessment regulations are suspected or alleged they will be subject to the relevant TCD procedures. All decisions are officially notified to the appropriate authorities. TCD plagiarism rules will apply on this course. In the case of research projects TCD guidelines for good scientific practice in research and scholarship will apply.

Graduation

Graduations are organised through Trinity College Dublin. Further information is available at <http://www.tcd.ie/academicregistry/graduation/>. Students are eligible for graduation once they have successfully passed all assessments and examinations and their research project has been passed. A list of student results is prepared and sent to the TCD Examination Office once the students have submitted two copies of the final bound version of their research project.

All registered postgraduate students eligible to be conferred with a higher degree in the current academic year, are annually invited, to make application to the Student and Graduate Records Office. The invitation includes provision of all the information necessary to make application.

Students opting for the Diploma exit will be eligible for graduation once they pass all assessments and examinations.

Students will only be able to proceed to graduation once their results are published. Students can only be nominated to proceed to graduation by the Clinical Biochemistry unit.

Regulations

In addition to course specific regulations described in this document TCD general regulations described in the University Calendar apply (<http://www.tcd.ie/calendar/>).

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.

A general set of guidelines for students on avoiding plagiarism is available on the [Library website](#). The Calendar entry outlines the process through which a suspected case of plagiarism should be dealt with. Where the summary procedure is invoked a written minute of the [Plagiarism Summary Procedure](#) must be completed.

The Plagiarism Policy document can be found [here](#).

Students at postgraduate level can reasonably be assumed to be familiar with rules in respect of plagiarism, therefore any plagiarism occurring in the context of any postgraduate work cannot normally be deemed to constitute Level 1 plagiarism.

All students are required to complete the Ready Steady Write plagiarism tutorial at the start of each academic year and must also sign a declaration when submitting all items of course work, whether in hard or soft copy or via Blackboard. The Declaration that is signed is the verification that you have completed the tutorial.

Text of Declaration

Each coversheet that is attached to submitted work should contain the following completed declaration:

"I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at <http://www.tcd.ie/calendar>.

I have also completed the Online Tutorial on avoiding plagiarism 'Ready Steady Write', located at <http://tcd-ie.libguides.com/plagiarism/ready-steady-write>."

The following text is reprinted from the College Calendar 2020-21 and should be borne in mind by all students:

It is clearly understood that all members of the academic community use and build on the work and ideas of others. It is commonly accepted also, however, that we build on the work and ideas of others in an open and explicit manner, and with due acknowledgement.

Plagiarism is the act of presenting the work or ideas of others as one's own, without due acknowledgement.

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. It is the responsibility of the author of any work to ensure that he/she does not commit plagiarism.

Plagiarism is considered to be academically fraudulent, and an offence against academic integrity that is subject to the disciplinary procedures of the University.

Examples of Plagiarism

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) procuring, whether with payment or otherwise, the work or ideas of another;

- d) quoting directly, without acknowledgement, from books, articles or other sources, either in
- e) printed, recorded or electronic format, including websites and social media;
- f) paraphrasing, without acknowledgement, the writings of other authors.

Examples (d) and (e) 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
- (iii) sources from which the notes were drawn;
- (iv) fail to distinguish between information which needs no acknowledgement because
- (v) it is firmly in the public domain, and information which might be widely known, but
- (vi) which nevertheless requires some sort of acknowledgement;
- (vii) come across a distinctive methodology or idea and fail to record its source.

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

Plagiarism in the context of group work

Students should normally 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, submitting work which is the product of collaboration with other students may be considered to be plagiarism.

When work is submitted as the result of a group project, it is the responsibility of all students in the group to ensure, so far as is possible, that no work submitted by the group is plagiarised.

Self plagiarism

No work can normally be submitted for more than one assessment for credit. Resubmitting the same work for more than one assessment for credit is normally considered self-plagiarism.

Avoiding plagiarism

Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All schools and departments must include, in their handbooks or other literature given to students, guidelines on the appropriate methodology for the kind of work that students will be expected to undertake. In addition, a general set of guidelines for students on avoiding plagiarism is available on <http://tcd.ie/libguides.com/plagiarism>

If plagiarism as referred to above is suspected, in the first instance, the Director of Teaching and Learning (Undergraduate), or their designate, will write to the student, and the student's tutor advising them of the concerns raised. The student and tutor (as an alternative to the tutor, students may nominate a representative from the Students' Union) will be invited to attend an informal meeting with the Director of Teaching and Learning (Undergraduate), or their designate, 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 them to attend. If the student does not in this manner agree to attend such a meeting, the Director of Teaching and Learning (Undergraduate), or designate, 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 §2.

If the Director of Teaching and Learning (Undergraduate), or designate, forms the view that plagiarism has taken place, he/she must decide if the offence can be dealt with under the summary procedure set out below. In order for this summary procedure to be followed, all parties attending the informal meeting as noted above must state their agreement in writing to the Director of Teaching and Learning (Undergraduate), or designate. If one of the parties to the informal meeting withholds his/her written agreement to the application of the summary procedure, or if the facts of the case are in dispute, or if the Director of Teaching and Learning (Undergraduate), or designate, 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 §2.

If the offence can be dealt with under the summary procedure, the Director of Teaching and Learning (Undergraduate), or designate, will recommend one of the following penalties:

- a) Level 1: Student receives an informal verbal warning. The piece of work in question is inadmissible. The student is required to rephrase and correctly reference all plagiarized elements. Other content should not be altered. The resubmitted work will be assessed and marked without penalty;*
- b) Level 2: Student receives a formal written warning. The piece of work in question is inadmissible. The student is required to rephrase and correctly reference all plagiarized elements. Other content should not be altered. The resubmitted work will receive a reduced or capped mark depending on the seriousness/extent of plagiarism;*
- c) Level 3: Student receives a formal written warning. The piece of work in question is inadmissible. There is no opportunity for resubmission.*

Provided that the appropriate procedure has been followed and all parties above are in agreement with the proposed penalty, the Director of Teaching and Learning (Postgraduate) should in the case of a Level 1 offence, inform the Course Director and, where appropriate, the Course Office.

In the case of a Level 2 or Level 3 offence, the Dean of Graduate Studies must be notified and requested to approve the recommended penalty. The Dean of Graduate Studies may approve or reject the recommended penalty, or seek further information before making a decision. If he/she considers that the penalties provided for under the summary procedure are inappropriate given the circumstances of the case, he/she may also refer the matter directly to the Junior Dean who will interview the student and may implement the procedures as referred to under conduct and college. Notwithstanding his/her decision, the Dean of Graduate Studies will inform the Junior Dean of all notified cases of Level 2 and Level 3 offences accordingly. The Junior Dean may nevertheless implement the procedures as set out in Section 5 (Other General Regulations).

If the case cannot normally be dealt with under summary procedures, it is deemed to be a Level 4 offence and will be referred directly to the Junior Dean. Nothing provided for under the summary procedure diminishes or prejudices the disciplinary powers of the Junior Dean under the 2010 Consolidated Statutes.

Student Support Services

Disability Service

The Disability Service provides supports for students with a disability or specific learning difficulty. Students requiring support in College are advised to contact the Disability Service as early as possible in order to register for examination accommodations, academic support and assistive technology. The service is located in Room 2054 of the Arts Building, on the entrance level, past the Lecky Library. Website: www.tcd.ie/disability/

Support Provision for Students with Disabilities

Trinity has adopted a [Reasonable Accommodation Policy](#) that outlines how supports are implemented in Trinity. Student seeking reasonable accommodation whilst studying in Trinity must apply for reasonable accommodations with the Disability Service in their student portal my.tcd.ie. Based on appropriate [evidence of a disability](#) and information obtained from the student on the impact of their disability and their academic course requirements, the Disability Staff member will identify supports designed to meet the student's disability support needs. Following the Needs Assessment, the student's Disability Officer prepares an Individual [Learning Educational Needs Summary \(LENS\)](#) detailing the Reasonable Accommodations to be implemented. The information outlined in the LENS is communicated to the relevant School via the student record in SITS.

Examination accommodation and deadlines

Students should make requests as early as possible in the academic year. To ensure the Assessment, Progression and Graduation Team can set your accommodations for examination purposes the following deadlines are applied:

- Semester 1 assessments and Foundation Scholarship assessment: the last Friday in September (27th September 2019)
- Semester 2 assessments: the last Friday in January (24th January 2020)
Reassessments: the last Friday in May (29th May 2020)

Student responsibilities for departmental assessments/course tests

- Students are required to initiate contact with the School/Department and request reasonable accommodations as **per their LENS report, or email received following their needs assessment** for particular assessments for School/ Department administered assessment. Students are advised to make contact **at least two weeks prior** to the assessment date to enable adjustments to be implemented.

Professional Learning Education Needs Summary - PLENS

Students with disabilities on professional courses in receipt of reasonable accommodation provided by College the Disability Service will be issued a PLENS report and are provided with supports such as examination and academic reasonable accommodations. In the background section of the PLENS the following text is included:

Student is encouraged to discuss any disability supports required on professional course and placement with the Academic contact and/or Placement Co-ordinator of their course. Student can be referred back to Disability Service for placement planning supports - Level 2 - Placement Planning, if and when required.

