

# **Major in Biochemistry**

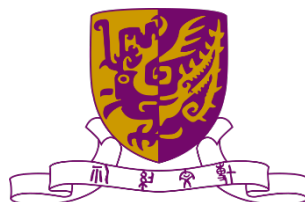
## **Course Selection Guide**

**2020/21**

**Biochemistry Programme**

**School of Life Sciences**

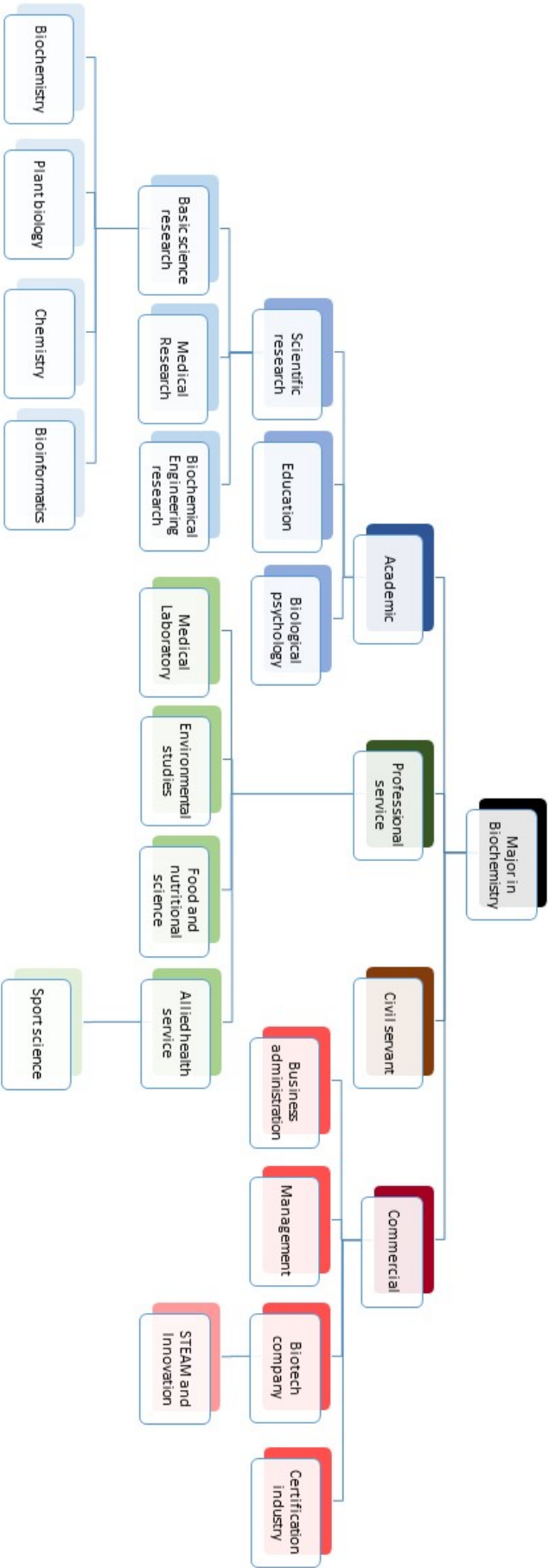
**The Chinese University of Hong Kong**





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**Study scheme selection guide**

# **Biochemistry Programme**

## **School of Life Sciences**

### **The Chinese University of Hong Kong**

This document tries to give our students an overview of the Biochemistry Programme in the School of Life Sciences (SLS) of CUHK. It is composed of (A) Background of the Biochemistry Programme, (B) Course List and Course Outline (2016-2017 version) and (C) Suggested Study Paths for your career development. Hope you enjoy the studies in Biochemistry Programme.

#### **(A) Background of the Biochemistry Programme:**

Biochemistry is a branch of science that investigates the chemical compounds and processes occurring in living organisms at molecular level. The knowledge procured from the study in Biochemistry has found extensive applications in medicine and biotechnology that drastically revolutionize our daily life.

Our programme aims to

- 1) provide concepts and mechanisms of biochemical processes, with emphasis on clinical and biomedical sciences;
- 2) provide training on the latest biochemical technology;
- 3) cultivate the ability of critical thinking, a proactive and responsible attitude and efficient communication skills for high competitiveness in further study and career development.

#### **History:**

Biochemistry Department was established in 1971, when the first batch of M.Phil. students was admitted. Prof. Lin MA, the second Vice-President of CUHK, was the Department Head. In 1973, the first batch of M.Phil. students graduated and the Department had admitted the first batch of major undergraduate students via transferring from other departments as United College students. This first batch of undergraduates graduated in 1976. Biochemistry Department is also a founding Department of the Medical School at CUHK. In 2010, Biochemistry Department merged with Biology Department to form the School of Life Sciences under the Faculty of Science.

#### **Study Areas (For more details, please refer to Part (C):**

Our curriculum emphasizes on current topics in biochemistry and molecular biology that have

scientific, medical and social significance. Major study focuses include genetics and cell biology, protein and enzymes, bioenergetics and metabolism, methods in biochemistry and molecular biology, and biomedical and health sciences. We also provide a wide range of elective courses for students to attain professional knowledge in specialized disciplines such as clinical biochemistry, immunology, endocrinology, neuroscience, forensic sciences and sport sciences, etc. Our curriculum is also designed to provide experiential learning through self-study modules, laboratory practicals and independent research. Apart from convention teaching in lecture theaters and student laboratory, our programme provides a number of eLearning materials and they can be found in the following website ‘<http://www.bch.cuhk.edu.hk/learnbiochem/>’.

### **Highlights of Biochemistry Programme:**

#### Biochemistry Programme Mission

- Mission 1: To provide concepts and mechanisms on the molecular basis of life processes and the significance in human activities and health.
- Mission 2: To provide training on the latest biochemical technology.
- Mission 3: To cultivate the ability of critical thinking, a proactive and responsible attitude and efficient communication skills for high competitiveness in further study and career development.

#### Biochemistry Programme Learning Outcomes (PLOs)

With the Programme mission, graduates of the Biochemistry Programme are expected to achieve the following PLOs:

- PLO1: Understand the core knowledge in biochemistry covering biomolecules, molecular biology, cellular biochemistry, metabolism, bioinformatics, proteins and enzymes and have the opportunity to specialize in a selected area of biochemistry.
- PLO2: Gain the knowledge of the latest biochemical technology in proteins, cell biology and, molecular biology.
- PLO3: Possess skills in designing experiments to test hypothesis, writing research report, applying their knowledge to daily life and developing self-learning capability.
- PLO4: Become all-round competent including the capability to work in a team.
- PLO5: Think critically and analytically.
- PLO6: Commit to ethical professionalism.

#### Centralized LEARNBIOCHEM e-learning platform

Biochemistry Programme has established a e-learning platform LEARNBIOCHEM with eight modules to enhance teaching and learning. Learning materials including videos of laboratory experiment on common biochemistry principles and techniques, each with interactive quizzes for students to evaluate what they have learned from the video. Recently, we further enriched the platform with materials for flipped classroom activities. There is a “Resources Finder” search function for students to find videos on laboratory techniques by courses, keywords or modules.

The site of this platform is: [www.bch.cuhk.edu.hk/learnbiochem](http://www.bch.cuhk.edu.hk/learnbiochem).

### Diverse curriculum of Biochemistry education

In addition to courses on general and specialized Biochemistry topics, the Biochemistry Programme also emphasizes on experiential and group learning as well as the cultivation of generic skills. Relevant courses offered include BCHE2070 Research Internship, BCHE3092 Self-study Modules in Biochemistry and Professional Development and BCHE4910 Group Research in Biochemistry.

### Level 1 Academic Advisors

In the BCHE Programme, each student has a Level-1 academic advisor. You can find who is your Level-1 advisor on CUSIS. Your advisor's office address, telephone number and e-mail can be found from the SLS website. You are required to meet your advisor at least once a year. Of course, individual meetings at any time initiated by students are welcome. Your Level-1 advisor can help you in the following areas:

- 1) Providing advice and assistance on academic development, study planning and life adjustment.
- 2) Referring students to other supporting units in the university for assistance.
- 3) Collecting students' feedback to improve curriculum, teaching and learning.

### Scholarships offered by Biochemistry Programme

The scholarships and awards were donated by the Biochemistry alumni in recognition of the Biochemistry undergraduate students' outstanding achievement and exceptional performance. All these scholarships as follows are nominated by the Biochemistry programme.

<b>Name of Scholarships / Awards (Amount)</b>	<b>Particular</b>
Prof. C.Y. Lee's Academic Award (HK\$2,000)	For a full-time year one or two undergraduate student majoring in Biochemistry with the highest major GPA during his/her first year of study in major subjects.
Prof. K.K. Ho's Academic Award (HK\$2,000)	For a full-time year two or three undergraduate student majoring in Biochemistry with the highest major GPA during his/her second year of study in major subjects.
Prof. Ma Lin's Academic Award (HK\$2,000)	For a full-time year three or final year undergraduate student majoring in Biochemistry with the highest major GPA during his/her third year of study in major subjects.
Biochemistry Alumni Association Scholarship (HK\$2,000)	A committee member of the Biochemistry Society, CUHK. The student should have the highest GPA during his/her term of service in the committee. (period of the service: from 2 <sup>nd</sup> term of year 1 to 1 <sup>st</sup> term of year 2)
Biochemistry Alumni (1977) Award for Distinguished Final Year Research Project (HK\$2,000)	The award will be given to the best final year research project of a full-time final year undergraduate student majoring in Biochemistry.

### Financial subsidy for MPhil and PhD in Biochemistry

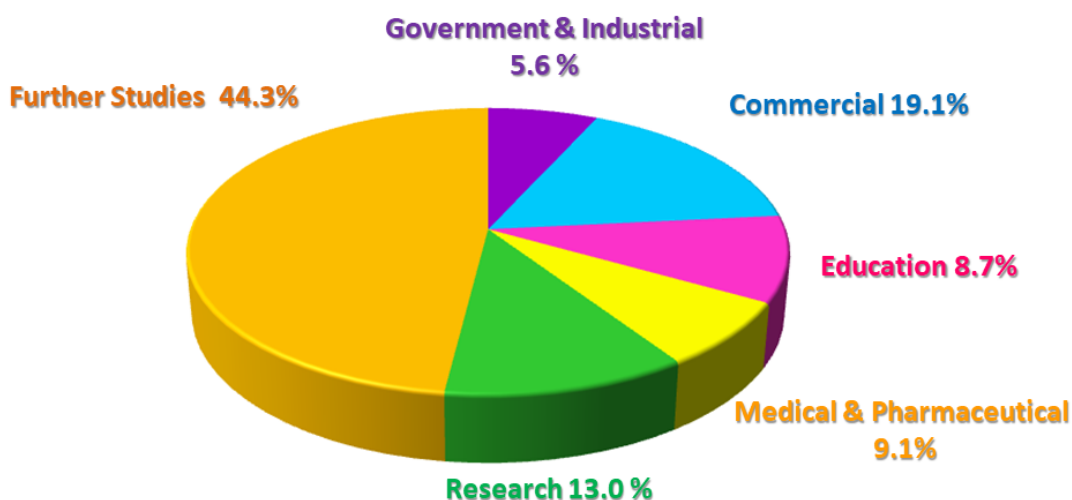
Biochemistry major students enjoy generous financial subsidy for their postgraduate studies; currently, local students in Hong Kong are waived from the tuition fees for their research-based postgraduate studies. Moreover, MPhil and PhD students receive studentship/fellowship (HK\$199,920 per year) from CUHK for two and four years, respectively. Students are also eligible for the application of the

prestigious Hong Kong PhD Fellowship Scheme (HK\$301,200 per year).

**Career Prospects (For more details, please see Part (B):**

- Nearly half of our graduates pursue postgraduate studies in local or overseas universities.
- About one fifth of our graduates have joined the medical and research laboratories.
- Some other graduates have entered the education, commercials, industrial and government sectors.

## Careers of Biochemistry Graduates (2012-2017)



### Contact Information

Website: [www.bch.cuhk.edu.hk/](http://www.bch.cuhk.edu.hk/)

Email: [biochemistry@cuhk.edu.hk](mailto:biochemistry@cuhk.edu.hk)

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Email: [pcshaw@cuhk.edu.hk](mailto:pcshaw@cuhk.edu.hk)

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Programme Secretary:

Ms Joanne Sun

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Email: [janny@cuhk.edu.hk](mailto:janny@cuhk.edu.hk)

Tel: 852-3943-6359

## (B) Course List and Course Outline

<b>Course List of Biochemistry Programme (BCHE Coded)</b>		
<i>Course Code</i>	<i>Course Title</i>	<i>Unit (s)</i>
BCHE2000	Frontiers in Biochemistry	2
BCHE2030	Fundamentals of Biochemistry	3
BCHE2070	Research Internship	2
BCHE3030	Methods in Biochemistry	3
BCHE3040	Proteins and Enzymes	3
BCHE3050	Molecular Biology	2
BCHE3070	Recombinant DNA Techniques	1
BCHE3080	Bioenergetics and Metabolism	3
BCHE3092	Self-study Modules in Biochemistry and Professional Development	2
BCHE3650	Molecular Biology and Recombinant DNA Laboratory	2
BCHE3730	Analytical Biochemistry Laboratory	2
BCHE4030	Clinical Biochemistry	3
BCHE4040	Aspects of Neuroscience	3
BCHE4060	Basic and Applied Immunology	3
BCHE4070	Management and Accreditation of Biochemical Laboratory	3
BCHE4080	Biochemistry for Forensic Sciences	2
BCHE4090	Biochemistry for Sport and Exercise	2
BCHE4130	Molecular Endocrinology	3
BCHE4610	Molecular Biology Laboratory	2
BCHE4640	Aspects of Neuroscience Laboratory	2
BCHE4760	Immunology and Haematology Laboratory	2
BCHE4830	Medical Biochemistry Laboratory	2
BCHE4901	Senior Experimental Project I	2
BCHE4902	Senior Experimental Project II	2
BCHE4903	Senior Experimental Project III	2
BCHE4910	Group Research in Biochemistry	3

**Suggested study paths with the courses in SLS for different types of career/higher degree studies. This is a recommendation. Students should consider their interest and time-table to choose courses apart from the core requirements**

### **Medical Biochemistry study path**

BCHE4030	Clinical Biochemistry
BCHE4040	Aspects of Neuroscience
BCHE4060	Basic and Applied Immunology
BCHE4070	Management and Accreditation of Biochemical Laboratory
BCHE4130	Molecular Endocrinology
BCHE4760	Immunology and Haematology Laboratory
BCHE4830	Medical Biochemistry Laboratory
BIOL3410	General Microbiology
BIOL4310	Human Genetics
ENSC3520	Environmental and Biochemical Toxicology



ENSC3820	Environmental and Biochemical Toxicology Laboratory
FNSC4101/4102	Human Physiology for Nutritional Studies I & II

### **Environmental Science study path**

BCHE2070	Research Internship
BIOL2210	Ecology
BIOL4220	Environmental Biotechnology
BIOL4260	Conservation Biology
ENSC2270	Introduction to Environmental Science
ENSC3520	Environmental and Biochemical Toxicology
ENSC3820	Environmental and Biochemical Toxicology Laboratory
ENSC4250	Environmental Health

### **Food and Nutritional Science study path**

BCHE2070	Research Internship
BCHE4090	Biochemistry for Sport and Exercise
FNSC2002	Nutrition for Health
FNSC3010	Nutrition and Human Development
FNSC3030	Nutritional Biochemistry
FNSC3180	Food Microbiology
FNSC4150	Introduction to Medical Nutrition Therapy
FNSC4101/4102	Human Physiology for Nutritional Studies I & II

### **STEAM and Innovation study path**

BCHE2070	Research Internship
BCHE3092	Self-study Modules in Biochemistry and Professional Development
BCHE4070	Management and Accreditation of Biochemical Laboratory
BCHE4910	Group Research in Biochemistry
BMEG2001	Introduction to Biomedical Engineering
BMEG3102	Bioinformatics
MBTE3000	Business and Social Aspects of Biotechnology
MGNT1010	Introduction to Business
MGNT1020	Principles of Management
LSCI3000	Synthetic Biology Workshop
SEEM2460	Introduction to Data Science
STAT3003	Survey Methods

*Participation more in extra-curricular activities such as iGEM (in School of Life Sciences); iCare (<http://www4.cuhk.edu.hk/icare/>) (at CUHK); PI Center (Dare to innovate, Dare to create, <http://www.picentre.cuhk.edu.hk/>) (at CUHK) and the College functions to get more fundings, more exposure, experience and awards to enrich your CV.*

## **Suggested Study Paths through Other Courses**

(The proposed courses offered by other departments can be used to fulfill their minor programmes.  
Please see their programme requirements)

