

Biochemistry

Programme A: Applicable to students admitted in 2003-04 and thereafter

Course List

<i>Code</i>	<i>Course Title</i>	<i>Unit</i>
BCH 0430/0440	Guided Study in Biochemistry	2/2
BCH 0431/0441	Supervised Research in Biochemistry	3/3
BCH 1000	Biochemical Basis of Life and Diseases	3
BCH 1700	Biochemical Basis of Life and Diseases Laboratory	2
BCH 2000	Frontiers in Biochemistry	2
BCH 2001	Current Topics in Biochemistry	2
BCH 2010	Cellular Basis of Biochemistry	3
BCH 2710	Cellular Basis of Biochemistry Laboratory	2
BCH 2020	Introduction to Biomolecules	3
BCH 2720	Introduction to Biomolecules Laboratory	2
BCH 2030	Fundamentals of Biochemistry	3
BCH 2730	Fundamentals of Biochemistry Laboratory	2
BCH 2080	Basic Skills in Biochemical Studies	2
BCH 3010	Bioenergetics	3
BCH 3610	Bioenergetics Laboratory	2
BCH 3020	Metabolism and Its Regulation	3
BCH 3620	Metabolism and Its Regulation Laboratory	2
^Δ BCH 3030	Methods in Biochemistry	3
^Δ BCH 3630	Methods in Biochemistry Laboratory	2
^Δ BCH 3040	Proteins and Enzymes	3
^Δ BCH 3640	Proteins and Enzymes Laboratory	2
BCH 4010	Molecular Biology	3
BCH 4610	Molecular Biology Laboratory	2
BCH 4020	Molecular Biotechnology on the Web	3
BCH 4030	Clinical Biochemistry	3
BCH 4630	Clinical Biochemistry Laboratory	2
^Δ BCH 4040	Aspects of Neurosciences	3
^Δ BCH 4640	Aspects of Neurosciences Laboratory	2
^Δ BCH 4050	Fermentation and Bio-processing	3
^Δ BCH 4650	Fermentation and Bio-processing Laboratory	2
^Δ BCH 4060	Basic and Applied Immunology	3
^Δ BCH 4660	Basic and Applied Immunology Laboratory	2
^Δ BCH 4130	Molecular Endocrinology	3
^Δ BCH 4730	Molecular Endocrinology Laboratory	2

Programme B: Applicable to students admitted in 2001-02 and 2002-03

Course List

<i>Code</i>	<i>Course Title</i>	<i>Unit</i>
BCH 0430/0440	Guided Study in Biochemistry	2/2
BCH 0431/0441	Supervised Research in Biochemistry	3/3
BCH 1000	Biochemical Basis of Life and Diseases	3
BCH 1700	Biochemical Basis of Life and Diseases Laboratory	2
BCH 2000	Frontiers in Biochemistry	2

^D Courses will be offered in 2004-05 and thereafter.

BCH 2001	Current Topics in Biochemistry	2
BCH 2010	Cellular Basis of Biochemistry	3
BCH 2710	Cellular Basis of Biochemistry Laboratory	2
BCH 2020	Introduction to Biomolecules	3
BCH 2720	Introduction to Biomolecules Laboratory	2
BCH 2030	Fundamentals of Biochemistry	3
BCH 2730	Fundamentals of Biochemistry Laboratory	2
BCH 2080	Basic Skills in Biochemical Studies	2
BCH 3010	Bioenergetics	3
BCH 3610	Bioenergetics Laboratory	2
BCH 3020	Metabolism and Its Regulation	3
BCH 3620	Metabolism and Its Regulation Laboratory	2
BCH 3030	Analytical Biochemistry	3
BCH 3630	Analytical Biochemistry Laboratory	3
BCH 3040	Enzymes	3
BCH 3640	Enzymes Laboratory	2
BCH 4010	Molecular Biology	3
BCH 4610	Molecular Biology Laboratory	2
BCH 4020	Molecular Biotechnology on the Web	3
BCH 4030	Clinical Biochemistry	3
BCH 4630	Clinical Biochemistry Laboratory	2
BCH 4040	Neurochemistry	3
BCH 4640	Neurochemistry Laboratory	2
BCH 4050	Aspects of Biotechnology	3
BCH 4650	Aspects of Biotechnology Laboratory	2
BCH 4060	Immunology	3
BCH 4660	Immunology Laboratory	2
BCH 4130	Endocrinology	3
BCH 4730	Endocrinology Laboratory	2

Course Description

BCH 0430/0440

Guided Study in Biochemistry

2/2 U; STOT; 2-term

Students are required to do a literature survey on a current topic in biochemistry under the supervision of a faculty member. They are required to give an oral presentation in the first term and a written report in the second term. The course is only open to final-year students.