Students are encouraged to speak with the placement co-ordinator if they are unsure of any needs for placement supports. Students can be referred back to Disability Service for placement planning supports, if and when required. More Information on placement supports offered are linked [here](#)

Please note: no reasonable accommodation can be provided outside the procedures outlined in the Trinity [Reasonable Accommodation Policy](#).

More detailed text on placement planning and supports can be found at the following link:
<https://www.tcd.ie/disability/services/placement-planning.php>

College Health Service

The College Health Service is located in House 47. All registered students are eligible to use the College Health Service throughout the year. The service offers, on campus, primary health and psychiatric care, between 9.30am and 4.30pm weekdays excluding lunchtime. Detailed information regarding services can be accessed on the website. Telephone: (01) 896 1556.

Website: www.tcd.ie/College_Health/

Consultations are strictly by appointment; however telephone advice from the triage nurse is free of charge.

Students can also attend DUBDOC, an out-of-hours emergency general practitioner service in St. James's Hospital (Tel No. 4545607/4538006) between 6pm and 10pm weekdays and 10am to 7pm weekends and Bank Holidays. This service is based in St. James Hospital.

Students (with the exception of Non Irish E.U. Students or Students with Medical Cards) will be responsible for any fees incurred for consultation or home visits.

Outside these hours, please telephone the Contactors Bureau at 8300244, who will send a doctor on request. There is a charge payable at the time except in the case of Medical Card holders, European Students with European Health Cards, N.Ireland and G.B Students.

Equality Office

Trinity College Dublin is committed to ensuring equality of opportunity for all its students and staff. Trinity promotes a respectful and diverse study environment that is free from discrimination, where all members of the College community can develop their full potential.

The Equality Officer advises on matters relating to equality legislation and assists with the development of College policies. The Equality Officer provides information on equality legislation and entitlements to staff and students. Several equality awareness events and activities take place throughout the year. Website: www.tcd.ie/equality

Postgraduate Advisory Service

The Postgraduate Advisory Service is a unique and confidential service available to all registered postgraduate students in Trinity College. It offers a comprehensive range of academic, pastoral and professional supports dedicated to enhancing your student experience.

The PAS exists to ensure that all Postgrad students have a contact point where they can turn to for support and information on college services and academic issues arising. Representation assistance to Postgrad students is offered in the area of discipline and/ or academic appeals arising out of examinations or thesis submissions, supervisory issues, general information on Postgrad student life and many others. If in doubt, get in touch! All queries will be treated with confidentiality.

The Postgraduate Advisory Service is led by the Postgraduate Support Officer who provides frontline support for all Postgraduate students in Trinity. The Postgrad Support Officer will act as your first point of contact and a source of support and guidance regardless of what stage of your Postgrad you're at. In addition each Faculty has three members of Academic staff appointed as Postgraduate Advisors who you can be referred to by the Postgrad Support Officer for extra assistance if needed.

The PAS is located on the second floor of House 27.

Opening Hours:

Students can drop-in to the Service every Tuesday or Thursday between 2.30pm and 3.30pm or at other times by appointment.

Phone: 8961417

Email: pgsupp@tcd.ie

Contact details of the Postgrad Support Officer and the Advisory Panel are available on our website: www.tcd.ie/Senior_Tutor/postgraduate/

Student Counselling Service

The Student Counselling Service is located on 3rd floor, 7-9 Leinster Street South, and are here to help you manage any difficulties you are experiencing so you can enjoy and fully participate in your time here at College. It is a confidential and professional service available free of charge to every Trinity College student. It offers help in coping with any personal and emotional problems that may impact on your studies or progress in the University and offers learning support and development aids. Visit the Student Counselling Website to find out more about the services available, such as One to one sessions with a trained counsellor, Group therapy and educational workshops, on-line support programmes, and more.

Website: www.tcd.ie/Student_Counselling/

Graduate Students' Union

The Graduate Students' Union is an independent body which represents graduate students in Trinity College, Dublin. All graduate students of the College, including postgraduate research students, and those on higher degree and higher diploma courses, automatically become members of the Union upon registering with the College. The day-to-day running of the Union is organised by an elected Executive, which consists of the Officers of the Union - the President, Vice-President, Treasurer, Events officer and one Officer from each Faculty - plus three additional Faculty Representatives (one from each of the three Faculties).

The GSU is located on the 2nd floor of House 6 in Front Square. They can be contacted via (01) 896 1169, or by e-mail at president@gsu.tcd.ie. Details of the many activities organised by the GSU can be viewed on the Graduate Students' Union website. www.tcdgsu.ie

Graduate Studies Office

The Graduate Studies Office website provides students with information, regulations and forms that you may require as a postgraduate student at Trinity College. This includes the Postgraduate Prospectus and Trinity College Calendar Part II.

Website: www.tcd.ie/Graduate_Studies

Clubs and Societies

A great way to get to know people is by joining one of the 100 student societies, which cover everything from the Afro-Caribbean Society to the Zoological Society. The societies meet regularly and provide an excellent opportunity to meet other students with similar interests.

Among the societies are the Philosophical Society (the "Phil"), dating from 1684 and the Historical Society (the "Hist") dating from 1770.

At the start of the academic year all the student societies set up their stands on campus in Front Square, encouraging new members to join. Even if you miss that week you can turn up at any student society meeting and be sure of a warm welcome. Full details of all the societies can be found on the Central Societies Committee website: <http://trinitysocieties.ie/>

Dublin University Central Athletic Club - DUCAC

Dublin University Central Athletic Club (DUCAC) is the governing body for Sport Clubs at Trinity. DUCAC is responsible for the overall administration of DU Sports Clubs in cooperation with Club Officers and for their interests and development in Trinity. An Executive Committee and other sub-committees oversee the business affairs of DUCAC, including the Pavilion Bar. DUCAC receives funding from the Capitation Committee at the University and supplements its income with a percentage of profits from the Pavilion Bar.

www.tcd.ie/Sport/student-sport/ducac/

Careers Advisory Service

Postgraduate study opens the doors to many opportunities but the market is competitive and you will need to differentiate yourself clearly from other candidates.

Resources

The Careers Advisory Service (CAS) provides a wide range of resources and services to help you make and implement informed choices about your future career direction.

The Careers Information Centre at 7-9 South Leinster Street contains a range of free, career related booklets and employer materials for you to take away. Online, the resources section of the website (www.tcd.ie/Careers/resources) provides useful information on a range of topics from career choice and planning, to working abroad, taking a year out and everything in between.

Services

Individual appointments to meet a Careers Consultant are also available. They work with you to identify how best to approach the next step in your career. They can also review your CV/LinkedIn profile and provide coaching to ensure maximum impact at interview. Job opportunities from employers currently recruiting Trinity graduates as well as postgraduate courses and funding are available online.

CAS also offers a wide range of seminars; workshops and employer presentations, including postgrad specific events, throughout the year that will help you explore where your postgraduate study can take you.

MyCareer

An online service that you can use to:

- Apply for opportunities which match your preferences - vacancies including research options
- Search opportunities- postgraduate courses and funding
- View and book onto employer and CAS events
- Submit your career queries to the CAS team
- Book an appointment with your Careers Consultant

Simply login to MyCareer using your Trinity username and password and personalise your profile.

Contact details: 7-9 South Leinster Street, Dublin 2
01 896 1705/1721

Opening Hours: During term - 9.30am - 5.00pm, Monday - Friday
Out of Term - 9.30am - 12.30pm & 2.15 - 5.00pm, Monday – Friday

Pastoral Care

College Chaplaincy

There are four College chaplains who represent four of the main Christian traditions in Ireland, Roman Catholic, Anglican, Methodist and Presbyterian. The chaplains work closely together as a team, and are available to help and support students and staff who seek pastoral care. The chaplains are happy to assist students belonging to other churches or other faiths wishing to make contact with their own religious communities here in Dublin.

Website: www.tcd.ie/Chaplaincy/

Prayer/Reflection facilities

Main campus

There is a Prayer Room, through the door to the left of the Chapel porch. The Prayer Room is available for quiet reflection and prayer to people of all traditions from 8 a.m. – 6 p.m. daily. Prayer rooms for Muslim worshippers are located in Arch 7, Goldsmith Hall.

Contemplation Room, Tallaght University Hospital

The Contemplation Room is a quiet space for all people. It is a sacred space for all faith traditions and none, for those of no spiritual preference or faith. It is also used for cultural events.

Camino Rest, St James's Hospital

Camino Rest serves as a house of prayer, a sacred and quiet space for people of all faith traditions and also for those who express no spiritual preference or faith.

It is a sanctuary where patients, visitors and staff can rest, reflect and refresh themselves through prayer, meditation or other accepted forms of personal renewal.

College Day Nursery

The Day Nursery provides care for children of students and staff of Trinity College. The Nursery has a maximum of 52 full time places and caters for children aged 3 months to 4.5 years.

Website: www.tcd.ie/about/services/daynursery

Student Information System

The student information system is accessible to staff and students via the web portal my.tcd.ie

All communications from College are sent to you via your online portal which gives you access to an 'in-tray' of your messages.

All fee invoices/payments, student levies and commencement fees are issued online and all payments are carried out online.

You can view your personal details – some sections of which you will be able to edit yourself.