### **Bioinformatics**

BCHE3050	Molecular Biology
BCHE3070	Recombinant DNA Techniques
BCHE3650	Molecular Biology and Recombinant DNA Laboratory
BBMS5200	Technology in Molecular Biology
BIOL4310	Human Genetics
BIOL2420	Population Genetics
BMEG5790	Bioinformatics
CMBI4201	Genomics and Transcriptomics
CMBI4202	Proteomics
CMBI4203	Metabolomics

### **Biochemical Engineering**

BMEG2001	Introduction to Biomedical Engineering
BMEG2011	Biomedical Engineering Laboratory
BMEG3101	Medical Instrumentation and Design
BMEG3102	Bioinformatics
BMEG3430	Biomaterials and Tissue Engineering
BMEG4010	Global Medical Device Regulatory Affairs
BMEG4450	Bionanotechnology
BMEG4510	Biomolecular Engineering
BMEG4520	Cardiovascular Engineering
BMEG4530	Musculoskeletal Tissue Engineering
BMEG4540	Electrophysiology

### **Chemistry Path**

BCHE4080	Biochemistry for Forensic Sciences
CHEM2120	Main Group Chemistry
CHEM2200	Organic Functional Groups: Structure and Reactivity
CHEM2300	Thermodynamics and Chemical Equilibrium
CHEM2400	Analytical Chemistry
CHEM2408	Analytical Chemistry Laboratory I
CHEM2820	Organic Chemistry Laboratory I
CHEM2830	Physical Chemistry Laboratory I
CHEM3410	Instrumental Analysis
CHEM4430	Accreditation of Laboratory Tests
CHEM4788	Chemical Applications in Forensic Science

### **Business Administration Path**

BCHE2070	Research Internship
BCHE4070	Management and Accreditation of Biochemical Laboratory
MBTE3000	Business and Social Aspects of Biotechnology
MGNT1010	Introduction to Business
MGNT1020	Principles of Management
DSME1035	Fundamentals of Business Economics
MGNT2510	Introduction to International Business
FINA3010	Financial Markets
MKTG3030	Integrated Marketing Communication

### **CUHK Entrepreneurship and Innovation Minor Programme**

([https://rgsntl.rgs.cuhk.edu.hk/aqs\\_prd\\_applx/public/handbook/document.aspx?id=1743&tv=T&lang=en](https://rgsntl.rgs.cuhk.edu.hk/aqs_prd_applx/public/handbook/document.aspx?id=1743&tv=T&lang=en))

### **Education Path**

EDUC2120	Principles and Implementation of Curriculum and Instructional Design
EDUC2210	Education and Society in Hong Kong
EDUC2240	Understanding Schooling and Education Policy in Hong Kong
EDUC2312	Child and Adolescent Development
EDUC3260	Teacher Development and Leadership
EDUC3311	Psychology Applied to Learning and Teaching
EDUC4130	Information Technology in Education

### **Geography Path**

GRMD1402	Global Change and Environmental Sustainability
GRMD1404	Geographical Landscape of the World
GRMD2209	Physical Geology
GRMD2221	Weather and Climate
GRMD3203	Urban Environmental Problems
GRMD3404	Natural Hazards and Human Responses

### **Management**

MGNT1010	Introduction to Business
MGNT1020	Principles of Management
MGNT2040	Human Resource Management
MGNT3010	Organizational Behaviour
MGNT4080	Managerial Skills for Modern Managers
MGNT4090	Technology and Innovation Management

**Psychology Path**

PSYC1000	General Psychology
PSYC2010	Introduction to Statistics
PSYC2190	Physiological Psychology
PSYC2780	Neuropsychology
PSYC3004	Special Topics in Clinical and Health Psychology
PSYC3720	Health Psychology

**Sport Science Path**

PHPC2007	Nutrition and Health
PHPC2016	Theories and Concepts of Health Behaviours
SPED2520	Functional Human Anatomy and Sports Injuries
SPED2540	Introduction to Exercise Physiology
SPED3550	Physiology of Human Performance
SPED3820	Introduction to Exercise and Sports Psychology
SPED4560	Physical Fitness Appraisal and Exercise Prescription

## Popular courses for Medical Biochemistry Study Path

	<b>Please select the courses below based on your personal interest and timetable</b>
<b>First Year of Attendance</b>	1 <sup>st</sup> term (maximum 18 units) CHEM1070, ELTU1001 or 1002, LSCI1002, MATH1520, UGFH1000 or UGFN1000
	2 <sup>nd</sup> term (maximum 18 units) BCHE2000, CHEM1280, CHLT1100, ENGG1000, STAT1012, UGFH1000 or UGFN1000
	Summer term (3 units) UGFH1000 or UGFN1000
<b>Second Year of Attendance</b>	1 <sup>st</sup> term (maximum 18 units) BCHE2030, BIOL2120, LSCI2002, LSCI2003, ELTU2018 or 2019
	2 <sup>nd</sup> term (maximum 18 units) BCHE3050, 3070, 3650, BIOL2313, 2410, CHLT1200
<b>Third Year of Attendance</b>	1 <sup>st</sup> term (maximum 18 units) BCHE3040, 3080, 3092, 4040, 4080, BIOL3630, ELTU3018
	2 <sup>nd</sup> term (maximum 18 units) BCHE3030, 3730, 4130, 4090, BIOL4310, ENSC3520
	Summer term (2 units) Major Elective(s): BCHE4901
<b>Fourth Year of Attendance</b>	1 <sup>st</sup> term (maximum 18 units) BCHE4060, 4640, 4760, BIOL3410 BCHE4902 or BCHE4910 or LSCI4000
	2 <sup>nd</sup> term (maximum 18 units) BCHE4030, 4830 BCHE4903 or LSCI4000

\*In addition to the popular general education courses, students should also other University General Education (9 units) & College General Education courses (6 units). The total units for General Education are 21 units.

\*\*Students should also take one Physical Education course (1 unit) in both Term 1 and Term 2 during their first year of attendance. The total units for Physical Education are 2 units.

## (C) Course Outlines

### BCHE2000 Frontiers in Biochemistry (2018-19, Term2)

Wed 9:30 am – 11:15 am (W2-3); L1 Science Centre

#### COURSE DESCRIPTION

This course presents the latest developments and advancements in biochemistry and molecular biology. It aims to alert students to the trends and recent breakthroughs in biochemical and biomedical research. Lecture topics are determined by individual teaching staffs of the course. They vary every year to reflect the latest development in the field of biochemical research. The lecture topics can be briefly classified into three major areas: New Research Areas (e.g. synthetic biology), Cellular Biochemistry (e.g. stem cells), and Biochemistry of Diseases (e.g. cancer).

#### LEARNING OUTCOME

Students are expected to understand recent developments in research fields related to Biochemistry and Molecular Biology. Basic and novel concepts of various topics and their future developments will be introduced and elaborated by teachers. Students are expected to read the recommended readings provided for each lecture topic, and to search for additional information in the library and online to study on their own.

#### CLASS SCHEDULE

Wk.	Date	Topic no.	Topic	Teacher
1	Jan. 9	1	Overview of the course; Synthetic Life	CKN; KMC
2	Jan. 16	2	Biochemistry: Past, Present and Future	PCS
3	Jan. 23	3	Non-coding RNA in Development	HLH
4	Jan. 30	4	Modulation of gene expression: RNAi vs. CRISPR	CKN
5	Feb. 6		<i>Lunar New Year Vacation</i>	
6	Feb. 13	5	Stem Cell Research	SYT
7	Feb. 20		General Discussion (Topics 1-5)	PCS/KMC/CKN/HLH/SYT
8	<b>Feb. 27</b>		<b>Mid-term Examination (Topics 2-5 )</b>	-
9	Mar. 6	6	Etiology of Cancer	SKK
10	Mar. 13	7	Cancer Treatment	WPF
11	Mar. 20	8	Metabolic Disease	HKN
12	Mar. 27	9	Structural Biology and Drug Discovery	WNA
13	Apr. 3	-	<i>Study week</i>	-
14	Apr. 10	10	Guest lecture – Depression: Pharmacology, Drug Discover and Therapy	Dr. Stephen Wong
15	Apr. 17		General Discussion (Topics 6-10)	WNA/HKN/SKK/WPF

#### TEACHERS' INFORMATION

Teacher Name	Office	Tel.	Email	
Prof. Jacky CK NGO (Course coordinator)	CKN	SCE E403	3943 6346	jackyngo@cuhk.edu.hk
Prof. Shannon AU	WNA	SC 178	3943 4170	shannon-au@cuhk.edu.hk
Prof. KM CHAN	KMC	SC 184	3943 4420	kingchan@cuhk.edu.hk
Prof. WP FONG	WPF	MMW 608	3943 6868	wpfong@cuhk.edu.hk
Prof. Jerome HL HUI	HLH	MMW 503C	3943 6316	jeromehui@cuhk.edu.hk
Prof. SK KONG	SKK	MMW 609	3943 6799	skkong@cuhk.edu.hk
Dr. Patrick HK NGAI	HKN	MMW 507B	3943 4359	hkngai@cuhk.edu.hk
Prof. PC SHAW	PCS	SC 180	3943 1363	pcshaw@cuhk.edu.hk

Prof. Faye SY TSANG	SYT	MMW 607	3943 1020	fayetsang@cuhk.edu.hk
Dr. Stephen Wong				

### **ASSESSMENT SCHEME**

9.09% (10 marks)	Group poster presentation: <i>Topic 1</i>
4.55% (5 marks)	On-line exercise: <i>Topic 2</i>
4.55% (5 marks)	On-line exercise: <i>Bioethics</i>
36.36% (40 marks)	Mid-term exam (MCQs + short Qs): <i>covering Topics: 2-5</i>
45.45% (50 marks)	Final exam (MCQs + short Qs): <i>covering Topics 6-10</i>

**REFERENCES** Reading materials will be given by individual teachers.

### **GRADE DESCRIPTOR (for reference only)**

#### Grade A :

Demonstrates a deep understanding of the latest developments and advancements in biochemistry and molecular biology, in particular their underlying principles and implications in health and diseases.

Demonstrate the ability to synthesize and apply the subject matter learnt in the course, to novel situations and/or in novel ways, in a manner that would surpass the normal expectation at this level. Has the ability to express the synthesis of ideas or application in a clear and cogent manner.

#### Grade A- :

Demonstrates high level of understanding of the latest developments and advancements in biochemistry and molecular biology, in particular their underlying principles and implications in health and diseases.

Demonstrate the ability to state and apply the subject matter learnt in the course to familiar and standard situations in a manner that is logical and comprehensive. Has the ability to express the knowledge or application with clarity.

#### Grade B :

Demonstrate a competent grasp of the latest developments and advancements in biochemistry and molecular biology, in particular their underlying principles and implications in health and diseases.

Demonstrates the ability to state and partially apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive. Has the ability to express the knowledge or application in a satisfactory and unambiguous way.

#### Grade C :

Demonstrate a basic understanding of the latest developments and advancements in biochemistry and molecular biology, in particular their underlying principles and implications in health and diseases.

Demonstrates the ability to state and apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is not incorrect but is somewhat fragmented. Has the ability to express the separate pieces of knowledge in an unambiguous way.

#### Grade D :

Demonstrate a simplistic knowledge of the latest developments and advancements in biochemistry and molecular biology, in particular their underlying principles and implications in health and diseases.

Demonstrates the ability to state and sometimes apply the subject matter learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials. Has the ability to state the knowledge or application in simple terms.

#### Grade F :

Demonstrate an incomplete or incorrect knowledge of the latest developments and advancements in biochemistry and molecular biology, in particular their underlying principles and implications in

health and diseases.

Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

## **IMPORTANT:**

### **Academic honesty and plagiarism**

The University adopts a policy of zero tolerance on plagiarism. Information regarding the academic honesty and plagiarism policy in the University is located at <http://www.cuhk.edu.hk/policy/academichonesty/>.

#### **Guideline about plagiarism**

Any assignment (i.e., project, essay, or paper) that shows evidence of plagiarism will be marked down severely. In simple terms, plagiarism is copying passages and/or ideas from other sources without referencing those sources. Moreover, when you report someone else's ideas/findings you must put it in your own words and not merely copy full sentences or parts of sentences from the source article. It is your responsibility as a scholar-in-training to cite the ideas and work of others correctly.

If you commit plagiarism in an assignment, and it is your first offence in the course, the penalty will range from a minimum of a single letter grade reduction in score on the assignment to a maximum of failure on the assignment. A second offence within the same course will result in a minimum penalty of a single letter grade reduction in the course grade to a maximum penalty of course failure. The specific penalty applied is up to the discretion of the professor. In all cases of plagiarism, the student's name will be recorded in a central database maintained by the general office. If a student is referred for plagiarism in more than one course, or more than one instance in the same course, the student's case will be forwarded to the university administration for follow-up action.

Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated Procedures are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>).

**REMINDER:** Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available online: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>; please check them out.



## BCHE2030 Fundamentals of Biochemistry (2018-19, Term 1)

### 1. Description

The course introduces the fundamental principles of biochemistry that are needed for all life science disciplines. It will cover the importance of water, structure-function relationships of biomolecules (including amino acids, proteins, carbohydrates, lipids and nucleic acids), the biochemical logic of the metabolic pathways, and an overview of metabolism with emphasis on how biomolecules are interconverting with each other.

### 2. Contents/Fundamental Concepts

Topic	Contents/Fundamental Concepts
Water – the medium of life	Molecular structure of water Weak interactions in aqueous system Acid/base equilibrium and buffers
Carbohydrates	Monosaccharides Disaccharides and oligosaccharides Polysaccharides Glycoconjugates Biological information and the sugar code
Lipids	Storage lipids Membrane lipids Other lipids
Nucleotide and nucleic acids	Nucleotide Nucleic acids Other functions of nucleotides
Proteins	Amino acid – basic building block of proteins Peptide bond Primary, secondary, tertiary and quaternary protein structures Hemoglobin as an example to illustrate how proteins function
Thermodynamics – to predict if a reaction will proceed	Free energy as a measure of a reaction's tendency to proceed spontaneously Concepts of 'high-energy' compounds and coupled reactions
Energy and Matters	Flow of energy and cycling of carbon/nitrogen in the biosphere Energy relationship between catabolic and anabolic pathway Oxidation of carbon fuels as a major source of cellular energy NAD(P)H/FADH <sub>2</sub> as universal electron carriers ATP is synthesized by proton gradients across membrane generated by transferring electrons to oxygen The light reaction of photosynthesis generates both proton gradients and reducing equivalents The dark reaction of photosynthesis uses the reducing power generated for biosynthesis of sugar from CO <sub>2</sub>

Chemical logic of biochemical reactions – to predict how a reaction should proceed	Electronegativity and polarity of covalent bond Different types of biochemical reactions
Enzyme catalysis – to predict how fast a reaction could proceed	Enzymes affect reaction rates but not equilibria Enzymes increase reaction rates by lowering the activation free energy Concepts of transition-state complementarity Why biochemical reaction is stereospecific? Basic enzyme kinetics Enzymes are good target for drug design
Glycolysis	Reactions in the glycolytic pathway are used as examples to illustrate the recurring motifs in metabolic pathway
Vitamins	Vitamins are often co-factors in enzyme catalysis
Overviews of metabolism	Convergent catabolism Divergent anabolism Cyclic pathway Regulatory strategy Compartmentation of metabolic pathways

### 3. Learning Outcomes

To appreciate the importance of water in living organism.

To understand the structure-function relationships of different types of biomolecules.

To understand the chemical logic (thermodynamics, mechanism, and catalysis) behind biochemical reactions.

To have an overview of metabolic pathways, and appreciate how biomolecules are interconverting with each other.