BCH 0431/0441

Supervised Research in Biochemistry

3/3 U; STOT; 2-term

In this course students undertake a research project under the supervision of a faculty member. Research work shall start in the summer preceding the final year. The results of the project shall be presented in the form of an oral presentation in the first term and a written report in the second term. The course is only open to final-year students.

BCH 1000

Biochemical Basis of Life and Diseases

3 U; 3 Lect.; 2nd term

Life activity is the summation and regulation of chemical reactions in a living organism. This course teaches the biochemical basis of life and emphasizes the application of biochemistry in diagnosis and treatment of disease. The topics include proteins and enzymes, metabolism

and energy, neural and hormonal regulation, nutrition, drug action and molecular biology. (Not for Biochemistry Majors or Minors, and Majors of Food and Nutritional Sciences, Environmental Science, Molecular Biotechnology and Pharmacy.)

BCH 1700

Biochemical Basis of Life and Diseases Laboratory

2 U; 3 Lab.; 2nd term

This course covers laboratory exercises that serve to illustrate the principles enunciated in BCH 1000. (Not for Biochemistry Majors or Minors, and Majors of Food and Nutritional Sciences, Environmental Science, Molecular Biotechnology and Pharmacy.)

BCH 2000

Frontiers in Biochemistry

2 U; 2 Lect.; 1st term

This course presents the latest developments and advancements in biochemistry and molecular biology. It aims to alert students the trends and recent breakthroughs in biochemical and biomedical research. Contents will vary from year to year. (For Biochemistry Majors only.)

BCH 2001

Current Topics in Biochemistry

2 U; 2 Lect.; 2nd term

This course illustrates topics in the field of biochemistry and molecular biology with scientific, medical and social significance. It introduces students to recent developments in these fields and their relevance to daily life. Contents will vary from year to year. Materials covered will be at an elementary level similar to other general education courses. (Not for Biochemistry Majors and students who have taken BCH 2000.)

BCH 2010

Cellular Basis of Biochemistry

3 U; 3 Lect.; 1st term

A beginner's course on cellular organization and function, this course introduces students to structural and functional concepts of cellular and subcellular components, including cell wall, plasma membrane, cytosol, endoplasmic reticulum, Golgi apparatus, mitochondria, lysosomes, ribosomes, chloroplasts, cytoskeletons, etc. The characteristics of prokaryotes versus eukaryotes, unicellular versus multicellular organisms, cell division, cell cycles, cell-cell and subcellular communications will be discussed.

BCH 2710

Cellular Basis of Biochemistry Laboratory

2 U; 3 Lab.; 1st term

This laboratory course concerns the isolation and characterization of major cellular components by various biochemical techniques. Cytological and histochemical techniques will also be introduced.

BCH 2020

Introduction to Biomolecules

3 U; 3 Lect.; 2nd term

Basic principles of organic chemistry relevant to the understanding of the structures and chemical properties of biomolecules (carbohydrates, proteins, lipids and nucleic acids), including their basic constituent molecules and functional groups will be covered. Spectroscopic methods for analyses of the structures of biomolecules will also be discussed. Certain biological functions of these biomolecules will be discussed in relation to their structures and their importance in the living system.

BCH 2720

Introduction to Biomolecules Laboratory

2 U; 3 Lab.; 2nd term

This laboratory course is designed for beginning students to acquaint themselves with the basic biochemical techniques and methods. The application of these techniques in the study of the structures and properties of carbohydrates, lipids, proteins and nucleic acids will be illustrated in the experiments. Quantitative aspects are emphasized whenever applicable.

BCH 2030

Fundamentals of Biochemistry

3 U; 3 Lect.; 2nd term

This course provides students in Environmental Science/Food and Nutritional Sciences / Biochemistry Minor students a general survey of biochemistry. The topics include acid-base concept, structures of biomolecules, properties of proteins and enzymes, metabolism of carbohydrates and lipids, biosynthesis of nucleic acids and protein, and metabolic regulation. (For Biochemistry Minor students admitted in 2001-02 and thereafter only. Not for Biochemistry Majors.)