In order to get information throughout the year, please ensure that your account is active and if you have any issues please contact IT Services - <http://www.tcd.ie/itservices>.

Information Systems Services

Information Systems Services (IS Services) is responsible for the provision and support of computer systems, networking, and audiovisual and media services in Trinity College. Once you have registered and obtained your computer username and password, you will be able to access your TCD e-mail account, use the College Computer Rooms and College printing. Also, if you own a computer, IS Services will assist with registering it on the network and availing of the free broadband service.

Website: www.tcd.ie/itservices/

Emergency Procedure

In the event of an emergency, dial Security Services on extension 1999.

Security Services provide a 24-hour service to the college community, 365 days a year. They are the liaison to the Fire, Garda and Ambulance services and all staff and students are advised to always telephone extension 1999 (+353 1 896 1999) in case of an emergency.

Should you require any emergency or rescue services on campus, you must contact Security Services. This includes chemical spills, personal injury or first aid assistance.

It is recommended that all students save at least one emergency contact in their phone under ICE (In Case of Emergency).

Data Protection

The University of Dublin, Trinity College needs to collect and use personal data (information) for a variety of purposes about its staff, students and other individuals who come in contact with the College. The purposes of processing data include the organisation and administration of courses, examinations, research activities, the recruitment and payment of staff, compliance with statutory obligations, etc. Data Protection legislation safeguards the privacy rights of individuals in relation to the processing of personal data. The Data Protection Act 2018 confers rights on individuals as well as responsibilities on those persons processing personal data. Personal data, both automated and manual, are data relating to a living individual who is or can be identified, either from the data or from the data in conjunction with other information.

For further details please refer to this link: https://www.tcd.ie/info_compliance/data-protection/

Student Supports Quick Glance

Trinity welcomes all its students and as a TCD student you have many supports available to you. Please see below for a list of relevant supports. We hope you find this Quick Glance Page useful. If you find a site is missing, please contact us and we will add it to this list.

Academic Registry | www.tcd.ie/academicregistry/
Academic Policies and Procedures | www.tcd.ie/teaching-learning/academic-policies/
Blackboard | <https://tcd.blackboard.com/webapps/login/>
Careers Advisory Service | www.tcd.ie/careers
Chaplaincy | www.tcd.ie/Chaplaincy/
Complaint Procedures | www.tcd.ie/about/policies/160722_Student%20Complaints%20Procedure_PUB.pdf
Disability Service | www.tcd.ie/disability/
Data Protection | www.tcd.ie/info_compliance/data-protection/student-data/
Dublin Uni. Central Athletic Club (DUCAC) | www.tcd.ie/Sport/student-sport/ducac/
Dignity and Respect Policy | www.tcd.ie/equality/policy/dignity-respect-policy/
Graduate Student's Union (GSU) | www.tcdgsu.ie
Guidelines on Plagiarism | <http://tcd-ie.libguides.com/plagiarism>
Health and Safety Statement | www.tcd.ie/medicine/local/staff/health-safety.php
Health Centre | www.tcd.ie/College_Health
IT Services | www.tcd.ie/itservices/
Maths Help Centre | <http://maths.tcd.ie/outreach/helproom/>
Mature Students Office | www.tcd.ie/maturestudents/
Online tutorial Ready Steady Write | <http://tcd-ie.libguides.com/plagiarism/ready-steady-write>
Orientation Programme | www.tcd.ie/students/orientation/
Postgraduate Advisory Service | www.tcd.ie/Senior_Tutor/postgraduateadvisory/
Student Services | www.tcd.ie/corporate-services/structure/student-services/
Student Counselling Services | www.tcd.ie/Student_Counselling/
Student societies | <http://trinitysocieties.ie/>
Student Representation Structures | www.tcdgsu.ie/becomearep/
Senior Tutor Services | www.tcd.ie/seniortutor/
TCD sports | www.tcd.ie/Sport/
TCD Student's Union (TCDSU) | www.tcdsu.org
Turnitin | www.turnitin.com/login_page.asp?lang=en_us

Important information on COVID-19 restrictions and modes of teaching and learning

In order to offer taught programmes in line with government health and safety advice, teaching and learning in Semester 1 up to reading week for your programme will follow a blended model that combines online and in-person elements to be attended on campus. This blended model will include offering online lectures for larger class groupings, as well as in-person or online classes for smaller groups. The differing modes of teaching and learning for particular modules are determined by your home School. Information on the modes of teaching and learning during the second part of Semester 1 and in Semester 2 will be available closer to the time.

Registered students are expected to be available to attend in-person teaching activities. Any request not to attend in person for exceptional reasons (such as travel restrictions or underlying health conditions) will be considered on a case-by-case basis by the relevant Head of School in consultation with College Health and there is no guarantee that these requests can be facilitated. It will depend on whether the programme learning outcomes and modes of assessment can be met through remote attendance.

For those students not currently in Ireland or planning to undertake travel before the start of term, if they are returning from a country that requires mandatory hotel quarantining or self-quarantining/isolating on arrival in Ireland, they are expected to allow for the period of restricted movement after arrival and prior to commencement of their studies, and therefore should factor this into their travel plans.

We would ask all students to adhere to the safety protocols when on campus for in-person teaching activities or student club and society events, i.e., mask wearing, hand washing, cough etiquette and to maintain social distancing. Please do not congregate outside lecture or tutorial rooms after your classes; we would ask you to exit the building immediately after your event has finished. When term starts on 13 September (or 27 September for first years), students will be permitted on campus for any in-person events that they are involved in. Access to campus will be via a valid student ID card.

Appendices

Appendix 1: Course Work Instructions

COURSE WORK: ASSIGNMENTS AND LOGBOOK of CASES MSc in Clinical Chemistry (Students 2021-2022)

Assignments (134 marks in total)	Instructions to students for the 6 assignments Note: Allocated times for presentations (usually 10 minutes) must be strictly adhered to. You will be stopped if you exceed your allocation. Make sure you practice your presentations in advance.
Essay (25 marks)	Please submit ONE essay from the advised list of topics. <ul style="list-style-type: none"> • You are asked to submit in electronic and paper format. The essay length should not exceed 6 typed pages (excluding references). • You are advised to read the topic in detail before attempting the essay. Ensure your essay is properly planned with logical sections (introduction stating what you will cover or focus on, main body with headings where appropriate and a conclusion). • Font size 11 or greater • Spacing of 1.5 • Font and spacing must be consistent throughout the document • Any reasonable numbering system sections and subsections is required (e.g. 1.0 Literature Review; sub-headings will be 1.1, 1.2, 1.3 etc.; subsections within a sub-heading should be numbered 1.1.1, 1.1.2 etc. or 1.2.1, 1.2.2. etc.) • Ensure all Tables and Figures are mentioned and properly references in the text throughout • References use Vancouver Style and must be consistent throughout. Make sure your reference list is correct. • All information provided in the essay must be properly referenced • You will be required to present a power-point summary of your essay in class
Audit Report (24 marks)	Using data from your own hospital Laboratory you are required to submit a horizontal, vertical, witness, or clinical audit of your choice. Use any appropriate format to present the audit e.g. forms in use in your base laboratory. For clinical audits follow a defined format - find out how audit is done in your laboratory and hospital and use this format. Speak to your laboratory's quality officer, and your hospitals clinical audit department. However, ensure that you have included clear CONCISE sections describing what you did, e.g. <ul style="list-style-type: none"> • Title of audit • Introduction/Aim of audit • Background to the Audit • Standard that you audited against (and its source, what kind of standard is it?) • Your Audit methodology • Results/Findings and Conclusions from the Audit • Recommendations for improvements • Plans for re-audit and concluding remarks Try to keep the report to approximately 500 words plus any supporting proformas etc. Do not include any identifiable patient details. Ensure any attached proformas used during the audit are adequately explained if they are not self-explanatory. You will be asked to make a presentation of your audit in class (10 PowerPoint slides is recommended), as this is how most hospital audits done by clinical teams are disseminated.