### 4. Assessment Scheme

Mid-term exam. 30%

Final exam. 50%

Assignment 20%

### 5. Textbooks

Nelson & Cox, Lehninger Principles of Biochemistry, W.H. Freeman Berg,  
Tymoczko & Stryer, Biochemistry, W.H. Freeman

### 6. Lecturers

Prof. WN Au (course co-ordinator), SC 178 tel: 3943 4170 email: [shannon-au@cuhk.edu.hk](mailto:shannon-au@cuhk.edu.hk)

Prof. KF Lau, SC 291 tel: 3943 1106 email: [kflau@cuhk.edu.hk](mailto:kflau@cuhk.edu.hk)

## 7. Course Schedule

BCHE2030 Fundamentals of Biochemistry (2018-19, Term 1) Friday

8:30 am – 11:15 am (F1-3); Lee Shau Kee Building (LSK LT6)

Wk.	Date	Topic	Teacher
1	Sept. 7	Introduction	Prof. KF Lau
2	Sept. 14	Water	Prof. KF Lau
3	Sept. 21	Carbohydrates	Prof. KF Lau
4	Sept. 28	Lipids	Prof. KF Lau
5	Oct. 5	Nucleotide and Nucleic Acids	Prof. KF Lau
6	Oct. 12	Proteins	Prof. WN Au
7	Oct. 19	Protein structure and function	Prof. WN Au
8	Oct. 26 (F1-F2)	Mid-term Examination	Prof. KF Lau
8	Oct. 26 (F3)	Protein structure and function	Prof. WN Au
9	Nov. 2	Thermodynamics, Energy and Matters	Prof. WN Au
10	Nov. 9	Enzyme Catalysis	Prof. WN Au
11	Nov. 16	Chemical Logic of Biochemical Reactions	Prof. WN Au
12	Nov. 23	Glycolysis, Vitamins	Prof. WN Au
13	Nov. 30	Overview of Metabolism	Prof. WN Au

## 8. Posting Course Announcements

Pay attention to your CUHK email account for announcements about this course, teachers will send messages to students via the CUHK Blackboard System (<http://blackboard.cuhk.edu.hk>) and students can view the message automatically in their CU email accounts. The UReply system will be used and multiple choice questions will be discussed to reinforce some basic concepts covered in the lectures.

## 9. Academic Honesty and plagiarism

The University adopts a policy of zero tolerance to any act of academic dishonesty. Please read the updated *Procedures* at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>). Please note that students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty.

**REMINDER:** Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on-line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>; please check them out.

## Grade Descriptors for BCHE2030

Grade	Overall course
A	<p>Demonstrates a deep understanding of the importance of water and different biomolecules in living organisms, their structure-function relationship, the chemical logics behind biochemical reactions, and an overview of metabolic pathways.</p> <p>Demonstrate the ability to synthesize and apply the subject matter learnt in the course, to novel situations and/or in novel ways, in a manner that would surpass the normal expectation at this level.</p> <p>Has the ability to express the synthesis of ideas or application in a clear and cogent manner.</p>
A-	<p>Demonstrates high level of understanding of the importance of water and different biomolecules in living organisms, their structure-function relationship, the chemical logics behind biochemical reactions, and an overview of metabolic pathways.</p> <p>Demonstrate the ability to state and apply the subject matter learnt in the course to familiar and standard situations in a manner that is logical and comprehensive.</p> <p>Has the ability to express the knowledge or application with clarity.</p>
B	<p>Demonstrate a competent grasp of the key concepts in biochemistry, including the importance of water and different biomolecules in living organisms, their structure-function relationship, the chemical logics behind biochemical reactions, and an overview of metabolic pathways.</p> <p>Demonstrates the ability to state and partially apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive.</p> <p>Has the ability to express the knowledge or application in a satisfactory and unambiguous way.</p>
C	<p>Demonstrate a basic understanding of the importance of water and different biomolecules in living organisms, their structure-function relationship, the chemical logics behind biochemical reactions, and an overview of metabolic pathways.</p> <p>Demonstrates the ability to state and apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is not incorrect but is somewhat fragmented.</p> <p>Has the ability to express the separate pieces of knowledge in an unambiguous way.</p>
D	<p>Demonstrate a simplistic knowledge of the importance of water and different biomolecules in living organisms, their structure-function relationship, the chemical logics behind biochemical reactions, and an overview of metabolic pathways.</p> <p>Demonstrates the ability to state and sometimes apply the subject matter learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials</p> <p>Has the ability to state the knowledge or application in simple terms.</p>
F	<p>Demonstrate an incomplete or incorrect knowledge of the importance of water and different biomolecules in living organisms, their structure-function relationship, the chemical logics behind biochemical reactions, and an overview of metabolic pathways.</p> <p>Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.</p>

## **BCHE2070 Research Internship (2018-19, 1<sup>st</sup> Term / 2<sup>nd</sup> Term)**

### **Description**

This course is designed to allow students to gain practical experience in scientific research in a laboratory or biotechnology firm during the summer period or term time. All research or internship projects, locally or overseas, must be approved by the School.

### **Learning Outcome**

After completing the course, students should be able to:

1. experience to carry out an independent research under supervision by a faculty staff;
2. design simple experiments and follow protocols to carry out some biochemical analyses;
3. obtain data and carry out data analysis with simple statistics, and
4. learn how to write a brief scientific report.

Objectives for students development:

1. Learn how to integrate basic biochemistry techniques to perform some experiments or develop an assay.
2. Learn how to collect and read literature in a specific area of research.
3. Learn how to design simple experiments, carry out the experimental procedure independently, and work as a member of the team.
4. Learn how to compile or collect data with accuracy and precision.
5. Learn how to analyze the data obtained and write a short paper to summarize the experiments or work done.
6. Better prepare students to learn time management skills and do independent research for their final year project (Supervised Research)

### **Course Syllabus**

There is no specific content for this course which is guided by a supervisor and the project is to be assigned by the supervisor. Summer Interns (including DREAM) may take this course but a local supervisor or supervisor from Biochemistry Program has to be assigned in addition to the internship supervisor for marking. Title of the project report must be different from other courses.

### Duration (study period):

Students taking this course usually start their experiments in the summer or early at term start and complete the project with a report written for marking by the end of first term. Deadline of submission of report is at term end. Two markers (including the supervisor and an extra marker is needed for dual supervisors) will evaluate the report (assessment form

attached).

### Job nature:

Students may hold a project on testing and purification of a biomolecule, cloning of a gene, detection of a gene mutation, performing PCR assay or ELISA assay, purification of a recombinant protein, developing an assay from modified protocols, doing literature search of patents and help filing a patent application in a patent law firm, doing data mining (*In Silico* analyses) or sequence analyses, testing of a drug, etc.

### **Assessment Scheme**

Research report 100%

### **Required Readings**

To be assigned by supervisor.

### **Recommended Readings**

#### Web

This website explain how to write a scientific report:

<http://geog.arizona.edu/~comrie/geog230/eport.htm>

### **Grade Descriptors for BCHE2070**

Grade	Marks	Contents and Writings	Data Presentation
A	>90	Able to identify and address the topic in the research up to a scholastic standard with an excellent review of the research topic	Up to a publication standard of SCI journal with quality data presentation
A-	80-90	Able to identify and address the topic in the research up to a high standard	Up to a publication standard to SCI journal, but errors occur and weak in discussion
B+	75-80	Able to identify and address the topic in the research up to a good standard	Up to a good standard with enough data, but lack of statistical analysis
B	70-75	Able to identify and address the topic in the research up to a good standard, but some minor errors occur	Up to a good standard, but failed to provide sufficient results or citations
B-	65-70	Able to identify and address the topic in the research up to a good standard, but research background not clearly reviewed	Limited data provided, weak in data interpretations or no interpretation at all
C+	60-65	Unable to address the topic in the research	Invalid data presented
C	55-60	Unable to address the topic in the research	Invalid and very limited data presented

C-/D	50-55	Unable to address the topic in the research, basically a review paper	No data presented, research failed but able to submit previous data to explain the project
F	< 50	Plagiarized materials found in the report No report submitted	Failed to present any data in the report

For reference only

**BCHE3030 METHODS IN BIOCHEMISTRY**  
**2018-19 2<sup>nd</sup> term**

**Description**

This course aims at introducing quantitative analyses of biochemical reactions and subcellular components to students. Methods for purification and studies on biomolecules will be introduced. Techniques including fluorescence spectrophotometry and microscopy, X-ray crystallography, centrifugation, chromatography and electrophoresis will be covered.

**Content/Fundamental Concepts**

**Fluorescence Technology:** This block is intended to introduce to students an in-depth knowledge of the principles of fluorescence and its applications for biochemistry and cell biology research. Topics include principles of fluorescence, design and application of fluorescence probes, fluorescence measurements, special techniques and recent advances in fluorescence technology.

**X-ray Crystallography:** This session will introduce the basic principles of protein crystallization. Different crystallization methods and optimization strategies will be discussed. The use of X-ray diffraction to determine the three-dimensional structure of proteins will be introduced.

**Centrifugation:** This session will introduce the basic theory of centrifugation and the mathematical expression of sedimentation rate. We will also discuss the different types of centrifuge and rotor commonly used in biochemical studies. The principles of differential centrifugation and density gradient centrifugation, and their applications will be covered.

**Chromatography:** This session will introduce the basic principles of chromatography, a partition process in which molecules distribute between two different phases. The various chromatographic techniques particularly useful in protein purification, including ion-exchange chromatography, gel filtration and affinity chromatography, will be discussed.

**Electrophoresis:** In this block of lectures, particular emphasis will be given to the electrophoretic methods used in studying proteins, namely SDS-polyacrylamide gel electrophoresis and isoelectric focusing. The use of electrophoresis in the study of nucleic acids will be discussed. In addition, the applications of the instrumental technique capillary electrophoresis will also be covered.

**Learning Outcome**

After completing the course, students should be able to understand both the basic principles and the practical aspects of different methods in biochemical analyses, including fluorescence techniques, X-ray crystallography, centrifugation, chromatography and electrophoresis. The knowledge gained will be useful in their final year experimental research project.

**Assessment Scheme**

Class Test (I)	30%	Fluorescence technology
Class Test (II)	30%	X-ray crystallography
Class Test (III)	40%	Centrifugation, chromatography and electrophoresis



## Grade Descriptors for BCHE3030

Grade	Overall Course
A	Outstanding performance on all learning outcomes
A-	Generally outstanding performance on the majority of learning outcomes
B	High performance on some learning outcomes
C	Satisfactory performance on the majority of learning outcomes
D	Barely satisfactory performance on a number of learning outcomes
F	Unsatisfactory performance on the majority of learning outcomes

## Learning Resources

Reference:

Principles and Techniques of Biochemistry and Molecular Biology 7th edition, 2010 Edited by Keith Wilson and John Walker, Cambridge University Press (QP 519.7 P75)

Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8th edition, 2018 Edited by Andreas Hofmann and Samuel Clokie, Cambridge University Press.

Other reading materials (including reference books, journals articles and web sites) will be given by individual teachers.

## Course Schedule

T 3-4 10:30 am – 12:15 pm MMW LT2  
H 4 11:30 am – 12:15 pm MMW LT2

Week no.	Date	Hour	Topic	
1	8 Jan (Tue)	2	Introduction to Fluorescence	S K Kong
	10 Jan (Thu)	1	Design and Application of Fluorescent Probes	S K Kong
2	15 Jan (Tue)	2	Fura-2, a Good Example for Fluorescent Probe Design	S K Kong
	17 Jan (Thu)	1	Fluorescence Measurement I: Fluorescence Fluorometer, Epi-Fluorescence Microscope & Confocal Microscopy	S K Kong
3	22 Jan (Tue)	2	Fluorescence Measurement II: Flow Cytometry, Real-time PCR Machine	S K Kong
	24 Jan (Thu)	1	Special Techniques and Recent Advances in Fluorescence Technology I: Fluorescence Resonance Energy Transfer	S K Kong
4	29 Jan (Tue)	2	Special Techniques and Recent Advances in Fluorescence Technology II: Green Fluorescence Protein & its Application	S K Kong
	31 Jan (Thu)	1	Introduction to Protein X-ray Crystallography	Shannon Au

5	5 Feb (Tue)		<b>HOLIDAY: LUNAR NEW YEAR</b>	
	7 Feb (Thu)		<b>HOLIDAY: LUNAR NEW YEAR</b>	
6	12 Feb (Tue)	2	Crystallization Methods and Optimization	Shannon Au
	14 Feb (Thu)	1	<b>CLASS TEST (I)</b>	SK Kong
7	19 Feb (Tue)	2	Basic Concepts in X-ray Diffraction (I)	Shannon Au
	21 Feb (Thu)	1	Basic Concepts in X-ray Diffraction (II)	Shannon Au
8	26 Feb (Tue)	2	Structure Determination, Model Building and Refinement	Shannon Au
	28 Feb (Thu)	1	Recent Advances in Protein Crystallography (I)	Shannon Au
9	5 Mar (Tue)	1	Recent Advances in Protein Crystallography (II)	Shannon Au
		1	General Techniques in Protein Purification	W P Fong
	7 Mar (Thu)	1	Basic Principles in Centrifugation	W P Fong
10	12 Mar (Tue)	2	Different Centrifugation Techniques, Basic Principles in Chromatography	W P Fong
	14 Mar (Thu)	1	<b>CLASS TEST (II)</b>	Shannon Au
11	19 Mar (Tue)	2	Resolution in Chromatographic Separation, Different Types of Chromatography	W P Fong
	21 Mar (Thu)	1	Chromatography for Protein Purification	W P Fong
12	26 Mar (Tue)	2	Steps in Protein Purification	W P Fong
	28 Mar (Thu)	1	Analysis of Protein Purity by SDS-PAGE	W P Fong
13	2 Apr (Tue)		<b>READING WEEK</b>	
	4 Apr (Thu)		<b>READING WEEK</b>	
14	9 Apr (Tue)	2	Basic Principles in Electrophoresis	W P Fong
	11 Apr (Thu)	1	Isoelectric Focusing and 2-D Electrophoresis	W P Fong
15	16 Apr (Tue)	2	Detection after Electrophoresis, Electrophoresis of Nucleic Acids	W P Fong
	18 Apr (Thu)	1	Capillary Electrophoresis	W P Fong

### Teacher's Contact Details

Professor FONG, Wing Ping (coordinator)  
 Professor KONG, Siu Kai  
 Professor AU, Shannon W.N.

MMW 608  
 MMW 609  
 SC 178

39436868 wpfong@cuhk.edu.hk  
 39436799 skkong@cuhk.edu.hk  
 39434170 shannon-au@cuhk.edu.hk

## **A Facility for Posting Course Announcements**

Course announcements and materials will be posted on the Blackboard website at the CU E-Learning system. The powerpoint slides used will be posted on the website before the lecture. No hard copies will be distributed in the class.

### **Academic Honesty and Plagiarism:**

According to University regulations, students must submit an electronic version of their assignment to VeriGuide system for the purpose of checking for possible plagiarism. Read the University's policies on plagiarism carefully and do not plagiarise! CUHK has adopted a policy of zero tolerance for plagiarism. Instructors will send all suspected cases of plagiarism directly to the disciplinary committee for investigation. In the case of group report, plagiarism will affect all partners! Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated Procedures are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>). Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>.

# BCHE3040 PROTEINS AND ENZYMES

2018/2019, 1<sup>st</sup> Term

## Description:

Three-dimensional conformations of proteins and protein folding will be discussed with emphasis on structure-function relationships. Enzyme catalysis will be introduced with respect to coenzyme requirements, kinetics, catalytic mechanism and regulation of enzymatic activities.

## Contents/Fundamental Concepts:

**Protein Structure and Folding:** This session will discuss the basic principles governing the structure of protein. As protein molecules are organized in a structural hierarchy, topology diagrams will be used to illustrate the motifs of protein structure. In particular, the alpha-domain structures, beta structures and the alpha/beta structures will be discussed. The key concepts of thermodynamics and kinetics in the process of protein folding and the stabilization of protein structure will be illustrated.

**Structure-Function Relationship in Selected Proteins:** Chaperone is protein that helps correct protein folding while ubiquitin, together with the proteasome system, is responsible for protein degradation. They will be discussed with respect to their structure-function relationship. Specific examples will be used to illustrate the general structure of membrane proteins. DNA-binding proteins can regulate gene activity. Different DNA binding motifs will be introduced. To improve the properties, protein can be engineered. Methods like DNA shuffling will be discussed.

**Protein-Protein Interaction:** The different methods for studying protein-protein interaction will be introduced. Among them are qualitative ones like chemical cross linking, co-immunoprecipitation, yeast two hybrid system, fluorescent resonance energy transfer, and also quantitative ones like surface plasmon resonance and isothermal titration calorimetry. The use of mass spectrometry in the identification of protein will also be discussed.

**Introduction to Enzymes:** The basic characteristics of enzymes as biocatalysts, for example the specificity, ability to be regulated and the catalytic power will be introduced. Ribonucleic acids having catalytic activities will be mentioned. The enzyme nomenclature system and the requirement of coenzymes and metals ions for various enzymatic reactions will also be discussed.

**Kinetics, Regulation and Mechanism:** Different methods for measuring enzyme activities and the precautions needed when performing enzyme assays will be discussed. Michaelis-Menten enzyme steady state kinetics will be covered, with particular emphasis on the significance of the  $K_m$  and  $k_{cat}$  values. Different types of enzyme inhibitors, including allosteric ones, will be introduced. The various means by which enzyme activities can be regulated will be mentioned. Examples will be given to illustrate how the different amino acid residues in the active site of the enzyme contribute to the activity of the enzyme.