BCH 2730

Fundamentals of Biochemistry Laboratory

2 U; 3 Lab.; 2nd term

This course is designed to provide students with an opportunity to practise the basic concepts of experimental biochemistry. The experiments to be carried out complement the topics taught in BCH2030. (Not for Biochemistry Majors.)

BCH 2080

Basic Skills in Biochemical Studies

2 U; 1 Lect. 1 Tut.; 1st term

This is a foundation course for all first-year Biochemistry students. This course aims at providing information on the history and development of biochemistry, laboratory safety (biological, chemical, and radioactive substances), basic statistics and data processing (data acquisition, handling and analyses), computer skills (Internet information, electronic resources, self learning, etc.), and presentation skills (oral and written presentation). Lectures will be aided with video, group discussion and hands-on computer practice. Evaluation is based on assignments.

BCH 3010

Bioenergetics

3 U; 3 Lect.; Both term

This course introduces the principles of bioenergetics. The following biochemical processes underlying energy transformation in living organisms will be discussed: glycolysis, citric acid cycle, electron transport, oxidative phosphorylation, fatty acid oxidation, photosynthesis and muscle contraction. Prerequisite: BCH 2020.

BCH 3610

Bioenergetics Laboratory

2 U; 3 Lab.; Both term

This course gives students practical experience in analyses of mitochondrial functions and other aspects of biochemical energetics.

BCH 3020

Metabolism and Its Regulation

3 U; 3 Lect.; 2nd term

This course presents an in-depth study on metabolism and its control. The topics covered include the biosynthesis of carbohydrates, lipids, DNA, RNA and proteins; the metabolism of amino acids and components of nucleic acids; prokaryotic gene regulation; DNA mutation and repair. The integration of metabolic pathways will also be discussed. Prerequisite: BCH 3010.

BCH 3620

Metabolism and Its Regulation Laboratory

2 U; 3 Lab.; 2nd term

This course covers laboratory exercises that serve to illustrate the principles enunciated in BCH 3020.

BCH 3030

Analytical Biochemistry

3 U; 3 Lect.; 1st term

This course, aiming at experimental competence with biological systems and their components at a quantitative level, covers the following: chromatographic and electrophoretic methods, centrifugation techniques, use of radioisotopes, fluorescence spectrophotometry and microscopy as well as the purification and characterization of various biomolecules. Prerequisite: BCH2020.

BCH 3630

Analytical Biochemistry Laboratory

3 U; 6 Lab.; 1st term

This laboratory course serves to provide basic training in biochemical techniques. Students will learn the application of different biochemical methods in the qualitative and quantitative estimation of biologically active molecules.

BCH 3040

Enzymes

3 U; 3 Lect.; 2nd term

The study of enzymes with respect to their coenzyme requirements, kinetics, mechanism of catalysis and regulation of activities will be emphasized. The applications of enzymes in medicine, in research as well as in industry will also be discussed. Prerequisite: BCH 2020.

BCH 3640

Enzymes Laboratory

2 U; 3 Lab.; 2nd term

This course serves to illustrate the principles enunciated in BCH3040. It consists of a set of experiments to illustrate pertinent aspects of practical enzymology, including enzyme preparation, electrophoretic analysis of isozymes, kinetic studies, enzyme immobilization.

BCH 4010

Molecular Biology

3 U; 3 Lect.; 1st term

This course discusses areas of molecular biology. Basic methodologies in recombinant DNA will be introduced first, followed by the structure, function and regulation of eukaryotic genes. Other topics including human genome, genetic diseases and molecular biology of viruses, cancer and development will also be covered. Prerequisites: BCH2010 and 3020. (Not for students who have taken BCH 4020 or 4510.)

BCH 4610

Molecular Biology Laboratory

2 U; 3 Lab.; 1st term

A set of experiments to illustrate various techniques in molecular biology will be performed, including the preparation of DNA and RNA and hybridisation studies.

BCH 4020

Molecular Biology on the Web

3 U; 3 Lect.; 2nd term

This course is the Internet version of BCH 4010 and the teaching will be conducted via the Internet. Basic methodologies in recombinant DNA will be introduced first, followed by the structure, function and regulation of eukaryotic genes. Other topics include human genome, genome, genetic diseases and molecular biology of viruses, cancer and development. Students are expected to have knowledge in DNA replication, transcription, translation and prokaryotic gene regulation. (Not for Biochemistry Majors and Minors, Molecular Biotechnology Majors, and students who have taken BCH 4010 or 4510.)