	<p>You will be assessed on the submitted document and on the class presentation/discussion.</p> <p>Refer to lecture material for more information. Make sure you understand the audit cycle and the difference between audit and research. Also check the RCPATH website which has a useful section on clinical audit (www.rcpath.org)</p>
<p>EQA Workshop Report (12 marks)</p> <p>(this is linked with the EQA workshop)</p>	<p><u>EQA Workshop Report</u></p> <p>The assignment will be completed and presented on the same day as the EQA workshop. Class will be divided into groups and will present as a group. Please note it is important each member of the group presents. Groups will be provided with an EQA report from a Laboratory and required to report on same. The EQA summary report should consider the following:</p> <ol style="list-style-type: none"> 1. Review of EQA report <ol style="list-style-type: none"> a. Scheme details b. Summary of all major findings 2. Issues identified <ol style="list-style-type: none"> a. current assay performance b. Trend analysis c. Areas of concern 3. Possible investigation & remedial action required <ol style="list-style-type: none"> a. Immediate action required b. Further investigation c. Remedial action required <p>Please aim to submit approximately 10 power-point slides. Assessment will be based on the submitted document.</p>
<p>Business Case Report (24 marks)</p>	<p>Submit a business case based on an example from your Laboratory within the past 2 years. You may use Word, Power Point or any other suitable software tool. It may be appropriate in some cases to include an Excel spreadsheet if it is necessary to present financial or workload information. Please ensure any information you divulge is not proprietary – check with your Manager first!</p> <p>Please speak to relevant staff in your Laboratory about how they would go about it, - e.g., the laboratory manager, chief medical scientist, principal biochemist, or consultant. You are also recommended to study the lecture that was given on this topic. The main purpose of this assignment is to get you writing a business case for something you want/your lab or hospital wants using guidance from your own organisation on the assumption that most hospital laboratories are very adept at this. Bear in mind that most successful business cases must be concise – usually the major message should be conveyed in a few pages. If the business case documentation you have been given by your lab to work with is more extensive, you should aim to summarise it for the purposes of this assignment in about 3 pages. The bottom line should also appear within these parameters (i.e., costs summary and benefits). If your business cases offers a number of options (e.g. often a do-nothing option, and then various development options including your recommended option), you should summarise the costs and benefits, pros and cons for each of these options.</p> <ul style="list-style-type: none"> • Title • Introduction • Background to the present case • Options appraised, including costs, benefits, pros/cons of each option (if appropriate) • Recommendation (or recommended option) • Conclusion <p>Ten PowerPoint Sides is recommended, plus (if you have to) any absolutely essential supplementary spreadsheets or supporting documents. Any attached documents must</p>

	<p>be explained if they are not self-explanatory. You may use other software if this is more convenient.</p> <p>The assessment will be based on both your submitted document and a class presentation/discussion.</p>
<p>Journal Article – review/presentation (25 marks)</p>	<p>You are asked to prepare a Power Point Presentation lasting approx. 15mins where you review a journal article of your selection. The Power Point presentation should ideally not be more than 10 slides in length. You will be asked to give a class presentation of your journal article.</p> <p>You may select any article relevant to laboratory medicine/clinical chemistry. This may be a review article, or an original scientific paper selected from a major scientific journal. It is better to focus the presentation on one major article, though you may refer to other articles, reviews or even newsletter/press articles on the same topic if this is relevant. In general, you can use the headings in the journal article for your presentation, and you can also project figures or tables from the journal article itself if this helps in the presentation.</p> <p>The Power Point will need to be submitted electronically by the deadline and the assessment will be based on the submitted PP and the class presentation.</p> <p>Please also attach an electronic copy of your chosen review article with the PowerPoint presentation assignment. We will aim to circulate these to the class in advance of the presentation.</p>
<p>Method Evaluation (24 marks)</p>	<p>Each student should compare two methods in their own laboratory.</p> <p>e.g.</p> <ol style="list-style-type: none"> 1. If your laboratory is introducing a new method 2. If your laboratory has two analysers capable of measuring the same analyte e.g. sodium on main analyser and blood gas analyser <p>Headings:</p> <ul style="list-style-type: none"> • Brief introduction • Practical Requirements: includes specimen size and type, sample handling, workload, IQC, EQA, method robustness, waste disposal, hazards, health and safety issues etc. • Performance characteristics: includes accuracy, analytical range, analytical specificity and sensitivity, decision limits, interference etc. • Precision studies • Detection limit • Reference ranges • Acceptability – CLIA, percent of biological variation. Conclusion <p>A written report is required and should include Excel spreadsheets of your precision and patient data plus appropriate graphs. The assessment will be based on both your submitted document and a class presentation/discussion. Try to ensure that your format and layout is good for presentation to save yourself the trouble of having to do a separate PowerPoint for the class presentation – in most cases, you should be able to use a Word and/or Excel document for presentation unless you are very good at linking everything into PowerPoint.</p>
<p>Logbook of Cases</p>	<p>Instructions to Students for the Logbook of 8 Cases</p>
<p>8 Cases presented in log book format (96 marks in total)</p>	<p>Please submit 4 cases per year (2 per semester)</p> <p>The preferred format is as Power Point slides as this is the format used by the clinical team in most hospital clinical case meetings</p> <p>At least 4 cases should be submitted during each academic year. You are encouraged to discuss cases with appropriate clinical and laboratory team members and perhaps</p>

	<p>review the patients chart where possible. Ensure all cases submitted are anonymous (in this regard do not even include patient initials; also you may state the age but not exact dates of birth).</p> <p>A list of cases will be provided (relevant to the current module). Try to submit on 8 different biochemical problems if possible. Exotic cases will not score any better than a well-presented “common gardener” problem.</p> <p>Assessment consists of the submitted cases, and presentation/discussion at Case Presentation sessions arranged each term.</p> <p>Each case should be submitted electronically and in paper copy.</p> <p>Suggested Case report Headings (note these are not obligatory and may be adjusted to suit the type of case):-</p> <ul style="list-style-type: none"> • Case title Slide (please use a descriptive title). Include your name, date and case number/topic number as per list provided • Presenting Complaint – to include history of the presenting complaint • Brief Mention of relevant aspects of Past History, Family History, Social History, Systems Review • Examination Findings – relevant. Don’t forget to include relevant units and reference ranges • Results with interpretation • You may want to ask a question at a suitable point– e.g. what is the diagnosis? • Differential Diagnosis with discussion • Diagnosis and information on the pathogenesis and treatment of the condition • Brief Account of the patient’s Progress, Monitoring (including cumulative laboratory findings), Response to treatment may be included where relevant (or you may focus on initial diagnosis if you wish) • Background information on the condition • Summary/Conclusions and references (where appropriate) <p>You should also check your case selections with your fellow students to avoid duplication of cases topics presented. Also check the database of previous cases topics which are indexed against the Case Topic Number. Try to select case topics that have not been covered previously or that have fewer uploaded cases. Further details of Case Topics and Selection of cases by individual students will be available at the Introductory Day and start of terms.</p>
OSPES	Instructions to Students for OSPES
OSPE Practice Runs	A number of practice run OSPES are held in order to familiarise students with the OSPE format. The practice OSPES will aim to cover material from that module. Feedback will be given verbally during the practice session.
Marked OSPES (108 marks total) 32 CM7801/CM7802 22 CM7803/CM7804	There are 4 Marked OSPES on the entire course – one per module/semester. These will be held on the same day as the end of module/semester Written Paper. All students regardless of year of entry will be doing the same OSPE at the same time (i.e. all students will either be doing Practice-Runs or a Marked OSPE at any one sitting, and the marked OSPES will always be on the same day as the end of module Written Paper).

Appendix 2a: Taught Course Module Descriptor: CM7801

Module Title:	Clinical Chemistry I
Module Code	CM7801
Module Coordinator:	Prof Gerard Boran
Module Authors:	Prof Gerard Boran, Dr Vivion Crowley, Prof Philip Mayne, Dr Ann Leonard, Dr Gerard O'Connor
ECTS Credits	15
<p>Rationale and Aims: This module covers a number of core areas in clinical biochemistry and the aims are to provide:</p> <ul style="list-style-type: none"> • up to date and in depth knowledge of core areas of clinical biochemistry • an in depth understanding of new procedures and methodologies • the skills to critically assess efficient utilisation of laboratory services and appropriate laboratory investigations for given clinical conditions • the ability to interpret biochemical results in conjunction with clinical information and to discuss the clinical utility of these results with clinical colleagues. • A framework for future learning and the ability to apply new learning to routine and specialised laboratory activity 	
<p>Methods of Teaching and Student Learning: The teaching strategy is a mixture of lectures, tutorials, workshops and case discussions. Workshops, tutorials and case discussions involve extensive student participation.</p> <p>Lectures will be delivered by national and international clinical practitioners, medical scientists and clinical biochemists who are experts in their subjects. While the format of lectures is conventional; informal interaction is encouraged.</p> <p>Short cases relevant to each module will be covered in each teaching session and will be complemented at the Clinical Laboratory Interface Workshops. Workshops will deal with both advanced laboratory techniques and the clinical laboratory interface.</p> <p>The varied teaching methodology ensures an inclusive curriculum that takes account of the diverse learning styles and preferences of the diverse student population that is attracted to this course.</p>	
<p>Module Content: Emphasis will be on current trends and recent developments.</p> <p>Fluid and electrolyte homeostasis: Physiological control of fluid electrolyte levels from a molecular level. Underlying causes of elevated or lowered levels of different electrolytes, physiological and pathological (e.g. potassium, sodium, magnesium) as well as the pre-analytical, analytical and drug influences on results. Investigation of fluid collections e.g. pleural effusion, ascites.</p> <p>Acid Base: Interpretation of acid base disturbance, identification of possible causes and suggested treatment. Patterns of acid base disturbance expected in common conditions.</p> <p>Renal Function: Acute kidney injury. Chronic renal failure. Renal dialysis. Renal Tubular disorders.</p> <p>Gastrointestinal Function: Gastrointestinal and pancreatic exocrine function. Investigation of suspected pathological conditions Immunological aspects of gastrointestinal disease Biochemical aspects of nutrition, monitoring nutritional status and nutritional support.</p>	

Investigation of liver disease. Alcohol.
Iron metabolism and Iron overload including Haemochromatosis.
Colorectal Cancer Screening.
Gut Hormones.

Cardiovascular disease:

Cardiovascular risk factors and laboratory assessment, including critical appraisal of available biomarkers. BNP and other markers in heart failure.

Lipid Metabolism:

Lipid metabolism and Dyslipidaemia.