**Clinical and Industrial Enzymology:** This session will introduce the use of enzymes in different clinical applications, for example, the serum enzyme activity assay as a diagnostic tool, the use of enzyme as a reagent to measure the concentration of metabolites, the use of enzyme inhibitor as drug and the use of enzyme itself as therapeutic agent. Examples will also be given to illustrate the application of enzymes in different industries, particularly, in pharmaceutical and food industries.

## Learning Outcomes:

After completing the course, students should be able to:

- (1) explain the protein structure and the folding process;
- (2) learn the structure and function of some selected proteins, for example, membrane proteins;
- (3) describe the different methods for studying protein-protein interactions;
- (4) know the basic principles in enzymology;
- (5) understand the kinetics, mechanism and regulation of enzyme activity; and
- (6) realize the clinical and industrial applications of enzymes.

## Assessment Scheme:

Assignments:	20%	
Mid-term Examination:	40%	(Proteins)
Final Examination:	40%	(Enzymes)

## Grade Descriptors

Grade	Overall Course
A	Outstanding performance on all learning outcomes
A-	Generally outstanding performance on the majority of learning outcomes
B	High performance on some learning outcomes
C	Satisfactory performance on the majority of learning outcomes
D	Barely satisfactory performance on a number of learning outcomes
F	Unsatisfactory performance on the majority of learning outcomes

## Learning Resources:

References:

- (1) Proteins: Structure and Function.  
D. Whitford, John Wiley & Sons Ltd., 2005. (QU55 W535) online access
- (2) Introduction to Proteins: Structure, Function and Motion.  
A. Kessel and N. Ben-Tal, CRC Press, 2011. (QU55 K37) online access
- (3) How Proteins Work.  
M. Williamson, Garland Science 2012. (QD431 W536)
- (4) Lehninger Principles of Biochemistry.  
D.L. Nelson and M.M. Cox, W.H. Freeman, 2017. (QU4 N45)
- (5) Biochemistry.  
J.M. Berg, J.L. Tymoczko, G.J. Gatto and L. Stryer, W.H. Freeman, 2015. (QU4 S77)

## Course Schedule:

M1                    8:30 am - 9:15 am                    MMWLT2  
 W1-2                8:30 am - 10:15 am                MMWLT2

### a. Course Schedule

Week	Date	Hour(s)	Topic
1	<b>3 Sep (Mon)</b>	<b>0</b>	<b><i>Inauguration Ceremony for Undergraduates - NO CLASS</i></b>
	5 Sep (Wed)	2	Introduction to Protein Structure
2	10 Sep (Mon)	1	From Motifs to Proteins
	12 Sep (Wed)	2	Protein Folding and Disease
3	17 Sep (Mon)	1	Proteins Associated with Folding and Degradation
	19 Sep (Wed)	2	Membrane Protein
4	24 Sep (Mon)	1	Examples: Bacteriorhodopsin, Potassium Channel and G-Protein
	26 Sep (Wed)	2	DNA-binding Protein
5	<b>1 Oct (Mon)</b>	<b>0</b>	<b><i>PUBLIC HOLIDAY</i></b>
	3 Oct (Wed)	2	Protein Engineering
6	8 Oct (Mon)	1	Protein-Protein Interaction
	10 Oct (Wed)	2	Protein Identification by Mass Spectrometry
7	15 Oct (Mon)	1	Introduction to Enzymes
	<b>17 Oct (Wed)</b>	<b>0</b>	<b><i>PUBLIC HOLIDAY</i></b>
8	22 Oct (Mon)	1	RNA as Biocatalyst
	<b>24 Oct (Wed)</b>	<b>2</b>	<b><i>MID-TERM EXAMINATION</i></b>
9	29 Oct (Mon)	1	Cofactor Requirement
	31 Oct (Wed)	2	Determination of Enzyme Activity
10	5 Nov (Mon)	1	Michaelis-Menten Kinetics
	7 Nov (Wed)	2	Inhibitors, Bi-substrate Reactions and Pre-steady State Kinetics
11	12 Nov (Mon)	1	Allosteric and Multimeric Enzyme
	14 Nov (Wed)	2	Regulation of Enzyme Activity
12	19 Nov (Mon)	1	Mechanism of Enzyme Catalysis
	21 Nov (Wed)	2	Examples of Enzyme Mechanism
13	26 Nov (Mon)	1	Clinical Enzymology
	28 Nov (Wed)	2	Industrial Enzymology
<b>Total:</b>		<b>35</b>	

## b. Tutorial Schedule

Question and Answer Session (s) will be arranged before the examinations.

### **Teacher's Contact Details:**

Professor FONG WING-PING MMW 608 39436868 wpfong@cuhk.edu.hk

### **A Facility for Posting Course Announcements:**

Course announcements and materials will be posted on the Blackboard course website. The powerpoint slides used will be posted on the Blackboard course website before the lecture.

### **Academic Honesty and Plagiarism:**

According to University regulations, students must submit an electronic version of their assignment to VeriGuide system for the purpose of checking for possible plagiarism. Read the University's policies on plagiarism carefully and do not plagiarise! CUHK has adopted a policy of zero tolerance for plagiarism. Instructors will send all suspected cases of plagiarism directly to the disciplinary committee for investigation. In the case of group report, plagiarism will affect all partners! Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated Procedures are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>). Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>.

**BCHE3050 Molecular Biology**  
**Schedule and Assessment Scheme 2018-19 Term 2**

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Teacher</b>
1	7 Jan	DNA, genome and elements	PCS
2	14 Jan	Organization and packaging of genome, DNA replication	PCS
3	21 Jan	DNA replication	PCS
4	28 Jan	Transcription	PCS
5	4 Feb	<i>Lunar New Year Holiday</i>	PCS
6	11 Feb	RNA processing and transcriptional regulation, tutorial	PCS
7	18 Feb	Transcriptional regulation	-
8	25 Feb	<b>50 min. test</b> , DNA mutation and recombination	PCS
9	4 Mar	DNA repair	PCS
10	11 Mar	Translation	PCS
11	18 Mar	Translation	PCS
12	25 Mar	Translational control	PCS
13	1 Apr	Reading week, no class	-
14	8 Apr	Proteins after translation	PCS
15	15 Apr	<b>50 min. test</b>	PCS

*School Term: 7 Jan – 18 Apr 2010*

*Class Period: 9:30AM - 11:15AM (Monday)*

*Venue: LT6 Lady Shaw Building (LSB LT6)*

**Course description:**

This course discusses basic areas of molecular biology. Topics include: DNA and genome, DNA replication, transcription, translation, gene regulation, DNA mutation, recombination and repair.

**References:**

J.M. Berg, J.L. Tymoczko, L. Stryer (2011) *Biochemistry*. 7th Edition, or 2015 8th Edition.

D.L. Nelson, M.M. Cox (2012) *Lehninger Principles of Biochemistry* 6th Edition, or 2017 7th Edition.

T.M. Devlin ed. (2011) *Textbook of biochemistry: with clinical correlations*, 7th Edition.

One online exercise – 10% (one week for each student to participate, 1 mark will be deducted every day for delay in returning the 3D viewer, please find Ms. Cindy Tam at Rm185, Science Centre South Block for the 3D viewer) Deadline: 23:59, 11 February 2019

Two tests (each 45%) – MC, T/F, short questions



## Grade Descriptors for BCHE3050 Molecular Biology

Grade	Overall course
A	Demonstrates the ability to synthesize and apply the principles of various topics in molecular biology learnt in the course, to novel situations and/or in novel ways, in a manner that would surpass the normal expectation at this level, and typical of standards that may be common at higher levels of study or research. Has the ability to express the synthesis of ideas or application in a clear and cogent manner.
A-	Demonstrates the ability to state and apply the principles of various topics in molecular biology learnt in the course to familiar and standard situations in a manner that is logical and comprehensive. Has the ability to express the knowledge or application with clarity.
B	Demonstrates the ability to state and partially apply the principles of various topics in molecular biology learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive. Has the ability to express the knowledge or application in a satisfactory and unambiguous way.
C	Demonstrates the ability to state and apply the principles of various topics in molecular biology learnt in the course to most (but not all) familiar and standard situations in a manner that is mostly correct and somewhat fragmented. Has the ability to express the separate pieces of knowledge satisfactory.
D	Demonstrates the ability to state and sometimes apply the principles of various topics in molecular biology learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials Has the ability to state the knowledge or application in simple terms.
F	Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

**BCHE3070 Recombinant DNA Techniques**  
**Schedule and Assessment Scheme 2018-19 Term 2**

Week	Date	Topic	Teacher
1	10 Jan	Restriction and modification enzymes	PCS
2	17 Jan	Restriction and modification enzymes	PCS
3	24 Jan	Separation and joining of DNA, purification of DNA, short exercise 1	PCS
4	31 Jan	Prokaryotic vectors and their introduction to cells	PCS
5	7 Feb	Holiday- Chinese New Year Vacation	PCS
6	14 Feb	Submit exercise, Prokaryotic vectors and their introduction to cells	-
7	21 Feb	Discussion on exercise	PCS
8	28 Feb	Polymerase chain reaction, DNA sequencing and applications	PCS
9	7 Mar	Polymerase chain reaction, DNA sequencing and applications, short exercise 2	PCS
10	14 Mar	Eukaryotic vectors and their introduction to cells	PCS
11	21 Mar	To obtain clones of a specific gene, Production of protein from cloned gene	PCS
12	28 Mar	Production of protein from cloned gene; submit exercise	PCS
13	4 Apr	Reading week – no class	-
14	11 Apr	Discussion on exercise	Helper
15	18 Apr	Rounding up	PCS

*Class Period: 10:30AM - 11:15AM (Thursday), LT1 Mong Man Wai Building (MMW LT1)*

**Course description:**

This course covers the basic concepts of common recombinant DNA techniques, including restriction and modification enzymes and their applications in recombinant DNA techniques, analyses of nucleic acids, insertion of DNA fragment into vectors and transformation of model organisms, expression of recombinant proteins, polymerase chain reaction, DNA and genome sequencing

Course objectives:

- (1) know the basic common techniques for DNA manipulation and analyses,
- (2) apply the knowledge acquired on given cases.

**Reference:**

Brown, T.A. (2010/2016) Gene cloning and DNA analysis. An introduction. 6<sup>th</sup>/7<sup>th</sup> Edition.

Exercise: 30%, 1 hour open book examination: 70% (Centralized Examination)

## Grade Descriptors for BCHE3070 Recombinant DNA Techniques

Grade	Overall course
A	Demonstrates the ability to synthesize and apply the principles and techniques in recombinant DNA learnt in the course, to novel situations and/or in novel ways, in a manner that would surpass the normal expectation at this level, and typical of standards that may be common at higher levels of study or research. Has the ability to express the synthesis of ideas or application in a clear and cogent manner.
A-	Demonstrates the ability to state and apply the principles and techniques in recombinant DNA learnt in the course to familiar and standard situations in a manner that is logical and comprehensive. Has the ability to express the knowledge or application with clarity.
B	Demonstrates the ability to state and partially apply the principles and techniques in recombinant DNA learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive. Has the ability to express the knowledge or application in a satisfactory and unambiguous way.
C	Demonstrates the ability to state and apply the principles and techniques in recombinant DNA learnt in the course to most (but not all) familiar and standard situations in a manner that is mostly correct and somewhat fragmented. Has the ability to express the separate pieces of knowledge satisfactory.
D	Demonstrates the ability to state and sometimes apply the principles and techniques in recombinant DNA learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials. Has the ability to state the knowledge or application in simple terms.
F	Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

# BCHE3080 Bioenergetics and Metabolism

## Course Outline (2018-19, 1<sup>st</sup> term)

<u>Teacher</u>	Office	Tel.	E-mail
Dr. Ngai Hung-Kui, Patrick	MMW507B	3943 4359	hkngai@cuhk.edu.hk

### Meeting Information

Tuesday 2:30 - 5:15 PM Basic Medical Science Building G18

### Course Description

This course covers basic concepts of how biological organisms obtain energy and perform metabolism to build different biomolecules. The following biochemical processes underlying energy transformation in living organisms will be discussed: photosynthesis, glycolysis, citric acid cycle, electron transport, oxidative phosphorylation, fatty acid oxidation. Biosynthesis of carbohydrates, lipids, nucleic acids, and proteins will be provided. The integration of metabolic pathways will also be discussed. Students are advised to take BCHE2030 before taking this course. (*Refer to Appendix I for the Grade Descriptors of this course*)

### Assessment Scheme

Mid-Term Examination	30%
Final Examination	60%
Term Paper (~600 words)	10%

### Recommended Textbooks

1. David L. Nelson, Michael M. Cox. (2017). **Lehninger Principles of Biochemistry** (7<sup>th</sup> ed.). New York: W.H. Freeman. [UL: QU4.N45 2017]
2. Jeremy M. Berg, John L. Tymoczko, Gregory J. Gatto, Jr., Lubert Stryer. (2015). **Biochemistry** (8<sup>th</sup> ed.). New York: W.H. Freeman & Company, Macmillan Education Imprint. [UL: QU4.S77 2015]
3. Thomas M. Devlin. (2011). **Textbook of biochemistry with clinical correlations** (7<sup>th</sup> ed.). Hoboken, NJ: John Wiley & Sons. [UL: Oversize - QU4.T49 2010]
4. Donald Voet, Judith G. Voet. (2011). **Biochemistry** (4<sup>th</sup> ed.). Hoboken, NJ: John Wiley & Sons. [UL: Oversize - QP514.2.V64 2011]

### Electronic Resources (E-Books)

1. Ferrier, D., Lippincott Williams & Wilkins, & Wolters Kluwer Health. (2014). **Biochemistry** (6<sup>th</sup> ed., Lippincott's illustrated reviews). Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins. [Online Access: ISBN 9781451175622]
2. Koolman, J., Röhm, K., & Wirth, J. (2013). **Color Atlas of Biochemistry** (3<sup>rd</sup> Ed.). Stuttgart: Thieme. [Online Access: ISBN 9783131696939]

3. Cammack, R. (2006). **Oxford dictionary of biochemistry and molecular biology** (Rev. ed.). Oxford; New York: Oxford University Press. [Online Access: ISBN 0198529171]
4. Panini, S. (2013). **Medical Biochemistry: An Illustrated Review**. New York: Thieme. [Online Access: ISBN 9781604063172]

### **Electronic Resources (E-Journals)**

1. **Journal of Biological Chemistry**  
American Society for Biochemistry Molecular Biology [Online Access ISSN 1083-351X]
2. **Cell Metabolism**  
Cambridge, MA: Cell Press [Online Access: ISSN 1932-7420]
3. **Trends in Endocrinology and Metabolism**  
Amsterdam, the Netherlands: Elsevier Science Pub. Co. [Online Access: ISSN 1879-3061]
4. **Diabetes, Obesity & Metabolism**  
England: John Wiley & Sons Ltd. [Online Access: ISSN 1463-1326]
5. **Journal of inborn errors of metabolism and screening**  
Thousand Oaks, CA : Sage Publications [Online Access: ISSN 2326-4594]

### **Immersive Learning Resources (Mobile Apps)**

All mobile apps are developed by the Biochemistry Programme (CUHK) and can be freely downloaded in Play Store / Apple Store / Blackboard.

1. Virtual Reality – ‘VR Mitochon’
2. Augmented Reality – ‘ATP Synthase’

### **CU eLearning System (Blackboard)**

Visit the website of the CU eLearning System (<https://blackboard.cuhk.edu.hk/>) and login using your Student-ID@link.cuhk.edu.hk and OnePass Password.

