Intercalated BSc in Neuroscience and Basic Medical Sciences

PROGRAMME SPECIFICATION

Awarding body/institution: Queen Mary, University of London

Teaching Institution: Barts & The London School of Medicine & Dentistry

Name of final award **BSc in Neuroscience**

Programme Title: Intercalated BSc in Neuroscience and Basic Medical Sciences

Criteria for admission:

The course is of one academic year's duration, designed specifically for medical or dental students who have completed two (pre-clinical) to four years of the MBBS/BDS course, *i.e.* students who wish to intercalate a degree before entering the final year of the MBBS/BDS degree programme.

The course is open to all eligible students within the University of London, and also to students who have fulfilled the above entrance requirements at other UK or EU medical schools. The course is offered within the Blizard Institute, Centre for Neuroscience and Trauma, and the successful candidates will receive a BSc degree of the University of London.

The entrance requirements are:

a. Completion of the first 2 years of a medical/dental course and satisfactory performance in the examinations prior to entering the BSc.
b. The course is offered for a minimum of 5 students, with a maximum of up to 18. No candidate will be accepted without interview.
c. Selection of internal students by the standardised intercalated degree ranking/interview procedure, as outlined in the intercalated degrees prospectus and web pages.

Aims of the programme:

Neuroscience is an exciting and rapidly developing field, both in terms of understanding the functioning of the brain and spinal cord and developing treatments for neurological and psychiatric disorders. The aim of this course is to provide an understanding of the neuroanatomical, neurophysiological, neuropharmacological and neuroimmunological processes that are involved in functioning of the normal nervous system and how these are altered in specific disease states. The Neuroscience modules cover the basic cellular neurobiology followed by applied modules which look at disorders of spinal and supraspinal systems. Another module provides generic transferable skills and specific skills to be able to complete a research project. Both clinical and non-clinical faculty teach on the course and there is an emphasis on integrating basic science with a clinical focus. There is an increasing need for scientifically trained doctors with an interest in neuroscience who will be in a position to carry out research to answer basic and translational research questions.

Learning outcomes for the programme

By the end of the programme, graduates will be able to:

- To be able to explain neurobiological concepts in major diseases of the nervous system
- To study in depth the basic neurobiology underpinning a variety of specific neurological and psychiatric conditions not covered in detail in the MBBS/BDS courses
- To be able to demonstrate good skills in critical appraisal of the literature and written presentations
- Synthesise information in a manner that utilizes knowledge or processes from the forefront of the discipline/practice and from a wide range of sources
- To experience first-hand the process of experimental investigation in the study of a problem related to neuroscience, and to acquire specialist laboratory or clinical skills (as well as data) sufficient to interpret and report the results of these investigations.

Assessment strategy

Modules will be assessed by 1 or more of the following components:

1. A written examination consisting of 3 essays from a choice of 6-10 questions separated into two or three sections, each of which will be related to similar themes. Students are required to answer at least one question from each section. These are worth 80% of the module mark for the Disconnected Pathways, Cell & Molecular Neuroscience and Brain and Mind modules and 100% for the Experimental Pathology module.
2. Attendance (worth 5% of the Core laboratory methods module only)
3. Short answer question/ single best answer exam (worth 15% of the Core laboratory methods module only)
4. In course essays (worth up to 10-20% depending on module)
5. In course oral and research project presentations (worth 10-20% depending on module)
6. Data handling exam (worth 10% of the Core laboratory methods module only)
7. Literature review essay (worth 40% of the Core laboratory methods module only)
8. The research project accounts for 3 course units. It is marked by 2 internal examiners and read by an external examiner. Fifteen per cent of the marks are awarded by the project supervisor, 75% by the internal examiners and 10% by the external examiner following a viva voce on the project. The overall project mark is derived from the sum of these numerical components. The viva examination is conducted in the presence of the external examiner and the Course Organizer.

The Core lab methods and Cell & Molecular Neuroscience exams are before Christmas, The Disconnect Pathways exam is in the second week of January and the Brain & Mind and Experimental Pathology exams are in May.

Programme structure

The programme consisted of 5 taught modules (1 unit each) and an experimental research project (3 units). Four taught units are delivered in the first term and one in the second term. The project is of 10 weeks duration and runs during the second term from

mid-January to end of March. Students should submit the completed project by the mid to end of April. An oral presentation based on the project and a viva voce on the project are held in the first week of June.

Module Details

1. Cellular and Molecular Neuroscience

CU value 1

Duration 1 semester, full time

This course unit aims to provide an overview of topics in cellular and molecular neuroscience that are fundamental to other BSc neuroscience course units.

Syllabus

Structure and function of neurons and synapses, neurotransmission: signal transduction, ion channel physiology, receptors, trophic factors, signalling pathways, cytokine biology, neuro-inflammation and inflammatory damage to the nervous system, cell death, molecular biology of brain tumours, stem cell neurobiology.