Toxicology:

Metabolic aspects of prescribed drugs, drugs of abuse and poisons. Investigation of the poisoned patient. Methods for drug analysis. Immunosuppressive drugs. Update on common poisonings.

Tumour markers:

Use of tumour markers in screening and early detection of cancer.
Diagnostic utility and the properties of an ideal marker. Monitoring response to therapy.

Enzymology:

Use of enzyme measurements in clinical diagnosis. Isoforms, isoenzymes and macro enzymes.

Methodology:

Methods available for analytes covered in the module with special emphasis on methodologies not found in all routine laboratories.
Critical assessment of available biochemical investigations for each topic covered in this module.
Critically reviewing available methodology – student exercise/presentation.
Specialist techniques including:

- Faecal Immunochemical Testing in Colorectal Cancer screening.
- Estimating GFR.
- Immunosuppressive drug measurement.
- Tandem Mass Spectroscopy for drug analysis

Course Work:

- 2 Cases
- 1 Assignment

Learning Outcomes:

On successful completion of this module participants will be able to:

- Identify and explain the relationship between normal physiological function and the pathological changes that occur in the different clinical conditions, to a molecular level, covered by the above topics.
- Formulate differential diagnoses based on the biochemical results and clinical information and choose further investigations based on the clinical question being asked and the results currently available
- Interpret laboratory results, taking into account clinical information and the pre-analytical and analytical issues in relation to the different analytes, and discuss results with their laboratory and clinical colleagues
- Demonstrate awareness of the capabilities and limitations of biochemical investigations in identifying the presence or absence of disease states associated with the above topics
- Identify, compare and appraise current and new analytical methods for relevant analytes and appraise recent advances both within the clinical laboratory and research centres.
- Explain controversial issues in relation to using tumour markers to screen for disease
- Assess advances in the understanding of pathological processes in these areas and the part played by clinical biochemistry and molecular medicine

Assessment:

Summative:
End of Module written paper

End of Module Objective Structured Practical Exercise (OSPE)

Course work (case presentations/assignments)

This module will account for 25% of overall taught course marks. 50% pass mark for end of module assessment. Compensation is possible provided $\geq 40\%$ mark is obtained in the area requiring compensation.

Formative:

OSPE practice runs during term

Presentations to class

ECTS Credits: 15

Indicative Resources:

- Rifai, N. et al. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 6th Edition, Elsevier 2018
- Rifai, N. et al. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics, 8th Edition, Elsevier 2019
- WJ Marshall, M Lapsley, Day A. Clinical Chemistry, 9th edition, Mosby 2020.
- MA Crook, Clinical Biochemistry and Metabolic Medicine, 8th edition, Hodder Arnold 2012.
- Ahmed N, Fundamentals of biomedical science: Clinical Biochemistry IBMS, 2nd edition, Oxford University Press 2017

Students will be directed to reviews and articles in relevant clinical/biochemical journals such as:

- Annals of Clinical Biochemistry
- Clinical Chemistry
- New England Journal of Medicine
- Clinical Chemistry and Laboratory Medicine

Specific articles will be referenced by each lecturer.

Guidelines, where relevant, will be referenced, some examples are listed below:

Cardiology:

European Society of Cardiology; Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *European Heart Journal*, Volume 41, Issue 1, 1 January 2020, Pages 111–188 - <https://academic.oup.com/eurheartj/article/41/1/111/5556353>

Irish Lipid Guidelines: Recommendations for the testing and reporting of lipids in clinical diagnostic laboratories within the Republic of Ireland. 5th Edition 2018.

Nephrology:

Irish Nephrology Society; Irish CKD Guidelines. AKI Guidelines.

Oncology:

ACBI: Guidelines for the use of tumour markers, 5th edition 2018.

NCCP Prostate Cancer GP referral guidelines

Gastroenterology:

National cancer screening service (<http://www.cancerscreening.ie>)

Clinical and Laboratory Standards Institute (CLSI) Guidelines:

Access to CLSI Guidelines is available through the Laboratory Medicine Department, Tallaght University Hospital. These guidelines are extensively referenced throughout the course.

Web Portals:

<http://www.acbi.ie> (Association of Clinical Biochemists in Ireland)

<http://www.acb.org.uk/> (Association of Clinical Biochemists)

<http://www.clsi.org> (Clinical and Laboratory Standards Institute)

<http://www.aacc.org> (American Association of Clinical Chemistry; NACB guidelines)

Module Title:	Clinical Chemistry II and General Paediatric Biochemistry
Module Code	CM7802
Module Coordinator:	Prof Gerard Boran
Module Authors:	Dr Vivion Crowley, Prof Philip Mayne, Prof Gerard Boran, Dr Ann Leonard, Dr Gerard O'Connor
ECTS Credits:	15
<p>Rationale and Aims:</p> <p>This module will provide updates on additional core areas of clinical chemistry as well as neonatal and paediatric biochemistry so as to provide:</p> <ul style="list-style-type: none"> • up to date and in depth knowledge of core areas of the topics covered • an in depth understanding of new procedures and methodologies • the skills to critically assess efficient utilisation of laboratory services and appropriate laboratory investigations for given clinical conditions • the ability to interpret biochemical results in conjunction with clinical information and to discuss the clinical utility of results with clinical colleagues. • A framework for future learning and the ability to apply new learning to routine and specialised laboratory activity <p>Guest speakers will emphasise current trends and recent developments in neonatal, paediatric and obstetric biochemistry as well as the selected core topics in clinical chemistry including cytokines, immunochemistry, haematological biochemistry, and nutrition.</p>	
<p>Methods of Teaching and Student Learning:</p> <p>The teaching strategy is a mixture of lectures, tutorials, workshops and case discussions. Workshops, tutorials and case discussions involve extensive student participation.</p> <p>Lectures will be delivered by national and international clinical practitioners, medical scientists and clinical biochemists who are experts in their subjects. While the format of lectures is conventional; informal interaction is encouraged.</p> <p>Short cases relevant to each module will be covered in each teaching session and will be complemented at the Clinical Laboratory Interface Workshops. Workshops will deal with both advanced laboratory techniques and the clinical laboratory interface.</p> <p>The varied teaching methodology ensures an inclusive curriculum that takes account of the diverse learning styles and preferences of the diverse student population that is attracted to this course.</p>	
<p>Module Content:</p> <p><u>Neonatal and Paediatric Biochemistry</u></p> <p>General Paediatric biochemistry covering electrolytes, calcium, phosphate, glucose, renal and liver function and the associated pathological conditions and relevant biochemical investigations. Prenatal and Postnatal Diagnosis and Screening. The neonate. Cystic fibrosis, molecular pathology and screening. Monitoring patients with cystic fibrosis. Metabolic bone disease in children. Investigation of hypoglycaemia. Requirements for a paediatric laboratory.</p> <p><u>Obstetric Biochemistry</u></p> <p>Physiological changes in pregnancy and how they affect interpretation of results and, how to identify pathological conditions during pregnancy. The role of biochemistry in the diagnosis and management of pre-eclampsia. Human chorionic gonadotropin analytical issues and clinical utility (including hCG heterogeneity).</p> <p><u>Calcium and Mineral Metabolism</u></p> <p>Calcium, Magnesium and Phosphate Metabolism. Bone markers and metabolic bone disease.</p> <p><u>Molecular Diagnostics and Genetics</u></p> <p>Molecular diagnostics methods</p>	

Molecular Diagnostics of Alpha-1 Antitrypsin Deficiency.
Biochemical Genetics.

Haematological biochemistry

Up to date information on vitamin B₁₂ and folate.
Pathophysiology of multiple myeloma and paraproteinaemia and the laboratory investigations.
Protein electrophoresis (different techniques), immunofixation and light chain analysis. Effect of paraproteins on other biochemical investigations.

Immunochemistry

Biochemistry and clinical aspects of cytokines
Acute phase response and its effect on biochemical tests and their interpretation.
Biochemistry of the Inflammatory Response.

Immunodeficiency and Allergy

Immunodeficiency conditions, investigation and monitoring. Allergies and how they are investigated.

Nutrition and Trace elements (including their toxicology)

Trace elements, their clinical relevance and analytical methods.
Physiology and pathology of the vitamins.
Identifying and explaining abnormal results. Nutrition including enteral and parenteral requirements.

Calculations in Clinical Chemistry

Calculations in clinical chemistry, statistics, buffers, half-life estimation, TmP and other clinically relevant calculations.

Methodology

Selected aspects of analytical methods relevant to the module with special emphasis on methodologies not found in all routine laboratories such as electrophoresis, HPLC.
Critical assessment of available biochemical investigations for each topic covered in this module.
Critically reviewing available methodology (student exercise/presentation).
Specialist techniques including:
Atomic Absorption Spectroscopy
Proteomics. SELDI-TOF. MALDI-TOF
Sweat Tests

Course Work:

- 2 Cases
- 1 Assignment

Learning Outcomes:

On successful completion of this module participants will be able to:

- Identify and explain the relationship between normal physiological function and the pathological changes that occur in the different clinical conditions, to a molecular level, covered by the above topics.
- Formulate differential diagnoses based on the biochemical results and clinical information and choose further investigations based on the clinical question being asked and the results currently available
- Interpret laboratory results, taking into account clinical information and the pre-analytical and analytical issues in relation to the different analytes and discuss results with their laboratory and clinical colleagues
- Demonstrate awareness of the capabilities and limitations of biochemical investigations in identifying the presence or absence of disease states associated with the above topics
- Identify, compare and appraise current and new analytical methods for analytes covered in the above list of topics and appraise recent advances employed both within the clinical laboratory and research centres.
- Assess advances in the understanding of pathological processes in these areas and the part played by clinical biochemistry and molecular medicine

Assessment:

Summative:

End of module written paper.