1. Course Website  
*2018R1-BCHE3080: Bioenergetics and Metabolism*
2. Companion Website – Multimedia Learning Materials  
*CU-BCHE3080-EL: Bioenergetics and Metabolism (Extended Learning)*

### **Honesty in Academic Work**

Every assignment handed in should be accompanied by a signed declaration. The form can be downloaded via the following website. Assignments without the properly signed declaration will not be graded. (Refer to Appendix II for more information about Academic Honesty)

[http://www.cuhk.edu.hk/policy/academichonesty/Eng\\_htm\\_files\\_\(2013-14\)/p10.htm](http://www.cuhk.edu.hk/policy/academichonesty/Eng_htm_files_(2013-14)/p10.htm)

**BCHE3080 Bioenergetics and Metabolism  
Course Schedule (2018-19, 1<sup>st</sup> term)**

<b>Wk.</b>	<b>Date</b>	<b>Modules</b>
1	Sept. 4	<b>Module 1 Overview of Bioenergetics and Metabolism</b>
2	Sept. 11	<b>Module 2 Glycolysis and the Catabolism of Hexoses</b> <ul style="list-style-type: none"> <li>• Glycolysis: a central pathway of glucose metabolism</li> <li>• Utilization of other sugars as metabolic fuels</li> <li>• Pentose phosphate pathway</li> </ul>
3	Sept. 18	<b>Module 3 Citric Acid Cycle</b> <ul style="list-style-type: none"> <li>• Common pathway for oxidation of acetyl group</li> <li>• Regulation and amphibolic nature of TCA cycle</li> </ul> <b>Module 4 Oxidative Phosphorylation</b> <ul style="list-style-type: none"> <li>• Structure and function of electron transport chain</li> </ul>
4	Sept. 25	<b><i>Public Holiday – The Day Following The Chinese Mid-Autumn Festival</i></b>
5	Oct. 2	<ul style="list-style-type: none"> <li>• Mechanism of ATP synthesis</li> </ul> <b>Module 5 Photophosphorylation</b> <ul style="list-style-type: none"> <li>• Structure of photosynthesis apparatus</li> <li>• The generation of ATP and the Calvin cycle</li> </ul>
6	Oct. 9	<b><i>Mid-term Examination (Modules 1- 4)</i></b>
7	Oct. 16	<b>Module 6 Oxidation of Fatty Acids</b> <ul style="list-style-type: none"> <li>• Utilization of fatty acids as metabolic fuels</li> <li>• Formation and utilization of ketone bodies</li> </ul>
8	Oct. 23	<b>Module 7 Oxidation of Amino Acids</b> <ul style="list-style-type: none"> <li>• Amino acid degradation &amp; metabolic fates of amino groups</li> <li>• Nitrogen excretion and the urea cycle</li> </ul>
9	Oct. 30	<b>Module 8 Biosynthesis of Carbohydrates</b> <ul style="list-style-type: none"> <li>• Gluconeogenesis</li> <li>• Biosynthesis of glycogen and other carbohydrates</li> </ul>
10	Nov. 6	<b>Module 9 Biosynthesis of Lipids</b> <ul style="list-style-type: none"> <li>• Biosynthesis of fatty acids and triacylglycerol</li> <li>• Biosynthesis of phospholipids, cholesterol, steroids and isoprenoids</li> </ul>
11	Nov. 13	<b>Module 10 Biosynthesis of Amino Acids</b> <ul style="list-style-type: none"> <li>• Biosynthesis of amino acids</li> <li>• Molecules derived from amino acids</li> </ul>
12	Nov. 20	<b>Module 11 Integration of Fuel Metabolism</b>
13	Nov. 27	<b>Module 12 Nucleotide Metabolism</b> <ul style="list-style-type: none"> <li>• Biosynthesis and degradation of nucleotides</li> </ul>

*Free academic consultation sessions will be arranged. Details of the arrangement will be announced in Blackboard.*

## Appendix I Grade Descriptors for BCHE3080

Grade	Descriptors of overall course
A/A-	Demonstrates the ability to apply the learned principles of bioenergetics and metabolism to novel situations and/or in novel ways. Shows the ability to design scientific methods to investigate a biochemical problem in a creative manner that would substantially surpass the normal expectation at this level and typical of standards that may be common at higher levels of study or research. Shows evidence of critical evaluation of different approaches to solving a problem. Demonstrates the ability to articulate the synthesis of new ideas or applications in a clear and cogent manner.
B	Demonstrates the ability to apply some learned principles of bioenergetics and metabolism to familiar and standard situations in a manner that is usually logically persuasive. Shows the ability to explain some biochemical phenomena in a manner that would meet the normal expectation at this level. Shows evidence of logical analysis of simple biochemical problems. Demonstrate the ability to articulate scientific concepts or applications in a logical and coherent way.
C	Demonstrates the ability to apply certain learned principles of bioenergetics and metabolism to familiar and standard situations in a manner that is partially correct or is somewhat fragmented. Shows the ability to articulate scientific concepts in a concise way.
D	Demonstrates the ability to apply certain learned principles of bioenergetics and metabolism to simple situations in a manner that is broadly correct in its essentials or is somewhat ambiguous. Shows the ability to explain certain scientific concepts or applications in simple terms. Demonstrate the ability to recall biochemical equations or definitions.
F	Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

## Appendix II Academic Honesty

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at <http://www.cuhk.edu.hk/policy/academichonesty/>.

With each assignment, students will be required to submit a signed declaration that they are aware of these policies, regulations, guidelines and procedures.

- In the case of group projects, all members of the group should be asked to sign the declaration, each of whom is responsible and liable to disciplinary actions, irrespective of whether he/she has signed the declaration and whether he/she has contributed, directly or indirectly, to the problematic contents.
- For assignments in the form of a computer-generated document that is principally text-based and submitted via VeriGuide, the statement, in the form of a receipt, will be issued by the system upon students' uploading of the soft copy of the assignment.

Assignments without the properly signed [declaration](#) will not be graded by teachers.

Only the final version of the assignment should be submitted via VeriGuide.

The submission of a piece of work, or a part of a piece of work, for more than one purpose (e.g. to satisfy the requirements in two different courses) without declaration to this effect shall be regarded as having committed undeclared multiple submissions. It is common and acceptable to reuse a turn of phrase or a sentence or two from one's own work; but wholesale reuse is problematic. In any case, agreement from the course teacher(s) concerned should be obtained prior to the submission of the piece of work.



**THE CHINESE UNIVERSITY OF HONG KONG**  
**School of Life Sciences**  
**Biochemistry Programme**

**BCHE3092 Self-Study Modules in Biochemistry and Professional Development**  
**(2018-19 / 1<sup>st</sup> Term)**

Teachers	Office	Tel.	E-mail
Prof. Shannon W.N. Au (Coordinator)	SC 178	3943 4170	shannon-au@cuhk.edu.hk
Prof. T.F. Chan	SC 177	3943 6876	tf.chan@cuhk.edu.hk
Prof. K.M. Chan	SC 184	3943 4420	kingchan@cuhk.edu.hk
Dr. F.H. Lo	MMW 507B	3943 4359	lofaihang@cuhk.edu.hk
Dr. Patrick H.K. Ngai	MMW 507B	3943 4359	hkngai@cuhk.edu.hk
Prof. Jacky C.K. Ngo	SC E403	3943 6346	jackyngo@cuhk.edu.hk
Prof. P.C. Shaw	SC 180	3943 1363	pcshaw@cuhk.edu.hk

### **COURSE OBJECTIVES**

This course aims to enhance students' abilities and competence in information search, critical reading and analysis, and communication in biochemistry. In addition, transferable skills and strategies for professional development necessary for career entry and for a sustainable satisfying career are also our emphases. Through different course activities, students should also be able to develop their generic skills in collaborative teamwork, problem solving, and peer-assessment.

### **COURSE OPERATION**

This course includes lectures on scientific paper reading and writing. Oral presentations and discussion will be arranged in small groups. A set of scientific papers on various biochemistry topics will be assigned to students to obtain wide scope of biochemistry knowledge. Students are requested to give two oral presentations, one on the assigned paper and another one on a selected research article. In the term end, a written report should be submitted in term end. In addition, this course will include a workshop series on career entry and trajectory development. Case studies and examples on combining developing transferable skills in global commercialization and career development will be discussed.

### **ASSESSMENT SCHEME**

1. On-line quizzes on Module 6 10%
2. Group presentation I
  - Powerpoint draft 5%
  - Presentation 15% (10% Teacher assessment, 2.5% Peer assessment, 2.5% Q&A)
3. Workshops 20%
4. Group presentation II
  - Difficulty of selected paper 5%
  - Presentation 20% (15% Teacher assessment, 2.5% peer assessment, 2.5% Q&A)
5. Individual written report 25%

Week	Date	Topic	Teacher/Venue	Remarks
1	4 Sep	Introduction / How to read a scientific paper	WNA / YIA LT1	Review Module 6 (M6)
2	11 Sep	How to present a scientific paper	WNA / UCA_104	Review Module 6
3	18 Sep	Self-study	-	<ul style="list-style-type: none"> <li>• Complete <b>Quiz M6a</b> by 18 Sep</li> <li>• Submit the draft Powerpoint file by 24 Sep</li> <li>• Arrange a time to meet the teacher in the week of 24 Sep</li> </ul>
4	25 Sep	Public holiday (Day after Mid-Autumn Festival)		
5	2 Oct	Group presentation I - Assigned Papers	PCS (Group A) / LSK_203 KMC (Group B) / ERB_406 TFC (Group C) / MMW_706 FHL (Group D) / MMW_715 CKN (Group E) / MMW_704 HKN (Group F) / LHC_G01 WNA (Group G) / SC_297	Submit the presentation file 24-hr before the assigned date of presentation
6	9 Oct	Group presentation I - Assigned Papers	PCS (Group A) / LSK_203 KMC (Group B) / ERB_406 TFC (Group C) / MMW_706 FHL (Group D) / MMW_715 CKN (Group E) / MMW_704 HKN (Group F) / LHC_G01 WNA (Group G) / SC_297	
7	16 Oct	Workshop 1	Dr. Erik Wong / UCC_C5	
7	20 Oct (Sat)	Workshop 2 & 3	Dr. Erik Wong / YIA_201	<ul style="list-style-type: none"> <li>• Workshop from 10.30 to 2.15pm (Lunch will be provided)</li> <li>• Complete <b>Exercise-W1</b> by 21 Oct</li> </ul>
8	23 Oct	Workshop 4	Dr. Erik Wong /UCC_C5	Complete <b>Exercise-W2 &amp; W3</b> by 25 Oct
9	30 Oct	Self-study	-	<ul style="list-style-type: none"> <li>• <del>Complete <b>Exercise-W4</b> by 28 Oct</del></li> <li>• Submit the selected article for presentation II by 6 Nov</li> <li>• Review Module 6</li> </ul>
10	6 Nov	Writing a scientific paper	CKN /UCA_104	Complete <b>Quiz-M6b</b> by 12 Nov
11	13 Nov	Group presentation II - Selected papers	PCS (Group B) / ERB_406 KMC (Group C) /MMW_706 TFC (Group D) / MMW_715 FHL (Group E / MMW_704 CKN (Group F) / LHC_G01 HKN (Group G) / SC_297 WNA (Group A) / LSK_203	Submit the presentation file 24-hr before the assigned date of presentation
12	20 Nov	Group presentation II - Selected papers	PCS (Group B) / ERB_406 KMC (Group C) /MMW_706 TFC (Group D) / MMW_715 FHL (Group E / MMW_704 CKN (Group F) / LHC_G01 HKN (Group G) / SC_297 WNA (Group A) / LSK_203	
13	27 Nov	Self-study		Submit your individual written report by 4 Dec.

## Grade Descriptors for BCHE3092

Grade	Marks#	Oral Presentations & Workshops	Term Paper Writing
A	>85	Able to address and discuss the selected topics in biochemistry up to a very high standard with a potential to do biochemistry research. Able to make a professional presentation with clarity and provide enough references to support the arguments proposed. Active participation in workshops and class projects.	Able to write critically on selected topics up to a publication standard with quality data presentation and discussion.
A-	80- 85	Able to address the selected paper in biochemistry research up to a high standard, and elaborate the papers with in depth analysis of the research rationale involved. Procedures explained well, with results and discussion elegantly illustrated. Active participation in workshops and class projects.	Able to write a nice paper review critically on selected papers in a good standard with clarity and enough citations of recent papers.
B+	75-79	Able to address the selected papers in biochemistry up to a good standard with all terms and their relationships clearly identified; and manage to answer explain the papers to peer students' satisfaction. Active participation in workshops and class projects.	Able to write a nice paper review critically on selected papers in a good standard with clarity and enough citations of recent papers.
B	70-75	Able to address the selected papers in biochemistry up to a good standard with all terms and their relationships clearly identified; and manage to answer explain the papers to peer students' satisfaction. Moderate participation in workshops and class projects.	Able to write a nice paper review critically on selected papers in a good standard with clarity and enough citations of recent papers.
B-	65-69	Able to address the selected papers in biochemistry up to a good standard with all terms and their relationships clearly identified; and manage to answer explain the papers to peer students' satisfaction. Moderate participation in workshops and class projects.	Able to write a nice paper review on selected papers in a good standard with clarity and enough citations of recent papers.
C+	60-64	Fair ability to address the topic or paper selected in biochemistry research; manage to make a decent presentation in the class. Fair participation in workshops and class projects.	Invalid or limited data presented in the required writing on paper review.
C	55-59	Fair ability to address the topic or paper selected in biochemistry research; manage to make a decent presentation in the class. Fair participation in workshops and class projects.	Invalid and very limited data presented in poster and term essays.
C-/D	50-54	Fair ability to address the topic or paper selected in biochemistry research; manage to make a decent presentation in the class. Fair participation in workshops and class projects.	Invalid and very limited data presented in poster and term essays.
F	< 50	Unable to discuss the selected papers in biochemistry; unable to make any presentations in the class. No participation in workshops and class projects.	Failed to submit any written report required. Assignments found with plagiarized materials.

# The range of marks is an approximation suggested for reference only. The actual grade shall reflect the overall performance in the course, which comprises the descriptors for both the oral presentation and workshops and written paper.

## Detailed Course Information

Course Code: **BCHE 3110** Title: **Chemical Biology** Chinese Title: 化學生物學  
Career: Undergraduate  
Units: 3  
Grading Basis: Graded  
Course Component(s): Lecture  
Language of Instruction: English  
Class Quota: 50

Programme Type: Major  Minor  Others   
Course Type: Required  Elective  STOT   
Term(s) of Offering: Term 2  
Course to be offered in 2020/2021.

Final Exam: Yes  
Centralised Exam Venue Needed: Yes

For students admitted in 2015/16 and thereafter.

### Enrollment Requirements

**Pre-requisite(s):** BCHE2030 and one of the following three courses (CHEM1070, 1072, 1280)  
BCHE2030 Fundamentals of Biochemistry  
CHEM1070 Principles of Modern Chemistry  
CHEM1072 General Chemistry  
CHEM1280 Introduction to Organic Chemistry and Biomolecules

**Co-requisite(s):** none

**Course exclusions(s):** none

**Other requirements(s):** none

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### Course Description (English version)

The discipline of chemical biology is focused on the application of chemical principles, particularly organic chemistry, to the study and manipulation of biological systems. Two major focus areas include the development of chemical tools to proteins and cells, and in the identification and creation of novel compounds as therapeutics for the treatment of human disease. The course will begin with a brief review of organic chemistry fundamentals and bio-orthogonal ligand reactions. It will then cover case studies to illustrate the power of chemical biology to solve important problems at the chemistry-biology interface.

### Course Description (Chinese version)

化學生物學著重化學原理的應用，特別是有機化學在生物系統中的研究和操縱。其中兩個主要領域包括蛋白質和細胞化學工具的開發，及新型化合物的鑑定和創造以作為治療人類疾病之用。本課程首先回顧有機化學和生物正交配體反應的基礎知識，再通過案例研究以瞭解化學生物學的應用。這些案例反映出化學生物學在跨學科領域上解決重要問題的能力。

### Learning Outcome

#### Knowledge

- Recall the fundamental aspects of chirality and basic reaction mechanisms in organic chemistry.
- Know the core bio-orthogonal reactions that can be used with biological systems.
- Be aware of the important biological and biomedical problems being tackled by scientists.
- Account for how chemical biology methods are used within biomedical research and pre-clinical drug discovery.

#### Skill

- Students will be able to assess, evaluate and choose appropriate chemical biology methods to use in their future research studies.

#### Value

- Chemical biology approaches have led to advances that have led to creation of multiple active biotech companies. The knowledge gained will equip them with the skills needed to pursue careers in disciplines at the chemistry and biology interface.