Assessment: 1 in-course essay (20%); end of module essay exam (80%)

2. Disconnected Pathways - Disorders Of Spinal Systems

CU value 1

Duration 1 semester, full time

This unit covers the basic neurobiology (anatomy, cellular biology and pathways) of neuronal degeneration and regeneration as illustrated by reference to diseases associated with the spinal cord and peripheral nerves. The main aim is to provide the students with a broad understanding of how the nervous system adapts to injury and disease, with an emphasis on pain mechanisms. The course deals with the basic organisation of the brain and spinal cord, the pathways involved, and plasticity of the nervous system after different types of insults or disease. The lectures will primarily focus on certain disease states such as peripheral neuropathy and spinal cord injury in the context of experimental findings and how efforts are being made to prevent or reverse some of the changes. The clinical and translational aspects of these diseases will also be discussed. Students will be expected to read and make use of textbooks, and also read and review research articles that are available in the library.

Syllabus

Basic and advanced anatomy of peripheral nerve and spinal cord; acute and chronic pain, pain models, trophic factors, development of sensory neurons and spinal cord, mechanisms and consequences of neonatal and adult peripheral nerve injury including

phantom limb; Mechanisms and consequences of spinal root injury; Glial responses to injury. Repair of nerve and root injuries. Spinal cord injury: basic and clinical science; Demyelinating diseases: MS; pharmacological and non-pharmacological management of pain.

Assessment: 1 in-course assessment (essay & oral presentation, 20%); end of module essay exam (80%)

3. Introductory Core Unit In Laboratory Methods

CU value 1

Duration 1 semester, full time

This core unit aims to provide an overview of basic laboratory and research methods. It covers basic topics such as safety, experimental design, statistics, use of literature, lab methods, analysing and presenting data. Generic thinking and writing skills are also covered. It involves staff from several departments and is examined by in course assessment of a library project, an oral presentation, and a poster presentation.

Syllabus

Finding, reading and evaluating research literature, experimental design and statistics, ethics of experimentation, how to give oral presentations, essay & dissertation writing, record keeping, molecular biology methods, in situ hybridization, western blot, use of microscopes, flow cytometry, histochemistry and tract tracing, electrophysiological methods, proteomics, cell culture, gene therapy

Assessment: Attendance (5%), end of module exam (15%), oral presentation (10%), Literature survey (40%), data handling (10%), oral presentation on project (20%)

4. Brain & Mind – Disorders of Supraspinal Systems

CU value 1

Duration 1 semester, full time

The course will focus on major pathology in neurology and psychiatry, involving supraspinal structures. It will give an integrated view of the major neurotransmitter systems and will analyse in depth the mechanisms underlying the effects of drugs used in central nervous system pathology. Neuronal pathways using dopamine, noradrenaline, serotonin, acetylcholine, excitatory and inhibitory amino acids and neuropeptides will be reviewed, with emphasis on their involvement in neuropathological processes underlying disorders such as Parkinson's disease, dementia, schizophrenia, mood disorders, pain, head injury, stroke, epilepsy and drug abuse. Current therapies will be critically evaluated from a pharmacodynamic and pharmacokinetic perspective. Emerging concepts and the rationale of new therapeutic approaches in neurology and psychiatry will be discussed.

Syllabus

History of neurology, challenges in drug discovery for neurological & psychiatric conditions, neuropathology of basal ganglia disorders, epilepsy, cognitive dysfunction, mood disorders, stroke and head injury; Imaging and biomarkers, pharmacokinetics, genomics, proteomics and metabonomics; neurobiology of endocannabinoids; neurotransmitter release.

Assessment: in course essay (20%) and end of module written examination (80%).

5. Experimental Neuropathology

CU value 1

Duration 1 semester, full time

The module covers the areas of brain injury due to mechanical trauma as well as neurodegenerative diseases, with emphasis on the research techniques that may be used to study the pathogenesis of neurological disorders. The module will complement the syllabus in basic neurosciences and is strongly linked at a technical and applied level to the clinical neurosciences.

Syllabus

Specific topics covered include genes and disease and axonal transport. Technical aspects such as the polymerase chain reaction are covered. The general pathology of head injury, neurodegeneration, demyelination and apoptosis will be discussed as well as specific neurodegenerative diseases including: motor neuron disease or death, multiple sclerosis, prion diseases and inherited disorders of the spinal cord.

Assessment: end of module written examination (100%).

6. Experimental Research Project

CU value 3

Duration 1 semester, full time

The project will constitute a piece of original research, and the student has 10 weeks of the second semester to devote at least 3-4 days/week of their time to acquire original data and then present a written report at the end. Students will deliver a short oral presentation on the project as part of the core lab methods module.

The topic of the projects offered will be related to the research interests of current staff. A list of projects is circulated to students during term 1.

Structure
Projects should be 7,000 - 8,000 words of text, excluding diagrams and bibliography and appendices. It must have an abstract that explains the key results and why the esearch was performed. The main body of the report is divided into sections (like a research paper): Introduction, methods, results, discussion, bibliography, and appendices. The

introduction should set the theoretical background and the hypothesis to be tested. Methods should provide enough detail to allow the work to be repeated and a description of the statistical methods used (if appropriate). Some of the technical information may appear in appendices. Results should provide a detailed account of what was. Raw and pilot data, and experimental failures can be part of the appendices. The discussion should contain the implications of the results and a critical analysis of the methodology and include reasons for failed experiments. Critical appraisal of the current results in relation to the research literature should also be performed. The confirmation or rejection of the experimental hypothesis should also be described.

Assessment: Supervisor report, 2 internal examiner reports and a viva with the external examiner.