End of module Objective Structured Practical Examination (OSPE)

Course work (case presentations/assignments)

This module will account for 25% of overall taught course marks. 50% pass mark for end of module assessment. Compensation is possible provided $\geq 40\%$ mark is obtained in the area requiring compensation.

Formative:

OSPE practice runs during term

Presentations to class

ECTS Credits: 15

Indicative Resources:

- Rifai, N. et al. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 6th Edition, Elsevier 2018
- Rifai, N. et al. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics, 8th Edition, Elsevier 2019
- W J Marshall, M Lapsley, Day A. Clinical Chemistry, 9th edition, Mosby 2020
- M A Crook, Clinical Biochemistry and Metabolic Medicine, 8th edition, Hodder Arnold 2012
- MA Crook, Cardiovascular Disease and Laboratory Medicine, ACB Venture Publications 2015
- Laboratory Diagnosis of Inherited Metabolic Diseases, AACC Publication 2012
- Anne Green, Imogen Morgan, Jim Gray. Neonatology and Laboratory Medicine, ACB 2003
- Dennis J. Dietzen, Michael J. Bennett and Edward C.C. Wong (Eds). Biochemical and Molecular Basis of Paediatric Disease AACC Press 2010
- Ahmed N, Fundamentals of biomedical science: Clinical Biochemistry IBMS, 2nd edition, Oxford University Press 2017
- Heap S., Gray J., and Ewer A. Neonatology and Laboratory Medicine, ACB Venture Publications 2017

Students will be directed to reviews and articles in relevant clinical/biochemical **journals** such as:

- Annals of Clinical Biochemistry
- Clinical Chemistry
- New England Journal of Medicine
- Clinical Chemistry and Laboratory Medicine

Guidelines, where relevant, will be referenced, some examples are listed below:

Trace elements and their toxicology:

- Detection and Monitoring of disorders of essential trace elements. *Ann Clin Biochem* 1996; 33: 486-510
- Sample collection guidelines for trace elements in blood and urine Pure & Appl. Chem., Vol. 67, Nos 8/9, pp. 1575-1608, 1995.
- *RCP Best Practice No 163* D Gaffney, G S Fell, D St J O'Reilly. Wilson's disease: acute and presymptomatic laboratory diagnosis and monitoring *J. Clin. Pathol.* 2000;53;807-812

Clinical and Laboratory Standards Institute (CLSI) Guidelines:

Access to CLSI Guidelines is available through the Laboratory Medicine Department, Tallaght University Hospital. These guidelines are extensively referenced throughout the course.

Web Portals:

<http://www.acbi.ie> (Association of Clinical Biochemists in Ireland)

<http://www.acb.org.uk/> (Association of Clinical Biochemists)

<http://www.clsi.org> (Clinical and Laboratory Standards Institute)

<http://www.aacc.org> (American Association of Clinical Chemistry; NACB guidelines)

Module Title:	Endocrinology and Metabolism I
Module Code	CM7803
Module Coordinator:	Prof Gerard Boran
Module Authors:	Dr Vivion Crowley, Prof Philip Mayne and Dr Ingrid Borovickova
ECTS Credits:	10
<p>Rationale and Aims:</p> <p>This module will provide the students with up to date knowledge of selected metabolic and endocrine disorders: biochemical investigations and their interpretation in conjunction with clinical information. There will be emphasis on current trends and recent developments. Lectures will be delivered by national and international clinical practitioners who are experts in their subjects.</p> <p>The aim of this module is to provide:</p> <ul style="list-style-type: none"> • up to date and in depth knowledge of the topics included in this module • an in depth understanding of new procedures and methodologies in endocrinology and metabolism • the skills to critically assess efficient utilisation of endocrine laboratory services and appropriate laboratory investigations for given clinical conditions • the ability to interpret biochemical endocrinology results in conjunction with clinical information and to discuss the clinical utility of these results with clinical colleagues. 	
<p>Methods of Teaching and Student Learning:</p> <p>The teaching strategy is a mixture of lectures, tutorials, workshops and case discussions. Conventional lectures will be combined with workshops, tutorials and case discussions involving extensive student participation where informal interaction will be encouraged. Short cases relevant to each module will be covered during teaching sessions and will be complemented at the Clinical Laboratory Interface Workshops. Relevant advanced laboratory techniques will also be covered in workshop format.</p> <p>The varied teaching methodology ensures an inclusive curriculum that takes account of the diverse learning styles and preferences that may arise from the diverse student population that is attracted to this course.</p>	
<p>Module Content:</p> <p><u>Neuroendocrine regulation and hormone signalling</u></p> <p>Relevant aspects of neuroendocrine regulation as well as end-organ endocrinology will be covered within relevant topics. This will include hormone signalling and hormone receptors to the molecular level, G-Protein receptor linked signalling, and positive and negative feedback mechanisms. Relevant drugs affecting hormone production will be covered, as well as hormone resistance syndromes e.g. thyroid, androgens.</p> <p><u>Autoimmune mechanisms in endocrinology:</u></p> <p>Autoimmune processes in endocrinology will be covered in the relevant endocrine axes.</p> <p><u>Hypothalamus and pituitary gland:</u></p> <p>Hypothalamic function and pulse generation. Pituitary gland hormone production in health and disease. Investigation of hypothalamic pituitary disease including molecular aspects. Heterogeneity of circulating hormones and their analytical and clinical implications e.g. macrohormones. Prolactinoma. Growth Hormone, laboratory aspects and clinical presentation</p> <p><u>Parathyroid gland:</u></p> <p>Pathophysiology of the parathyroid glands. Parathyroid hormone in health and disease. Heterogeneity of circulating parathyroid hormone and the analytical and clinical implications. PTH in renal disease. Hyper- and hypo-parathyroidism in adults and in children. Pseudohypoparathyroidism.</p>	

Thyroid function:

Thyroid disease: guidelines; interpretation of results; discordant results and problem solving. Thyroid cancer and thyroglobulin. Thyroid disease in pregnancy. Thyroid hormone resistance syndrome.

Adrenal cortex:

Adrenal Cortex, Hormone Production and Molecular Function. Adrenal steroidogenesis
Laboratory Investigation including adrenal steroid profiling
Cushing's and Addison's – clinical, pathophysiology and investigation

The Gonads and Reproductive Endocrinology:

Puberty, normal and pathological. Hirsutism, causes and investigation. Male hypogonadism.
Reproductive endocrinology. Endocrine aspects of pregnancy (including gestational diabetes, thyroid dysfunction).

Special Areas:

Endocrinology of hypertension, Carcinoid Syndrome, Multiple Endocrine Neoplasia

Growth disorders

Growth Hormone, laboratory aspects and clinical presentation.
GH deficiency or excess in adults; IGF1 and IGF BP3.

Methodology

Relevant analytical methods for this module with special emphasis on specialist hormone measurement methodologies not found in all routine laboratories.
Critical assessment of available endocrine biochemical investigations for each topic covered in this module.

Specialist techniques including:

Dynamic function tests
Macro-hormones and their analytical and clinical impact
Adrenal steroid profiling (urine)

Course Work:

- 2 Cases

Learning Outcomes:

On successful completion of this module participants will be able to:

- Identify and explain the relationship between normal physiological function and the pathological changes that occur in the different endocrine conditions covered by the above topics to a molecular level.
- Formulate differential diagnoses based on the biochemical results and clinical information and interpret laboratory results and, taking into account clinical information, pre-analytical and analytical issues in relation to the different analytes
- Discuss biochemical results with their laboratory and clinical colleagues including further relevant investigations based on the clinical question being asked and the results currently available
- Demonstrate awareness of the capabilities and limitations of endocrine and other investigations in identifying the presence or absence of disease states associated with the above topics
- Appraise relevant current and new analytical hormone for hormones in the routine and research context
- Assess advances in the understanding of endocrine pathological processes and the part played by molecular endocrinology

Assessment:

Summative:

End of module Examination

End of module Objective Structured Practical Examination (OSPE)

This module will account for 16.67% of overall course marks. 50% pass mark for end of module assessment. Compensation is possible provided $\geq 40\%$ mark is obtained in the area requiring compensation.