#### 知識

- 回顧有機化學中空間螺旋特性的基本知識和化學反應機理。
- 瞭解可應用於生物系統的核心生物正交反應。
- 關注科學家正在研究的重要生物學和生物醫學課題。
- 說明化學生物學方法如何可以應用在生物醫學的研究和臨床前藥物的新發現。

#### 技能

- 學生將能夠測試，評估和選擇適當的化學生物學方法以用於未來的研究。

#### 價值

- 化學生物學的研究催生了多家活躍的生物科技公司的創建。學生獲得的相關知識將使他們具備在化學和生物學跨學科領域工作所需的專業技能。

### Course Syllabus (English version & Chinese version)

#### Schedule

Week	Topic
週	主題
1	The properties of atoms and how they form bonds 1. Periodic properties (atomic and ionic radii, electron affinity, ionization energy, electronegativity) 2. Lewis theory, Atomic orbitals, hybrid orbitals and 3. Molecular Geometry
1	原子性質及化學鍵生成 1. 週期性（原子和離子半徑，電子親和力，電離能，負電性） 2. 路易斯理論，原子軌道，混成軌道 3. 分子幾何
2	Organic chemistry principles relevant to biological reactions I 1. Stereochemistry 2. Nucleophiles and electrophiles 3. Nucleophilic substitution reactions ( $S_N1$ and $S_N2$ ) 4. Chemical synthesis based on nucleophilic substitution reactions
2	與生物反應相關的有機化學原理一 1. 立體化學 2. 親核試劑和親電試劑 3. 親核取代反應 ( $S_N1$ and $S_N2$ ) 4. 基於親核取代反應的化學合成
3	Organic chemistry principles relevant to biological reactions II 1. Functional groups in proteins and nucleic acids 2. Nucleophilic substitution reactions in biology 3. Carboxylic acids and their derivatives 4. Chemical reactions on carboxyl groups
3	與生物反應相關的有機化學原理二 1. 蛋白質和核酸中的官能團

	<p>2. 生物學中的親核取代反應</p> <p>3. 羧酸及其衍生物</p> <p>4. 羰基化學反應</p>
4	<p>Chemical synthesis of peptides</p> <p>1. Mechanism and thermodynamics of peptide bond formation</p> <p>2. Protecting groups</p> <p>3. Solid phase peptide synthesis</p> <p>4. Native chemical ligation and their derivatives</p>
4	<p>肽的化學合成</p> <p>1. 肽鍵形成的機理和熱力學</p> <p>2. 保護基團</p> <p>3. 固相肽合成</p> <p>4. 本身已具有的官能團的化學連接及其衍生物</p>
5	<p>Natural and bioconjugate protein reactions</p> <p>1. Bioorthogonal reactions for protein labeling and conjugation</p> <p>2. Expressed protein ligation</p> <p>3. Isopeptide formation in biology: SpyTag/SpyCatcher reaction, ubiquitination, etc.</p>
5	<p>天然蛋白及生物接合蛋白的化學反應</p> <p>1. 用於蛋白質標記和接合的生物正交反應</p> <p>2. 基因表達蛋白的連接反應</p> <p>3. 生物學中的異肽形成：SpyTag / SpyCatcher 反應，泛素化等。</p>
6	<p>Chemistry of enzymes and coenzymes</p> <p>1. Enzymes and catalysis</p> <p>2. Chemistry of selected coenzymes</p> <p>3. Michaelis-Menton Kinetics</p> <p>4. Catalytic antibodies</p>
6	<p>酶和輔酶的化學</p> <p>1. 酶與催化</p> <p>2. 代表性輔酶的化學</p> <p>3. Michaelis-Menton 動力學</p> <p>4. 催化性抗體</p>
7	<p>Chemical Biology of Carbohydrates</p> <p>1. Monosaccharides: structure and reactivity</p> <p>2. Oligosaccharides and polysaccharides</p> <p>3. Enzymatic reactions of carbohydrates</p> <p><b>Midterm Examination (Weeks 1-6)</b></p>
7	<p>碳水化合物的化學生物學</p> <p>1. 單糖：結構和反應性</p> <p>2. 寡糖和多糖</p> <p>3. 碳水化合物的酶促反應</p> <p><b>期中考試（1-6 週）</b></p>
8	<p>From genes to proteins</p> <p>1. DNA Replication and RNA Transcription</p> <p>2. Structure of DNA</p> <p>3. Structure of RNA</p> <p>4. Synthesis of proteins by protein translation</p>
8	<p>蛋白質的生物合成</p> <p>1. DNA 複製和 RNA 轉錄</p>

	<ul style="list-style-type: none"> <li>2. DNA 的結構</li> <li>3. RNA 的結構</li> <li>4. 蛋白質轉譯和合成</li> </ul>
9	<b>Directed Evolution</b> <ul style="list-style-type: none"> <li>1. Directed Evolution of Nucleic Acids and Enzymes</li> <li>2. Nucleic acid selection (SELEX)</li> <li>3. Protein evolution to screen for novel properties (Phage-display, Yeast display, <i>E. coli</i> display, mRNA display)</li> </ul>
9	<b>定向進化</b> <ul style="list-style-type: none"> <li>1. 核酸和酶的定向進化</li> <li>2. 核酸選擇 (SELEX)</li> <li>3. 蛋白質進化及新特性篩選 (噬菌體展示, 酵母展示, 大腸桿菌展示, mRNA 展示)</li> </ul>
10	<b>Incorporating unnatural amino acids into proteins</b> <ul style="list-style-type: none"> <li>1. Evolution of tRNA synthetases for incorporation of UAAs</li> <li>2. Use of the pyrrolysine tRNA/tRNA synthetase for UAA incorporation</li> <li>3. Application of UAA incorporation for biological and biotechnological studies</li> </ul>
10	<b>蛋白質中非天然氨基酸的納入</b> <ul style="list-style-type: none"> <li>1. tRNA 合成酶的進化和 UAA 納入</li> <li>2. 吡咯賴氨酸 tRNA / tRNA 合成酶在 UAA 納入中的使用</li> <li>3. UAA 納入在生物和生物技術研究的應用</li> </ul>
11	<b>Special Topics (Novel Roles of Metals in Biology)</b> <ul style="list-style-type: none"> <li>1. Zinc and magnesium ions in hydrolytic reactions (metalloproteases, polymerases)</li> <li>2. Heme and non-heme iron proteins</li> <li>3. Nickel ions in organometallic reactions</li> <li>4. Molybdenum and tungsten containing enzymes</li> <li>5. cis-Pt(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub> as an anticancer therapeutic</li> </ul>
11	<b>專題研究 (金屬在生物學中的新作用)</b> <ul style="list-style-type: none"> <li>1. 水解反應中的鋅和鎂離子 (金屬蛋白酶, 聚合酶)</li> <li>2. 血紅素和非血紅素鐵蛋白</li> <li>3. 有機金屬反應中的鎳離子</li> <li>4. 含鋁和鎢的酶</li> <li>5. cis-Pt(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub> 作為抗癌藥</li> </ul>
12	<b>Special Topics (Protein therapeutics and protein delivery)</b> <ul style="list-style-type: none"> <li>1. Antibodies</li> <li>2. CRISPR (Gene editing)</li> <li>3. Transcription Factors (Cellular Reprogramming)</li> <li>4. Strategies for overcoming the barriers to cellular delivery</li> </ul>
12	<b>專題研究 (蛋白質治療和蛋白質遞送)</b> <ul style="list-style-type: none"> <li>1. 抗體</li> <li>2. CRISPR (基因編輯)</li> <li>3. 轉錄因子 (細胞重新編程)</li> <li>4. 克服細胞遞送障礙的策略</li> </ul>
13	<b>Review and Final Examination (Weeks 7-12)</b>
13	<b>評論和期末考試 (7-12 週)</b>

#### 4-5 Page Written Essay

Students will need to complete a 3-5 page (single spaced text, 12 point, Times New Roman, 1" margins, figures included) proposal for a project based on the chemical biology techniques and problems learned in class or from external reading. The main text should include Specific Aims, Introduction, and Research Plan. One additional page of supporting figures and tables is allowed,

along with additional pages for references (include full paper titles). The topic is open, but students are encouraged to discuss with the professor for guidance.

### Midterm

The midterm will be short answer and focus on the general principles used in chemical biology to elucidate biological questions.

Assessment:

Midterm Examination: 25%

Final Examination: 35%

Written Proposal: 40%

### Assessment Type and Percentage (For CUSIS)

Assessment Type	Percentage
Attendance	
Classwork	
Discussion	
Essay test or exam	
Essays	40%
Fieldwork or field study	
Homework or assignment	
Lab reports	
Micro-teaching	
Online discussion/forum	
Other	
Participation	
Participation or attendance	
Presentation	
Project	
Report	
Selected response test or exam	
Short answer test or exam	60%
TOTAL	100%

### Feedback for Evaluation (English)

1. Feedback from course evaluation
2. Discussion with students
3. Self reflection of teacher(s)
4. Feedback from Visiting Committee & regular program reviews

### Feedback for Evaluation (English)

1. 課目評鑑
2. 與學生會談
3. 教師反饋
4. 校外專家委員會及課程檢討

### Required Readings

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### Recommended Readings

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## Grade Descriptors

Grade	Overall Course
A	An outstanding level of attainment of the learning outcomes of the course, i.e., (1) to demonstrate a keen understanding of the key concepts in chemical biology; and (2) to be able to use that knowledge to design strategies to solve biological problems. Grade A is awarded to students with outstanding performance on all learning outcomes, i.e. have the ability to express the synthesis of ideas or application in a clear and cogent manner in the quiz/assignments and final examination
A	課程學習成果達到的傑出水平，即（1）對化學生物學的關鍵概念有敏銳的理解；（2）能夠利用這些知識來設計解決生物學問題的策略。成績 A 授予在所有學習成果上表現優異的學生，即具有在測驗/作業和期末考試中以清晰，有說服力的方式表達思想或應用的綜合能力的學生
A-	A superior level of attainment of the learning outcomes of the course as listed above. Grade A- is awarded to students with generally outstanding performance on all (or almost all) learning outcomes, i.e., have the ability to express the ideas and knowledge with clarity in the quiz/assignments and final examinations.
A-	達到上述課程學習成果的較高水平。A-級是授予在所有（或幾乎所有）學習成果上通常表現出色的學生，即具有在測驗/作業和期末考試中清晰表達思想和知識的能力。
B	A high level of attainment of the learning outcomes of the course as listed above. Grade B is awarded to students with substantial performance on all learning outcomes, OR high performance on some learning outcomes which compensates for less satisfactory performance on others, resulting in overall substantial performance, i.e. have the ability to express the knowledge in a satisfactory and unambiguous way in the quiz/assignments and final examination.
B	達到上述課程的學習成果的較高水平。B 級授予在所有學習成果上表現出色的學生，或在某些學習成果上表現出色的學生，以彌補對其他學習成績的不滿意表現，從而總體上取得實質性成績，即在測驗/作業和期末考試中具有以令人滿意且明確的方式表達知識的能力。
C	A satisfactory level of attainment of the learning outcomes of the course as listed above. Grade C is awarded to students with satisfactory performance on the majority of learning outcomes, possibly with a few weaknesses, i.e. have the ability to express the knowledge in an unambiguous way in the quiz/assignments and final examinations.
C	達到上述課程的學習成果的滿意水平。C 級成績授予在大多數學習成績上表現令人滿意的學生，可能還有一些弱點，即具有在測驗/作業和期末考試中明確表達知識的能力。
D	A fair level of attainment of the learning outcomes of the course as listed above. Grade D is awarded to students with barely satisfactory performance on a number of learning outcomes, i.e. have the ability to state the knowledge in simple terms in the quiz/assignments and final examinations.

D	達到上述課程的學習成果的合理水平。D級成績授予在許多學習成果上表現差強人意的學生，即能夠在測驗/作業和期末考試中以簡單的方式陳述知識。
F	An unsatisfactory level of attainment of the learning outcomes of the course as listed above OR failure to meet specified assessment requirements. Failed to give correct answers to most if not all questions in the quiz/assignments and final examinations.
F	上述課程的學習成績達不到令人滿意的水平，或者未達到指定的評估要求。無法對測驗/作業和期末考試中的大多數（如果不是全部）問題給出正確答案。

NEW Additional Information

Course Attributes

CU University Theme/Priority

- GLB: **Global Citizen and Social Enterprisingness**
- INN: **Innovation and Design**
- N/A

CU Research Components (UG)

- 0%
- 1% - 49%
- 50% - 74%
- 75% - 100%

Micro-modules (produced by the course teachers)

**Total no. of micro-modules:** \_\_\_\_\_

**Approximate total duration of all the micro-modules produced:** \_\_\_\_\_ (minutes)

- N/A

eLearning Hours for Blended-mode Class Section

*Applicable to the blended-mode courses approved by the eLearning Task Force.*

**Total no. of duration:** \_\_\_\_\_ (minutes)

- N/A

Faculty Package Courses

- This new course is a particular course and it is also a Faculty Package Course.**
- N/A

<u>Course Attribute – Faculty Package</u>	<u>Course Attribute Value</u>
<input type="checkbox"/> <b>TFAC (Faculty Package Course)</b>	<input type="checkbox"/> <b>SCF (Faculty of Science)</b>
<input checked="" type="checkbox"/> N/A	<input checked="" type="checkbox"/> N/A

**The Chinese University of Hong Kong  
School of Life Sciences Biochemistry Programme**

**BCHE 3650 Molecular Biology Laboratory**

2018-19, 2<sup>nd</sup> Term

Periods: Thursday (2:30 -6:15p.m.)

Location: Science Center East Block SCE402 and SCE 408

**Web page:** <https://elearn.cuhk.edu.hk/webapps/login>

**Course coordinator**

Prof. PC Shaw                      SC180                      39436803                      [pcshaw@cuhk.edu.hk](mailto:pcshaw@cuhk.edu.hk)

**Technical staff**

Liang Yiu Hon (Eric)                      MMW601                      39436052                      [ericliang@cuhk.edu.hk](mailto:ericliang@cuhk.edu.hk)

**Demonstrators:**

Name		Lab.	Email	Tel.
Zhang Wenxi	張文秀	MMW 611	zh_wenxiu@126.com	39436363
Li Yiqian	李宜騫	MMW 507E	liyiqian1994@gmail.com	39436115
Lu Jiaqi	魯家琪	SC 195	lujq5@mail2.sysu.edu.cn	39438027
Kong Lim Ho	江鎌浩	SC 195	konglimho@yahoo.com.hk	39438027
Yu Mei Hui	餘美慧	RRSSB G02	cketnn7@hotmail.com	39431271
Li Qingyun	李慶云	SRSSB 118	1192152176@qq.com	39431349
Zheng Jiale	鄭嘉樂	MMW 611	kalok2609@outlook.com	39436363
Zhai Yuqi	翟雨琪	SC 294	354722951@qq.com	39436119
Zhao Limin	趙麗敏	SC G96	lmzhao31@link.cuhk.edu.hk	39431008

**Marking Scheme**

**Lab performance 10 %**

**Lab reports 25 %**

**Pre-class exercise 10%**

**Pre-lab quiz 10%**

**Examination 45%**

## Experiment Schedule 2019 for Student

Date	Experiment	Content	Demonstrator(s) in charge
Jan. 10		Check in	All
Jan. 24	1	DNA Extraction and Polymerase chain reaction	Lu Jiaqi (In charge) Li Yiqian
Jan. 31	2	Recombinant DNA construction	Yu Mei Hui (In charge)
Feb. 14	3	DNA transformation into E. coli.	Zhang Wenxiu
Feb. 21	4 and 5	Plasmid preparation (Part I)	Zheng Jiale
Feb. 28	4 and 5	Plasmid preparation (part II)  DNA Sequencing and Blast Search	Zheng Jiale  Zhai Yuqi (In charge) Zhao Limin
Mar. 7	6	Gene Expression study by Real Time PCR (part I)	Kong Lim Ho (In charge) Li Qingyun
Mar. 14	6	Gene Expression Study by Real Time PCR (part II)	Kong Lim Ho (In charge) Li Qingyun
Mar. 28		Lab Discussion	All
April. 11		Lab Examination	All

## Grade Descriptors for BCHE3650

Grade	Overall course
A	<p>Demonstrates the ability to synthesize and apply the principles or techniques learnt in the course, to novel situations, in a manner that would surpass the normal expectation at this level, and typical of standards that may be common at higher levels of study or research.</p> <p>Has the ability to express the synthesis of ideas or application in a clear and cogent manner.</p>
A-	<p>Demonstrates the ability to state and apply the principles or techniques learnt in the course to familiar and standard situations in a manner that is logical and comprehensive.</p> <p>Has the ability to express the knowledge or application with clarity.</p>
B	<p>Demonstrates the ability to state and partially apply the principles or techniques learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive.</p> <p>Has the ability to express the knowledge or application in a satisfactory and unambiguous way.</p>
C	<p>Demonstrates the ability to state and apply the principles or techniques learnt in the course to most (but not all) familiar and standard situations in a manner that is not incorrect but is somewhat fragmented.</p> <p>Has the ability to express the separate pieces of knowledge in an unambiguous way.</p>
D	<p>Demonstrates the ability to state and sometimes apply the principles or techniques learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials</p> <p>Has the ability to state the knowledge or application in simple terms.</p>
F	<p>Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.</p>

## **BCHE 3730 Analytical Biochemistry Laboratory (2018-19)**

### **Course Outline**

#### **Lab Supervisors:**

Prof. W.P. FONG	MMW 608	3943-6868	<a href="mailto:wpfong@cuhk.edu.hk">wpfong@cuhk.edu.hk</a>
Prof S.K. KONG	MMW 609	3943-6799	<a href="mailto:skkong@cuhk.edu.hk">skkong@cuhk.edu.hk</a>
Prof S. AU	SC 178	3943-4170	<a href="mailto:shannon-au@cuhk.edu.hk">shannon-au@cuhk.edu.hk</a>