BCH 4030

Clinical Biochemistry

3 U; 3 Lect.; 2nd term

This course presents the basic principles in clinical biochemistry and its methodology. Tests of functions will be described. Prerequisites: BCH 2010 and 2020.

BCH 4630

Clinical Biochemistry Laboratory

2 U; 3 Lab.; 2nd term

Relevant assays of biochemical constituents in body fluids will be performed.

BCH 4040

Neurochemistry

3 U; 3 Lect.; 1st term

This course will discuss the structure and composition of nervous tissue in relation to its functions. Aspects of metabolism special to the nerve and brain will be examined. These include energy metabolism, water and electrolyte balance, exchanges between blood and brain, and between brain and cerebrospinal fluid, neurotransmitters and modulators, nutrition and development of the nervous system, neuroendocrinology and the biochemistry of mental diseases. Prerequisite: BCH 2010 or 2020.

BCH 4640

Neurochemistry Laboratory

2 U; 3 Lab.; 1st term

This course consists of a set of experiments to illustrate various biochemical techniques for the study of neurochemistry.

BCH 4050

Aspects of Biotechnology

3 U; 3 Lect.; 2nd term

This course surveys various aspects of modern biotechnology. Topics to be covered include basic microbial techniques, recombinant DNA and monoclonal antibody technology, protein engineering, fermentation, bioprocessing, bioreactors and immobilized enzyme and cell technologies. To complement the technical aspects of this course, the regulatory and business aspects of the biotechnology industry will also be discussed. Prerequisite/Corequisite: BCH 3020. (Prerequisite not applicable to Food and Nutritional Sciences Major students.)

BCH 4650

Aspects of Biotechnology Laboratory

2 U; 3 Lab.; 2nd term

The practicals in this course consist of video, tour and actual experiments, designed to familiarize students with various aspects of modern biotechnology. Students will have opportunities to perform fermentation studies to simulate an industrial setting.

BCH 4060

Immunology

3 U; 3 Lect.; 1st term

This course aims at providing students with the essential concepts of modern immunology. Topics to be covered include architecture and development of the immune system, antigens and antibodies, immunoglobulin genes and diversity, the major histocompatibility system and immunohematology, tolerance and immune regulation. The effector mechanisms of the immune system will be introduced, with special emphasis on their role in immunity to infection. The relationship of immunology to clinical problems of immunodeficiency, hypersensitivity and autoimmunity, transplantation and cancer will be discussed. Prerequisite: BCH2010. (Prerequisite not applicable to Biology Major students.)

BCH 4660

Immunology Laboratory

2 U; 3 Lab.; 1st term

This laboratory course serves to provide students with basic training in immunological techniques at both the molecular and cellular levels. Various aspects and practical applications of the methodology in immunochemistry, cellular immunology and molecular immunology will be illustrated.

BCH 4130

Endocrinology

3 U; 3 Lect.; 2nd term

This course describes the chemical structures and biological functions of different hormones in the animal body with special emphasis on human subjects. The evolution of hormonal regulation in animal body, as compared with neural control, will be discussed. More details on the organization and operation of different hypothalamus-pituitary-endocrine gland axes will be presented. Some tissue hormones (e.g., prostaglandins) and gastro-intestinal hormones with potent pharmacological properties will be reviewed. Special attention will be devoted to the endocrinology of reproduction, energy homeostasis and the control of fertility. New advances in neuropeptides as potential hormone candidates will be presented. Prerequisites: BCH2010 and 2020. (Prerequisites not applicable to Biology Major students.)

BCH 4730

Endocrinology Laboratory

2 U; 3 Lab.; 2nd term

This course aims at developing laboratory skill for students to isolate, characterize and quantitatively estimate various animal hormones. Modern methods in chemical analysis and assays of hormones including radioimmunoassay and competitive protein binding assay will be attempted.

Study Scheme

1. Major Programme

A. Applicable to students admitted in 2003-04 and thereafter

Students are required to complete a minimum of 63-65 units as follows:

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|----------------------------|---|--------------------|
| (i) | Required Courses (Please see Notes 1 and 2):
BCH 0430/0440 or 0431/0441, 2000, 2010/2710,
2020/2720, 2080, 3010/3610, 3020/3620, 3030/3630,
3040/3640, 4010/4610 | 43-45 units |
| (ii) | Elective Courses:
Students are required to take at least two courses with
laboratories from Group A:
<u>Group A</u>
BCH 4030/4630, 4040/4640, 4050/4650, 4060/4660,
4130/4730
<u>Group B</u>
ENS 3320#/3920#, 4250#/4252#, 4310#/4510#
FNS 3010#/3011#, 4150#/4151#, 4160#/4161#
MBT 4520# | 20 units |
| <hr style="width: 100%;"/> | | Total: 63-65 units |

to be included in the Major GPA as well

Recommended course pattern

<i>First Year of Attendance</i>	19 units
1st term : BCH 2000, 2010/2710, 2080	
2nd term : BCH 2020/2720, 3010/3610	
<i>Second Year of Attendance</i>	20 units
1st term : BCH 3020/3620, 3030/3630	
2nd term : BCH 3040/3640, 4010/4610	
<i>Third Year of Attendance</i>	4-6 units
1st term : BCH 0430 or 0431	
2nd term : BCH 0440 or 0441	
<i>Elective Courses</i>	20 units
Students are required to take at least two courses with laboratories from Group A: <u>Group A</u> BCH 4030/4630, 4040/4640, 4050/4650, 4060/4660, 4130/4730 <u>Group B</u> ENS 3320/3920, 4250/4252, 4310/4510, FNS 3010/3011, 4150/4151, 4160/4161, MBT 4520	
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	Total: 63-65 units

B. Applicable to students admitted in 2001-02 and 2002-03

Students are required to complete a minimum of 62-65 units as follows:

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|-----|--|-------------|
| (i) | Required Courses (Please see Notes 1 and 2):
BCH 0430/0440 or 0431/0441, 2000, 2010/2710,
2020/2720, 2080, 3010/3610, 3020/3620, 3030/3630,
3040/3640, 4010/4610, CHM 2250/2870 | 48-50 units |
|-----|--|-------------|

(ii) Elective Courses:	14-15 units
BCH 4030/4630, 4040/4640, 4050/4650, 4060/4660, 4130/4730, BIO 4220#/4222#, 4310#, FNS 3010#/3011#, ENS 3320#/3920#, 4240#/4242#, 4250#/4252#, 4310#/ 4510#, 4525#, MBT 4510#, 4520#	

Total: 62-65 units

to be included in the Major GPA as well

Recommended course pattern

<i>First Year of Attendance</i>	18 units
1st term : BCH2000,2010/2710,2080	
2nd term : BCH 2020/2720, CHM 2250/2870	
<i>Second Year of Attendance</i>	21 units
1st term : BCH 3010/3610, 3030/3630	
2nd term : BCH 3020/3620, 3040/3640	
<i>Third Year of Attendance</i>	9-11 units
1st term : BCH 4010/4610, 0430 or 0431	
2nd term : BCH 0440 or 0441	
<i>Elective Courses</i>	14-15 units
BCH 4030/4630, 4040/4640, 4050/4650, 4060/4660, 4130/4730, BIO 4220/4222, 4310, FNS 3010/3011, ENS 3320/3920, 4240/4242, 4250/4252, 4310/4510, 4525, MBT 4510, 4520	

Total: 62-65 units

- Notes: 1. Students should obtain Grade "D" or above in each of the courses of BCH 2000, 2010/2710, 2020/2720 and 2080. Otherwise, they are required to repeat the courses. Students who cannot meet the Grade "D" requirement in any one of the courses mentioned above after two attempts will be required to withdraw from the University. Please refer to Reg. 15.2(d) of the General Regulations Governing Full-time Undergraduate Studies.
2. Only Major courses coded 3000 and above will be included in the calculation of the Major GPA for honours classification.

2. Minor Programme

Applicable to students admitted in 2001-02 and thereafter

Students are required to complete a minimum of 20 units as follows:
BCH 2010/2710, 2020/2720, 2030/2730 and at least 5 units from courses in biochemistry at level 3000 and above with accompanied laboratory. Those who have taken BCH 2030/2730 are not allowed to take BCH 3010/3610 or BCH 3020/3620 to fulfil their Minor requirement. Among the 20 units, no more than 5 should overlap with the requirement of the student's Major programme. For the purpose of exemption, BCH 3010/3610 and BCH 3020/3620 are regarded as equivalent to BCH 2030/2730. Biology Majors are not required to take BCH 2010/2710 and BCH 2020/2720 but are required to take BCH 2030/2730 and at least 10 units from biochemistry courses at level 3000 and above with accompanied laboratory. These courses should not overlap with those taken for fulfilment of their Major elective requirement.

3. Faculty Language Requirement

(Please refer to the "Faculty Language Requirement" of Faculty of Science for details.)