Formative:

OSPE practice runs

Presentations to class

ECTS Credits: 10

Indicative Resources:

Texts:

- J. Larry Jameson (Ed). Harrison's Endocrinology McGraw Hill, 4th edition 2017
- Rifai, N. et al. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 6th Edition, Elsevier 2018
- Rifai, N. et al. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics, 8th Edition, Elsevier 2019
- W J Marshall, M Lapsley, Day A. Clinical Chemistry, 9th edition, Mosby 2020
- M A Crook, Clinical Biochemistry and Metabolic Medicine, 8th edition, Hodder Arnold 2012.
- Williams Textbook of Endocrinology, 14th Edition, Elsevier, 2020
- Ahmed N, Fundamentals of biomedical science: Clinical Biochemistry IBMS, 2nd edition, Oxford University Press 2017
- Heap S., Gray J., and Ewer A. Neonatology and Laboratory Medicine, ACB Venture Publications 2017

Students will be directed to reviews and articles in relevant clinical/biochemical **journals** such as:

- Annals of Clinical Biochemistry
- Clinical Chemistry
- New England Journal of Medicine
- Clinical Chemistry and Laboratory Medicine

Guidelines, where relevant, will be referenced, some examples are listed below-

Irish national guidelines for thyroid function testing in primary care, 2016

UK Guidelines for the Use of Thyroid Function Tests, British Thyroid Association, 2006.

Clinical and Laboratory Standards Institute (CLSI) Guidelines:

Access to CLSI Guidelines is available through the Laboratory Medicine Department, Tallaght University Hospital. These guidelines are extensively referenced throughout the course.

Web Portals:

<http://www.acbi.ie/> (Association of Clinical Biochemists in Ireland)

<http://www.acb.org.uk/> (Association of Clinical Biochemists)

<http://www.clsi.org/> (Clinical and Laboratory Standards Institute)

<http://www.aacc.org/> (American Association of Clinical Chemistry; NACB guidelines)

Module:	Endocrinology and Metabolism II and Inborn Errors of Metabolism
Module Code	CM7804
Module Coordinator:	Prof Gerard Boran
Module Authors:	Prof Gerard Boran, Dr Vivion Crowley, Prof Philip Mayne
ECTS Credits	10
<p>Rationale and Aims:</p> <p>This module will provide the students with up to date knowledge of selected metabolic and endocrine disorders in adults and children: biochemical investigations and their interpretation in conjunction with clinical information including inborn errors of metabolism. The principles of screening and neonatal conditions screened will also be covered.</p> <p>There will be emphasis on current trends and recent developments. Lectures will include clinically relevant topics by national and international guest speakers who are experts in their subjects.</p> <p>The aim of this module is to provide:</p> <ul style="list-style-type: none"> • up to date and in depth knowledge of these topics • an in depth understanding of new procedures and methodologies • the skills to critically assess efficient utilisation of laboratory services and appropriate laboratory investigations for the selected endocrine and IEM clinical conditions • the ability to interpret biochemical results for endocrine disorders in this module and IEMs in conjunction with clinical information and to discuss the clinical utility of these results with clinical colleagues 	
<p>Methods of Teaching and Student Learning:</p> <p>The teaching strategy is a mixture of lectures, tutorials, workshops and case discussions. Informal interaction is encouraged during lectures. Workshops, tutorials and case discussions involve extensive student participation.</p> <p>Short endocrine and IEM cases relevant to this module will be covered in each teaching session and will be complemented at the Clinical Laboratory Interface Workshops. Workshops will deal with both advanced laboratory techniques and the clinical laboratory interface.</p> <p>The varied teaching methodology ensures an inclusive curriculum that takes account of the diverse learning styles and preferences that may arise from the diverse student population that is attracted to this course.</p>	
<p>Module Content:</p> <p><u>Neonatal Screening</u></p> <p>Principles of screening for disease and how they apply to current neonatal screening. Neonatal screening, conditions screened for, incidence and prevalence in the Irish population. Criteria for screening and suggested expanded screening panel. Analytical methodologies used in screening.</p> <p><u>Paediatric Endocrinology</u></p> <p>Congenital adrenal hyperplasia. Short stature and growth hormone dysfunction. Precocious puberty.</p> <p><u>Inborn errors of metabolism (IEM)</u></p> <p>Inborn errors of metabolism: pathogenesis and molecular basis of these conditions, their clinical presentation and investigation and protocols for making a diagnosis. Molecular genetics of inherited metabolic disorders. Conditions covered here include:</p> <ul style="list-style-type: none"> • Hyperammonaemia. • Mitochondrial disorders and lactic acidosis. • Galactosaemia and related disorders. • Neurotransmitter disorders. • Disorders of purine and pyrimidine metabolism. • Inherited metabolic disorders presenting in adults. 	

- Lysosomal Storage Disorders.
- Organic Acidaemias.

Diabetes Mellitus (DM)

Classification, pathogenesis and molecular basis of the different types of diabetes mellitus.
 Clinical management of diabetes. Biochemical investigation, diagnosis and monitoring of DM.
 HbA_{1c} methodology including variants, target levels and standardisation. Diabetes and pregnancy.
 Point of care testing in DM

Adrenal Medulla:

Catecholamines and metanephrines in health and disease; pheochromocytoma and neuroblastoma.
 Renin and aldosterone: clinical and analytical aspects.

Immunoassays and choosing an Immunoassay Platform:

Immunoassays and interferences; standardisation of immunoassays; choosing an immunoassay analyser; analysis of steroid hormones, problems and solutions.

Obesity:

Obesity: clinical and biochemical aspects.

Vitamin D and Bone Metabolism:

Bone Physiology and pathology.
 Clinical aspects of Vitamin D metabolism.
 Osteoporosis - pathophysiology and management.

Porphyria:

Porphyrias: pathogenesis; classification; clinical and analytical aspects and issues.

Methodology:

Methods available for analysis of the analytes covered in the module with special emphasis methodologies not found in all routine laboratories.
 Critical assessment of available biochemical investigations for each topic covered in this module.
 Visit to specialist metabolic laboratories.
 Specialist techniques including:

- GC and Tandem Mass Spectrometry
- HPLC
- Amino acid analysis
- Catecholamine and metanephrine analysis
- Steroid Hormone Assays

Other special topics (lipodystrophy) dependent on guest speaker availability.

Course Work:

- 2 Cases

Learning Outcomes:

On successful completion of this module participants will be able to:

- Describe the current pathophysiological and biochemical aspects of inborn errors of metabolism and endocrine disorders covered in this module
- Formulate differential diagnoses based on the biochemical results and clinical information and choose further investigations based on the clinical question being asked and the results currently available
- Critically assess the investigation strategies and methodologies used to investigate these conditions and discuss findings with laboratory and clinical colleagues
- Assess advances in the understanding of pathological processes in these areas and the part played by clinical biochemistry and molecular medicine
- Identify and appraise specific new analytical methods and recent advances employed both within the clinical laboratory and research centres.

Assessment:

Summative:

End of module Examination

End of module Objective Structured Practical Examination (OSPE)

This module will account for 16.67% of overall course marks. 50% pass mark for end of module assessment. Compensation is possible provided $\geq 40\%$ mark is obtained in the area requiring compensation.

Formative:

OSPE practice runs

Presentations to class

ECTS Credits: 10

Indicative Resources:**Texts:**

- J. Larry Jameson (Ed). Harrison's Endocrinology McGraw Hill, 4th edition 2017
- Dennis J. Dietzen, Michael J. Bennett and Edward C.C. Wong (Eds). Biochemical and Molecular Basis of Paediatric Disease, 5th edition, Elsevier Science 2021
- Rifai, N. et al. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 6th Edition, Elsevier 2018
- Rifai, N. et al. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics, 8th Edition, Elsevier 2019
- W J Marshall, K Bangert, M Lapsley. Clinical Chemistry, 9th edition, Mosby 2020.
- M A Crook, Clinical Biochemistry and Metabolic Medicine, 8th edition, Hodder Arnold 2012.
- Laboratory Diagnosis of Inherited Metabolic Diseases, 2012, AACC publication.
- Ahmed N, Fundamentals of biomedical science: Clinical Biochemistry IBMS, 2nd edition, Oxford University Press 2017
- Heap S., Gray J., and Ewer A. Neonatology and Laboratory Medicine, ACB Venture Publications 2017

Students will be directed to reviews and articles in relevant clinical/biochemical **journals** such as:

- Annals of Clinical Biochemistry
- Clinical Chemistry
- New England Journal of Medicine
- Clinical Chemistry and Laboratory Medicine

Guidelines, where relevant, will be referenced, some examples are listed below:

- Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia, 2006, WHO; IDF.
- National Metabolic Biochemistry Network; Guidelines for the investigation of hypoglycaemia in infants and children, February 2011 2nd revision. www.metbio.net.

Clinical and Laboratory Standards Institute (CLSI) Guidelines:

Access to CLSI Guidelines is available through the Laboratory Medicine Department, Tallaght University Hospital. These guidelines are extensively referenced throughout the course.