#### **Lab Coordinator:**

Anita YIU	SC E412A	3943-6881	<a href="mailto:anita-garcia@cuhk.edu.hk">anita-garcia@cuhk.edu.hk</a>
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#### **Demonstrators:**

TAI Jingxuan	MMW 611	3943-6363	<a href="mailto:jingxuantai@gmail.com">jingxuantai@gmail.com</a>
LIU Shiyue	MMW 610	3943-8034	<a href="mailto:doraliusy@gmail.com">doraliusy@gmail.com</a>
SUN Kailei	SC 193	3943-6118	<a href="mailto:kaileisun@gmail.com">kaileisun@gmail.com</a>
LIU Qingsheng	SC 293	3943-8073	<a href="mailto:lqshbiomedical@hotmail.com">lqshbiomedical@hotmail.com</a>
ZHANG Ying	MMW 610	3943-6398	<a href="mailto:zhangying1130@bjmu.edu.cn">zhangying1130@bjmu.edu.cn</a>
Nathaniel WONG	MMW 611	3943-6363	<a href="mailto:nathanielwch@gmail.com">nathanielwch@gmail.com</a>
Ryan YIP	RRSSB 118	3943-1349	<a href="mailto:yph1993@yahoo.com.hk">yph1993@yahoo.com.hk</a>

#### **Lab Location:**

SC E 402

#### **Lab Time Slot:**

2:30 – 6:15 p.m. on WED

## **BCHE3730 Experiment Schedule**

<b>Date</b>	<b>Expt</b>	<b>Content</b>	<b>Demonstrator -in-charge</b>
Jan 9		Check in	
Jan 23 & Jan 30	1	Fluorescence Techniques: (A) The use of Fura-2 for measurement of free calcium ion concentration;  Demonstration : Cell death analysis by (B) flow cytometry and (C) fluorescence microscopy	TAI Jingxuan & LIU Shiyue
Feb 27	2	Protein Crystallization	SUN Kailei
Mar 13	3	Separation of sub-cellular components by differential centrifugation	LIU Qingsheng & ZHANG Ying
Mar 20	4	Ion exchange chromatography	Nathaniel WONG
Mar 27	5	Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE)	Ryan YIP
Apr 10		Lab discussion	
Apr 17		Lab examination	

### **Grading:**

Report:	50%
Pre-Lab Quiz:	10%
Performance:	10%
Exam:	30%

### **Quality Assurance Policies for Course Assessment:**

1. The course assessment procedures are under the supervision of the Examination Committees of the Biochemistry Programme and the School of Life Sciences.
2. The turn-around time for each assignment will be completed within the academic term.
3. All students are given access to their examination scripts.



### **Lab-Log and Lab Report (50%)**

Reports are in write-up form format and have to be submitted, with an **Academic Honesty Declaration form**, before 5 pm on the following Wednesday. Marks will be deducted for overdue reports (10% per day). Without prior approval from the course coordinator, no assignment can be submitted if he/she fails to attend a lab session.

Students are required to submit both the hard copy and soft copy of each report to the collection box outside SC191 & to Blackboard eLearn (<https://blackboard.cuhk.edu.hk/>) respectively.

The Academic Honesty Declaration form can be downloaded at the website: [http://www.cuhk.edu.hk/policy/academichonesty/Eng.htm\\_files\\_\(2013-14\)/declaration\\_en.doc](http://www.cuhk.edu.hk/policy/academichonesty/Eng.htm_files_(2013-14)/declaration_en.doc)

### **Pre-Lab Quiz (10%)**

Students will be given a short 5-minute quiz at 2:30 pm on each experimental day. The material covered will be those in the laboratory manual and designated videos.

### **Performance (10%)**

Every student is required to attend all lab sessions. No make-up laboratory session will be arranged in the course. Absence will lead to a zero mark for performance for the missed experiment. Students have to notify the course coordinator at least one week in advance to apply for leave. Proof, such as medical certificates, is required for successful leave application.

Students must follow instructions given by the course coordinator and the demonstrators during lab sessions. Violation of safety guidelines or improper handling of equipment may lead to a -1% of penalty mark to the assessment of performance.

### **Exam (30%)**

A closed-book exam will be held, covering all 5 experiments. Duration of the exam will be 1.5 hours.

**The Chinese University of Hong Kong places very high importance on honesty in academic work submitted by students, and adopts a policy of zero tolerance on cheating in examinations and plagiarism. Any related offence will lead to disciplinary action including termination of studies at the University.**

(<http://www.cuhk.edu.hk/policy/academichonesty/>)

**BCHE3730 Grade Descriptors:**

<b>Grade</b>	<b>Overall Course</b>
A	<ul style="list-style-type: none"><li>• Demonstration of excellent understanding of the strategies and design of experiments in the analysis of biochemical molecules;</li><li>• Demonstration of excellent understanding of the utilization of analytical equipment in the analysis of biochemical samples;</li><li>• Demonstration of excellent laboratory skills;</li><li>• Demonstration of excellent ability in data analysis and interpretation of experimental results.</li></ul>
A-	<ul style="list-style-type: none"><li>• Demonstration of very good understanding of the strategies and design of experiments in the analysis of biochemical molecules;</li><li>• Demonstration of excellent understanding of the utilization of analytical equipment in the analysis of biochemical samples;</li><li>• Demonstration of very good laboratory skills;</li><li>• Demonstration of excellent ability in data analysis and interpretation of experimental results.</li></ul>
B	<ul style="list-style-type: none"><li>• Demonstration of good understanding of the strategies and design of experiments in the analysis of biochemical molecules;</li><li>• Demonstration of good understanding of the utilization of analytical equipment in the analysis of biochemical samples;</li><li>• Demonstration of good laboratory skills;</li><li>• Demonstration of good ability in data analysis and interpretation of experimental results.</li></ul>
C	<ul style="list-style-type: none"><li>• Demonstration of satisfactory understanding of the strategies and design of experiments in the analysis of biochemical molecules;</li><li>• Demonstration of good understanding of the utilization of analytical equipment in the analysis of biochemical samples;</li><li>• Demonstration of satisfactory laboratory skills;</li><li>• Demonstration of satisfactory ability in data analysis and interpretation of experimental results.</li></ul>
D	<ul style="list-style-type: none"><li>• Demonstration of minimal understanding of the strategies and design of experiments in the analysis of biochemical molecules;</li><li>• Demonstration of fair understanding of the utilization of analytical equipment in the analysis of biochemical samples;</li><li>• Demonstration of minimal laboratory skills;</li><li>• Demonstration of minimal ability in data analysis and interpretation of experimental results.</li></ul>
F	<ul style="list-style-type: none"><li>• Demonstration of poor understanding of the strategies and design of experiments in the analysis of biochemical molecules;</li><li>• Demonstration of poor understanding of the utilization of analytical equipment in the analysis of biochemical samples;</li><li>• Demonstration of poor laboratory skills;</li><li>• Demonstration of poor ability in data analysis and interpretation of experimental results.</li></ul>

**BCHE4030 Clinical Biochemistry  
2018-2019**

Course Code: BCHE4030 (3 Units, Second Term)  
 Period: M5 (12:30pm – 1:15pm); W1-2 (8:30am - 10:15am)  
 Venue: SC L4  
 Medium of Instruction: English

**Teachers:**

FH Lo MMWB Rm 507B, Tel: 3943-5019, e-mail: [lofaihang@cuhk.edu.hk](mailto:lofaihang@cuhk.edu.hk)  
 SK Kong (Coordinator) MMWB Rm 609, Tel: 3943-6799, e-mail: [skkong@cuhk.edu.hk](mailto:skkong@cuhk.edu.hk)

**Objectives:**

This course presents the basic principles in clinical biochemistry and its methodology. Test of functions, biochemical profiles involved in pathogenesis, diagnosis and management of some diseases will be described.

**Learning Outcomes:**

After completing the course, students should be able to:

- Acquire core knowledge on clinical biochemistry,
- Understand the relationship of biochemistry to clinical problems;
- Appreciate the applications of biochemistry to modern medicine;
- Applying knowledge of clinical chemistry for diseases diagnosis;
- Develop generic skills such as critical thinking, writing & life-long learning skills and team spirit.

Wk	Date/2019	*: Quiz	Hr.	Topics	Teacher
<b>eAdd-Drop: 14-20 Jan 2019</b>					
1	Jan 7 (M)		1	<ul style="list-style-type: none"> <li>• Introduction to Clinical Biochemistry</li> <li>• Revision of Analytical Methods</li> <li>• Biochemical Endocrinology</li> <li>• Principles of Endocrine Disorders</li> <li>• Laboratory Investigations of Endocrine Disorders</li> <li>• Metabolic Aspects of Malignant Diseases</li> <li>• Liver Functions</li> <li>• Liver Diseases and Biochemical Investigations</li> <li>• Blood Cells, Plasma Proteins and Enzymes I</li> </ul>	LFH (25)
	Jan 9 (W)		2		
2	Jan 14 (M)		1		
	Jan 16 (W)		2		
3	Jan 21 (M)		1		
	Jan 23 (W)		2		
4	Jan 28 (M)		1		
	Jan 30 (W)		2		
	Feb 4 (M)				
	Feb 6 (W)				
<b>No-Class/Chinese New Year Holiday</b>					
5	Feb 11 (M)		1	<ul style="list-style-type: none"> <li>• Blood cells, Plasma Proteins and Enzymes II</li> <li>• Haemostasis and Thrombosis</li> <li>• Blood Disorders and Tests</li> <li>• Renal Functions and Bone Profile</li> <li>• Iron Profile, Lipid Profile, and Cardiac Markers</li> </ul>	
	Feb 13 (W)		2		
6	Feb 18 (M)		1		
	Feb 20 (W)		2		
7	Feb 25 (M)		1	<ul style="list-style-type: none"> <li>• Electrolytes and Water Balance</li> </ul>	SKK (15)
	Feb 27 (W)*		2		
8	Mar 4 (M)		1	Tutorial	
	Mar 6 (W)		2	<b>Mid-Term Test I</b>	
9	Mar 11 (M)		1	Tutorial	
	Mar 13 (W)		2	<b>Mid-Term Test II</b>	
10	Mar 18 (M)		1	<ul style="list-style-type: none"> <li>• Disorders of Electrolytes and Water Balance</li> </ul>	
	Mar 20 (W)		2		
11	Mar 25 (M)		1	<b>Quiz I</b>	
	Mar 27 (W)		2	<ul style="list-style-type: none"> <li>• Acid-Base Regulation</li> </ul>	
	Apr 1 (M)			<b>No-Class/Easter Holiday Reading Week</b>	
	Apr 3 (W)				
12	Apr 8 (M) *		1	<ul style="list-style-type: none"> <li>• Disorders of Acid-Base</li> </ul>	
	Apr 10 (W)		2		
13	Apr 15 (M)		1	<b>Quiz II</b>	
	Apr 17 (W)		2	<ul style="list-style-type: none"> <li>• Development of New Clinical Biochemistry Assays</li> </ul>	
<b>Course Evaluation (10:00 am – 10:15 am)</b>					

### References:

George J. Netto, Rana D. Saad, Peter A. Dysert, II. Diagnostic molecular pathology: current techniques and clinical applications, part I. Proc (Bayl Univ Med Cent) 2003 October; 16(4): 379–383. (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1214554/>)

Other reference materials will be provided by teachers.

### Textbooks: (All are reserved in the Library)

- Herbert Waldmann & Petra Janning. Concepts and case studies in chemical biology. (online)
- John W Baynes & Marek H Dominiczak. Medical Biochemistry, 5<sup>th</sup> ed. (online)
- Lela Buckingham & Maribeth L. Flaws. Molecular Diagnostics: Fundamentals, Methods, & Clinical Applications. (online)
- Michael Lieberman et al. Marks' basic medical biochemistry: a clinical approach, 4<sup>th</sup> ed. (online)
- Victor Hoffbrand & Paul Moss. Essential Haematology, 6<sup>th</sup> ed. (online)
- William J Marshall & Stephen K Bangert. Clinical Chemistry, 6<sup>th</sup> ed. (online)
- Michael Laposata. Laboratory Medicine The Diagnosis of Disease in the Clinical Laboratory, 2<sup>nd</sup> ed. (UL QY25 .L285 2014)
- Nessar Ahmed. Clinical Biochemistry. (QU4 .C55 2011) (Medical Library)
- Philip D. Mayne. Clinical Chemistry in Diagnosis and Treatment, 6<sup>th</sup> ed. (QY90.Z54 1994)
- Shauna C. Anderson & Susan Cockayne. Clinical Chemistry: Concepts and Application. (UL Oversize QY90 .C6423 2007)

### Assessment:

Mid-term Test I:	Short Questions (close-book format) 30% final mark
Mid-term Test II:	MCQ (close-book format) 20% final mark
Quiz I:	10% final mark (SKK materials) (Close-book format)
Quiz II:	10% final mark (SKK materials) (Close-book format)
Final examination:	30% final mark (SKK materials, Open-notes exam: Two A4 pages all you can write and print.)

### Quality Assurance Policies for Course Assessment:

1. The course assessment procedures are under the supervision of the Examination Committees of the Biochemistry Programme and the School of Life Sciences.
2. The turnaround time for each assignment will be completed within the academic term.
3. All students are given access to their examination scripts.

### Academic Honesty

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at <http://www.cuhk.edu.hk/policy/academichonesty/>. For ALL written assignment, students will have to submit a statement that they are aware of these policies, regulations, guidelines and procedures. **Warning: plagiarism could lead to serious consequences!**

**BCHE4030 Grade Descriptors**

<b>Grade</b>	<b>Overall Course</b>
A	<ul style="list-style-type: none"><li>• Outstanding achievement of all the stated learning outcomes;</li><li>• Demonstration of excellent understanding of biochemistry knowledge for solving clinical problems;</li><li>• Demonstration of excellent understanding of the social impact of biochemistry on modern medicine;</li><li>• Demonstration of excellent knowledge of clinical chemistry for diagnosis;</li><li>• Demonstration of excellent generic skills;</li></ul>
A-	<ul style="list-style-type: none"><li>• Outstanding achievement of all the stated learning outcomes;</li><li>• Demonstration of excellent understanding of biochemistry knowledge for solving clinical problems;</li><li>• Demonstration of excellent understanding of the social impact of biochemistry on modern medicine;</li><li>• Demonstration of excellent knowledge of clinical chemistry for diagnosis;</li><li>• Demonstration of very good generic skills;</li></ul>
B	<ul style="list-style-type: none"><li>• Good achievement of all the stated learning outcomes;</li><li>• Demonstration of excellent understanding of biochemistry knowledge for solving clinical problems;</li><li>• Demonstration of very good understanding of the social impact of biochemistry on modern medicine;</li><li>• Demonstration of very good knowledge of clinical chemistry for diagnosis;</li><li>• Demonstration of very good generic skills;</li></ul>
C	<ul style="list-style-type: none"><li>• Satisfactory achievement of all the stated learning outcomes;</li><li>• Demonstration of satisfactory to good understanding of biochemistry knowledge for solving clinical problems;</li><li>• Demonstration of good understanding of the social impact of biochemistry on modern medicine;</li><li>• Demonstration of satisfactory to good knowledge of clinical chemistry for diagnosis;</li><li>• Demonstration of satisfactory generic skills;</li></ul>
D	<ul style="list-style-type: none"><li>• Fair achievement of all the stated learning outcomes;</li><li>• Demonstration of minimal understanding of biochemistry knowledge for solving clinical problems;</li><li>• Demonstration of fair to satisfactory understanding of the social impact of biochemistry on modern medicine;</li><li>• Demonstration of minimal knowledge of clinical chemistry for diagnosis;</li><li>• Demonstration of minimal generic skills;</li></ul>
F	<ul style="list-style-type: none"><li>• Poor achievement of all the stated learning outcomes;</li><li>• Demonstration of poor understanding of biochemistry knowledge for solving clinical problems;</li><li>• Demonstration of poor to fair understanding of the social impact of biochemistry on modern medicine;</li><li>• Demonstration of poor to good knowledge of clinical chemistry for diagnosis;</li><li>• Demonstration of poor generic skills;</li></ul>

## **BCHE4040 Aspects of Neuroscience (2018-19, 1<sup>st</sup> Term)**

### **Description**

This course will discuss the structure and components 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. Students are advised to take BCHE2030 or equivalent before taking this course.