Web Portals:

- <http://www.acbi.ie/> (Association of Clinical Biochemists in Ireland)
- <http://www.acb.org.uk/> (Association of Clinical Biochemists)
- <http://www.clsi.org/> (Clinical and Laboratory Standards Institute)
- <http://www.aacc.org/> (American Association of Clinical Chemistry; NACB guidelines)
- <http://www.metbio.net/> (National Metabolic Biochemistry Network)

Module Title:	Quality Assurance and Laboratory Management
Module Code:	CM7805
Module Coordinator:	Dr Ann Leonard
Module Authors:	Prof Gerard Boran, Dr Vivion Crowley, Prof Philip Mayne, Dr Ann Leonard
ECTS Credits	10
<p>Rationale and Aims:</p> <p>This module will introduce the students to the key principles of laboratory management, health informatics and quality assurance and provide them with the ability to implement this knowledge in the workplace. Students will gain an understanding of management theory, information management and quality management and laboratory systems. Awareness of the legal and ethical requirements of a laboratory.</p> <p>There will be emphasis on current trends and recent developments. Lectures will be delivered by national and international clinical practitioners who are experts in their subjects.</p> <p>The aim of this module is to provide:</p> <ul style="list-style-type: none"> • an understanding of the principles and requirements of laboratory management and quality assurance • the skills to critically assess efficient utilisation of laboratory services and to evaluate different workplace scenarios from the management • An understanding of the role of clinical laboratory informatics and its relationship with other IT systems • an in depth understanding of new procedures and methodologies • a strategy and framework for future learning in the area of laboratory management and provision of a quality service. 	
<p>Methods of Teaching and Student Learning:</p> <p>The teaching strategy is a mixture of lectures, tutorials and workshops. Informal interaction is encouraged at interactive lectures given in many cases by leading hospital and laboratory managers. Workshops and tutorials involve extensive student participation, and the course assignments require workplace practice on topics relevant to this module such as business cases, audits, method evaluation, and aspects of point of care testing. The varied teaching methodology also allows adaptation to accommodate varying background, skills and experience in our student population.</p>	
<p>Module Content:</p> <p><u>Quality Assurance</u></p> <ul style="list-style-type: none"> • Method Evaluation <ul style="list-style-type: none"> • Clinical utility and analytical performance • Method Validation • Accuracy, precision, bias. Comparison with other assays • Sources of variation in laboratory results • Measures of uncertainty. Analytical and biological variation. Multiple analyses. • Quality Assurance • Function of internal quality control and external quality assurance. Managing and problem solving internal quality control issues. Managing, understanding results and dealing with problems of EQA. <p><u>Laboratory Management</u></p> <ul style="list-style-type: none"> • Accreditation • Requirements for a quality management system including documentation control, policies and standard operating procedures, audits, managing non-conformances and incidents, staff training and development <ul style="list-style-type: none"> • Laboratory Management 	

Covering business case development, tendering process, demand management, principles of lean six sigma, relevant statistics for laboratory management and research, laboratory automation, health and safety.

The role of the manager in the laboratory. The management and assessment of a quality system. Service planning, including out of hours cover. Staff management and continuing professional development.

- Laboratory Information Systems and Decision Support
Understanding use of information management for decision support within the laboratory and throughout the hospital. IT solutions for provision of information to external users and receipt of data from external laboratories
- Human Resource Management/Staff conflict resolution
Managing staff resources and dealing with work related staff problems
- POCT
Provision and management of a POCT service

Course Work:

- 4 assignments

Learning Outcomes:

On successful completion of this module participants will be able to:

- Set up a laboratory service based on user requirements including choosing appropriate general chemistry and immunoassay platforms, pre-analytic systems and POCT; staff resources; laboratory information system requirements and other hospital IT systems, and preparing tender and other documents required for managing a laboratory
- Establish a quality management system, including IQC and EQA, and prepare a laboratory for accreditation.
- Describe the procedures and policies involved in staff management and staff complaints
- Describe the statutory requirements for health and safety within the laboratory and the ability to identify safety issues within the laboratory
- Use statistics in the laboratory setting
- Discuss user requirements for laboratory information systems, new developments in electronic patient charts and other hospital IT systems.
- Devise solutions to laboratory based problems in the areas of management, quality assurance (IQC/EQA), provision of quality results, POCT and service provision.

Assessment:

Summative:

This module will account for 16.67% of overall course marks. 50% pass mark for end of module assessment. Compensation is possible provided $\geq 40\%$ mark is obtained in the area requiring compensation.

Formative:

Presentations to class

ECTS Credits: 10

Indicative Resources:

Texts:

- Rifai, N. et al. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 6th Edition, Elsevier 2018
- Rifai, N. et al. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics, 8th Edition, Elsevier 2019

- Christopher P. Price and Andrew St. John. Point of Care Testing: Making Innovation Work for Patient Centred Care, AACC Publication 2012
- Alan Deacon. Calculations in Laboratory Science ACB 2009
- David Burnett. A Practical Guide to Accreditation in Laboratory Medicine ACB 2002
- M. M. Houck and D. Gialamas. Forensic Science Laboratory Management CRC Press 2015
- Larson, Donna L. Clinical Chemistry. Fundamentals and laboratory techniques. Elsevier, 2017

Students will be directed to reviews and articles in relevant **journals** such as:

- Annals of Clinical Biochemistry
- Clinical Chemistry
- Clinical Chemistry and Laboratory Medicine

Guidelines, where relevant, will be referenced, some examples are listed below:

Irish Guidelines for Safe and Effective Management and Use of Point of Care Testing.

Irish Guidelines for Safe and Effective Management and Use of Point of Care Testing in Primary and Community Care.

Clinical and Laboratory Standards Institute (CLSI) Guidelines:

Access to CLSI Guidelines is available through the Laboratory Medicine Department, Tallaght University Hospital. These guidelines are extensively referenced throughout the course.

Web Portals:

http://www.westgard.com/	Westgard Web – Westgard QC
http://www.ukneqas.org.uk	(UK national external quality control scheme)
http://www.wegas.com	(Welsh external quality control scheme)
http://www.ieqas.ie	(Irish external quality assurance scheme)
http://www.clsi.org	(Clinical and Laboratory Standards Institute)
http://www.aacc.org	(American Association of Clinical Chemistry; NACB guidelines)

Appendix 3a: Supervisor Nomination Form

SUPERVISOR NOMINATION FORM

Student Name: _____ **TCD Student No:** _____

*I wish to confirm that the above named student has my consent and support to undertake the MSc in Clinical Chemistry. This requires supervision of the student's course work over a two year period including a project, assignments and a logbook of ten cases.
Responsibilities of the supervisor are listed below.*

Supervisors Name: _____

Position/Title & Place of Employment: _____

Signature: _____

Email Address: _____

Tel No: _____

SUPERVISOR RESPONSIBILITIES

- To assist the student in the conduct of their project including access to resources and facilities at their base laboratory.
- To provide assistance to the student for the course work, logbook of ten cases and assignments.
- Occasionally we may need to contact the supervisor in connection with the students' progress
- Supervisors are also welcome to contact the Course Director or Executive Officer if they wish to discuss any aspect of the course.

Appendix 3b: Project Proposal Form

PROJECT PROPOSAL FORM

All headings below must be completed however you may expand any section as required.

Student Name and TCD Registration Number	
Supervisor's Name	
Name and address of Laboratory	
Accreditation Status (where relevant)	
Proposed Title of Project	You can tweak this as the project develops: perhaps you get results which may lead you down a slightly different path than anticipated.
Introduction/Literature Review (background)	Max 300 words: explain your research idea with absolute clarity from the outset so we all know exactly what you are planning to do. Link it with not more than 5 key references to highlight the gap in knowledge that your project addresses. Provide background information in a few key sentences, but no lectures here please on basic concepts.
Aims and Objectives <ul style="list-style-type: none"> • Overall aims and hypothesis • Specific objectives for the project 	Scope your project specifically and precisely for the MSc: itemise your aims and objectives clearly and don't have too many (3-5 is usual) to avoid your project getting too big. Avoid generalised broad aims/objectives where the scope is unclear. You can have additional aims/objectives related to longer term ongoing projects but if so clearly separate these from your MSc.
Ethical Approval	Note: projects cannot be accepted without a satisfactory response to this section.
Study design <ul style="list-style-type: none"> • Patients and controls • Inclusion and exclusion criteria • Samples and storage • Study methods • Analytical methods • What you expect to find (expected results) • Who are your collaborators 	<p>Ensure you have thought out your methodology for each of your specific objectives as they usually require different approaches.</p> <p>What is your hypothesis? What are you trying to prove/disprove?</p> <p>List names (or grades) and say what you require of them (e.g. a registrar to identify patients for you; a phlebotomist to bleed the patient, etc)</p>
Work Timetable	Note: aim to complete everything within one year. Give specific target dates for key milestones (planning phase, project work – itemise; writing the first draft; final draft after your supervisor has read it and suggested revisions)
Proposed statistical analysis	State the techniques you will use (and give the name of your software tool). State your null hypothesis where appropriate.
Up to 5 Key References	List them 1-5 Note: do not list any standard texts such as Tietz here. These are unlikely to be a source of a gap in scientific knowledge. Instead, list no more than 5 key scientific papers that have examined your question or a similar question, or done your study in a different

	way, different country/population. If your analytical method is unusual, the reference paper should appear here, but not a kit insert.
Provide details of costs of your project	Your base laboratory will need to know what costs you are likely to incur to successfully complete your project. Itemise these costs here: Additional Staffing (note: needing extra staff will usually render your project unfeasible) Equipment Assay kits Consumables Any other relevant categories TOTAL COSTS:
LABORATORY APPROVAL OF PROJECT	
I CONFIRM APPROVAL OF THIS PROJECT WHICH HAS BEEN DISCUSSED WITH ME	
PROJECT SUPERVISOR	HOD / CMS / LAB MANAGER
NAME: _____	NAME: _____
POSITION: _____	POSITION: _____
SIGNATURE: _____	SIGNATURE: _____
DATE: _____	DATE: _____