### **Contents/Fundamental Concepts**

1. Structure and function of the central nervous system.
2. Cells of the nervous system
3. Myelin;
  - a. Structure and function
  - b. Biosynthesis and genes regulating its biosynthesis
  - c. Diseases related to myelin dysfunction, eg, multiple sclerosis
4. Biochemistry, physiology and pharmacology of transport system:
  - a. Blood-brain-CSF barriers
  - b. Cellular (Membrane) transport
  - c. Axoplasmic transport
5. Ion channels, potentials and signal conduction
6. Metabolism:
  - a. Brief review of brain metabolism
  - b. Some inherited neurological diseases related to metabolic disorders
  - c. Nutrition and brain function
7. Biochemistry, physiology and pharmacology of synaptic transmission:
  - a. Classification of neurotransmitters
  - b. Biosynthesis of transmitters and their regulation
  - c. Termination of neurotransmission
  - d. Properties and molecular biology of receptors
  - e. 2nd messengers and signal transduction
  - f. Modulation of signal transmission
8. Biochemistry and molecular biology of neurological and psychiatric disorders
  - a. Myasthenia gravis
  - b. Parkinson's disease
  - c. Alzheimer's disease
  - d. Huntington's disease
  - e. Affective disorders and schizophrenia

### **Learning Outcomes**

After reading this course, students are expected be able to:

- Outline the special features of the nervous system and its components.
- Describe the functions of the nervous system both at the cellular and molecular levels.
- Explain how neurons communicate with each other in cellular and molecular terms.
- Explain the pathophysiology of certain neurological and neuropsychiatric disorders, and the biochemical basis of treating them.

## BCHE4040 Aspects of Neuroscience (2018-19, 1<sup>st</sup> Term)

### Assessment Scheme

Mid-term Exam 45%

Final Exam 55%

### Grade Descriptors

Grade	Overall course
A	Demonstrates a deep understanding of the structure and components of nervous tissue in relation to its functions, neurotransmitters, development of the nervous system and the biochemistry of mental diseases. Demonstrate the ability to apply the concepts to solve most neuroscience issues in particular in the area of neuro-diseases that would substantially surpass the normal expectation at this level and typical of standards that may be common at higher levels of study. Demonstrates the ability to articulate the synthesis of new ideas or applications in a clear and cogent manner.
A-	Demonstrates high level of the structure and components of nervous tissue in relation to its functions, neurotransmitters, development of the nervous system and the biochemistry of mental diseases. Demonstrate the ability to apply the concepts to solve some neuroscience issues in particular in the area of neuro-diseases. Demonstrates the ability to articulate the synthesis of new ideas or applications in a clear and cogent manner.
B	Demonstrate a competent grasp of the key concepts in the structure and components of nervous tissue in relation to its functions, neurotransmitters, development of the nervous system and the biochemistry of mental diseases. Demonstrates the ability to state and partially apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive. Demonstrate the ability to articulate neuroscience concepts or applications in a logical and coherent way
C	Demonstrate a basic understanding of the structure and components of nervous tissue in relation to its functions, neurotransmitters, development of the nervous system and the biochemistry of mental diseases. Demonstrates the ability to state and apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is not incorrect but is somewhat fragmented. Shows the ability to articulate scientific concepts in a concise way.
D	Demonstrate the ability to apply certain concepts learnt from the course to simple situations in a manner that is broadly correct in its essentials or is somewhat ambiguous. Demonstrates the ability to state and sometimes apply the subject matter learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials.
F	Demonstrate an incomplete or incorrect neuroscience concepts. Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

### Recommended Readings

- Neuroscience : exploring the brain / Mark F. Bear, Barry W. Connors, Michael A. Paradiso (WL300 .B425 2007)
- Neuroscience / edited by Dale Purves ... [et al.]. (WL102 .N487 2008)
- Neuroscience at a glance / Roger A. Barker, Stephen Barasi ; and neuropharmacology by Michael J. Neal. (WL102 .B326 2008)
- Articles recommended by teachers.

**BCHE4040 Aspects of Neuroscience  
(2018-19, 1<sup>st</sup> Term)**

<b>Name of Lecturer</b>	<b>Office</b>	<b>Tel.</b>	<b>Email</b>
Prof. KF Lau (Course Coordinator)	SC 291	3943 1106	kflau@cuhk.edu.hk
Prof. Alex Koon	MMW 621	3943 1218	alexkoon@cuhk.edu.hk

**Course Schedule**

**M4 (Mon 11:30 a.m. – 12:15 pm) & H3-4 (Thu 10:30 am – 12:15 pm)**

**Venue: MMW 702**

Wk.	Date	Hr.	Topic	Teacher		
1	Sept. 3* (M)	0	• Structure and function of the central nervous system	Prof. Alex Koon		
	Sept. 6 (H)	2	• Cells of the nervous system: neuron, Schwann cells and astrocytes			
2	Sept. 10 (M)	1	• Myelin			
	Sept. 13 (H)	2	• Biochemistry, physiology and pharmacology of transport system:			
3	Sept. 17 (M)	1	a. Blood-brain-CSF barriers			
	Sept. 20 (H)	2	b. Cellular (Membrane) transport			
4	Sept. 24 (M)	1	c. Axoplasmic transport			
	Sept. 27 (H)	2	• Ion channels, potentials and signal conduction			
5	Oct. 1* (M)	0				
	Oct. 4 (H)	2	<b>Mid-term Exam</b>			
6	Oct. 8 (M)	1	• Biochemistry, physiology and pharmacology of synaptic transmission		Prof. KF Lau	
	Oct. 11 (H)	2				
7	Oct. 15 (M)	1				• Classification of neurotransmitters
	Oct. 18 (H)	2				• Biosynthesis of transmitters and their regulation
8	Oct. 22 (M)	1				• Termination of neurotransmission
	Oct. 25 (H)	2		• Properties and molecular biology of receptors		
9	Oct. 29 (M)	1		• Second messenger and signal transduction		
	Nov. 1 (H)	2		• Modulation of signal transmission		
10	Nov. 5 (M)	1		• Biochemistry and molecular biology of neurological and Psychiatric disorders		
	Nov. 8 (H)	2				
11	Nov. 12 (M)	1				
	Nov. 15* (H)	0				
12	Nov. 19 (M)	1				
	Nov. 22 (H)	2				
13	Nov. 26 (M)	1				
	Nov. 29 (H)	2				
<b>Total:</b>		<b>35</b>				

**\*: Class suspension**

Sept. 3 – Inauguration Ceremony for Undergraduates

Oct. 1 – Public Holiday–National Day

Nov. 15 – 85<sup>th</sup> Congregation

**Special arrangement**

Nov 5

Nov 8



**Reminders:**

**Academic Honesty:** According to University regulations, students must submit an electronic version of their assignment to VeriGuide system for the purpose of checking for possible plagiarism. Read the University's policies on plagiarism carefully and do not plagiarise! CUHK has adopted a policy of zero tolerance for plagiarism. Instructors will send all suspected cases of plagiarism directly to the disciplinary committee for investigation. In the case of group report, plagiarism will affect all partners! Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated Procedures are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" ( <http://www.cuhk.edu.hk/policy/academichonesty/>). Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>

# BASIC AND APPLIED IMMUNOLOGY

## 2018 – 2019

Course Code: BCHE4060 (3 Units, First Term)  
Period: W3-4 (10:30 am – 12:15 pm); F3 (10:30 am – 11:15 am)  
Venue: SC L2  
Medium of Instruction: English

### Objectives:

This course aims at providing students with the essential concepts of basic and applied 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 T cell receptors, tolerance and autoimmunity, and integration of immune responses. The effector mechanisms of the immune system will be introduced, with special emphasis on the role of innate and acquired immunity in health and disease. The relationship of immunology to clinical problems of infectious disease, immunodeficiency, hypersensitivity, transplantation and cancer will be discussed. The applications of immunology to modern medicine and biotechnology, including vaccination, monoclonal antibody production and antibody engineering will also be covered.

### Learning Outcomes:

After completing the course, students should be able to:

- Have an in-depth knowledge of the key features of the immune system;
- Comprehend the integrated nature of the immune system;
- Understand the molecular and cellular basis for the generation of antibody diversity, activation of an immune response and its regulation, and maintenance of self-tolerance;
- Define the immunological mechanisms underlying the process of inflammation in states of health and disease;
- Appreciate the relevance of the immune system to our daily lives and its application in advancing biomedical research and biotechnology;
- Develop competencies in finding, reading and critically evaluating relevant scientific literature;
- Develop generic skills such as critical thinking, writing and lifelong learning skills.

### Lecturers:

SK Kong MMWB Rm 609, Tel: 3943-6799, e-mail: [skkong@cuhk.edu.hk](mailto:skkong@cuhk.edu.hk)  
Iris Pang SC 138, Tel: 3943-1393, email: [irispang@cuhk.edu.hk](mailto:irispang@cuhk.edu.hk)

### Reference Textbooks: (Some are reserved in the University Library)

1. Punt, Stranford, Jones, Owen (2018) Kuby Immunology (8<sup>th</sup> Ed) Macmillan (Published in Summer 2018)
2. Owen, Punt & Stranford (2013) Kuby Immunology (7<sup>th</sup> Ed) Macmillan (QW504.K83 2013)
3. Kindt, Goldsby & Osborne (2007) Kuby Immunology (6<sup>th</sup> Ed) Freeman (QW504.K83 2007)
4. Murphy *et al.* (2017) Janeway's Immunobiology (9<sup>th</sup> Ed) Garland Science. (QW504.J37 2017)
5. Abbas, Lichtman, and Pillai (2012) Cellular and Molecular Immunology (7<sup>th</sup> Ed) Saunders. (QW568.A23 2012)  
[Cellular and Molecular Immunology (9<sup>th</sup> Ed) **Full text available online** via ClinicalKey Books through CUHK Library]
6. Doan *et al.* (2013) Immunology (2<sup>nd</sup> Ed) Lippincott Williams & Wilkins (QW518.2.I55 2013)
7. Coico & Sunshine (2009) Immunology: A Short Course (6<sup>th</sup> Ed) Wiley-Blackwell (QW504.B35 2009)  
[Immunology: A Short Course (7<sup>th</sup> Ed) **Full text available online** via ProQuest Ebook Central through CUHK library]
8. Male, Brostoff, Roth & Roitt (2013) Immunology, (8<sup>th</sup> Ed) Mosby. (QW504.R65 2013)  
**[Full text available online** via ClinicalKey Books through CUHK Library]

## eLearning Materials:

- **Nature Immunology - Immunology of the skin:** <https://vimeo.com/87645793>  
A number of immunocytes and their functions can be seen in this 7-min animation.
- **Nature Immunology - Immunology of the Gut Mucosa:** <https://vimeo.com/59633140>  
In this 7-min animation, you can see how dendritic cells start an immune response in gut or keep the response at a quiescent state. With bacterial invasion, you can see how neutrophils use special weapon to destroy the bacteria too.
- **Nature Immunology - Immunology Wars:** <https://vimeo.com/215319937>  
In this 3-min video, you will see how the monoclonal antibodies provide protections to destroy cancer cells with T-lymphocytes.
- **Nature Immunology - Innate lymphoid cells:** <http://www.nature.com/ni/multimedia/ilc/index.html>  
In this 4.5-min video, you will see how different types of immune cells including Innate lymphoid cells (ILCs), a recently found immunocyte population, work together using interleukines to provide barrier, tolerance, pathogen clearance and chronic inflammation functions in our gut.
- **Panopto videos through CUHK Blackboard eLearning system**  
Micromodules on various immunology topics related to this course are accessible through the course's Blackboard eLearning platform.
- **Videos (5-10 minutes each) for laboratory techniques:** Biochemistry is a practical science. Learning the laboratory techniques and skills is an important element in the biochemistry curriculum. Laboratory techniques (e.g. ELISA), skills for data presentation and self-study skills are available at <http://www.bch.cuhk.edu.hk/learnbiochem/> (Login: elearnbch1; Password: learn@slsbch!).



## Assessment Scheme:

Quizzes [3 total (close-book)]	15% final mark
Micromodules & online questions	5% final mark
Term paper assignment	10% final mark
Mid-term examination (open-book examination)	30% final mark
Final examination (close-book. One A4-paper of notes permitted)	40% final mark

### In-class quizzes (15% total grade)

There are 3 quizzes for this course (5% final mark each). The quizzes are part of the learning process. The questions are set to help you think about the important issues raised by the course materials and help you pin down the key items to be learned. Answers will be discussed when the quiz is marked. This feedback arrangement hopefully can correct the misunderstanding of the concept as early as possible.

### Micromodules & online questions (5% total grade)

Micromodules on different topics related to immunology are posted on the course's Blackboard eLearning website via the Panopto video platform. You can view the videos anytime and as many times as you prefer. However, **full marks will only be given upon successful completion of the full length of the video from start to finish** (4% total) and **the accompanying online test questions** (1% total) **before the day of the course**. For example, if the video is 10 minutes long, marks will **not** be given if you access the video 10 times, each time consisting of 1 min.

### Term Paper Assignment (10% total grade)

Write a term paper on the following:

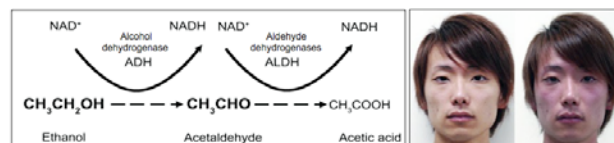
- To apply immunology concepts as tools for understanding real-world phenomena.
- What you need to do is to use the knowledge of immunology to explain 2 pieces of experience in our daily life.

#### Guidelines:

- Four students in one group will prepare **2 phenomena in 2 slides (in .ppt or .pptx format)**.
- **(To train your teamwork spirit, a group with less than 3 students without prior permission will get 2 final marks deduction.)**
- Below is one example showing how histamine from mast cells gives the Facial Flushing after drinking alcohol.
- On a 3<sup>rd</sup> slide, put down your name & student ID and add one statement for academic honesty.
- Upload your term paper (**3 slides**) to Blackboard (<https://elearn.cuhk.edu.hk/>).
- **Deadline: 5:00 pm, 3 Nov 2018** (Late submission: mark deduction: 1 final mark/day.)
- **Academic Honesty:** Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at <http://www.cuhk.edu.hk/policy/academichonesty/>. With each assignment, students will be required to submit a statement that they are aware of these policies, regulations, guidelines and procedures.

#### Experience in Our Daily Life

##### Facial Flushing after Drinking Alcohol: Histamine Release from Mast Cells



- East Asians have mutation/SNP in ALDH2 (a glutamine (487) to lysine) → Loss Function.
- ALDH2 variant cannot convert acetaldehyde to acetic acid.
- ROH consumption → Acetaldehyde ↑ → Mast cells → Histamine Release → ↑ Blood vessel permeability → Facial flushing (面部潮紅), nausea, headache.

Acetaldehyde induces histamine release from human airway mast cells to cause bronchoconstriction. *Int Arch Allergy Immunol.* 2004 Jul;134(3):233-9.

## Grade Descriptors for BCHE4060:

Grade	Overall Course Expectations
A	<ul style="list-style-type: none"> <li>Consistently excellent performance on all learning outcomes</li> <li>Be able to apply concepts learnt in class to tackle challenging immunology problems in a manner that exceeds normal standards expected for the majority of students in an upper-level undergraduate science course</li> <li>Demonstrates the ability to identify relationships and synthesize new ideas that connect the immunological principles introduced in class</li> <li>Has the ability to integrate knowledge of the different components of the immune system to understand their holistic contribution to immunity and disease</li> </ul>
A-	<ul style="list-style-type: none"> <li>Excellent performance on almost all learning outcomes</li> <li>Demonstrates the ability to express, clarify and analyze immunological concepts and their applications logically and comprehensively</li> <li>Be able to apply concepts learnt in class in a way that not only fulfills the normal expectations, but occasionally goes beyond the normal expectations</li> </ul>
B	<ul style="list-style-type: none"> <li>Substantial performance on all or almost all learning outcomes</li> <li>Demonstrates the ability to recall, describe and analyze immunological concepts and their applications in an unambiguous manner</li> <li>Be able to apply concepts learned in class to tackle standard immunology problems logically and in a way that fully meet the expectation for the majority of students in an upper-level undergraduate science course</li> </ul>
C	<ul style="list-style-type: none"> <li>Satisfactory performance on the majority of learning outcomes</li> <li>Demonstrates the ability to recall and state most (but not all) immunological concepts and their applications in a satisfactory manner</li> <li>Be able to express and apply separate or fragmented pieces of immunology knowledge learned in class to solve familiar immunological problems</li> </ul>
D	<ul style="list-style-type: none"> <li>Barely satisfactory performance on a number of learning outcomes</li> <li>Demonstrates the ability to recall and state immunology principles in simple terms</li> <li>Be able to occasionally apply concepts learned in class to solve familiar immunological problems in a way that is broadly (but not always) correct</li> </ul>
F	<ul style="list-style-type: none"> <li>Unsatisfactory performance on a number of learning outcomes; <b>OR</b></li> <li>Failure to meet the specified assessment requirements</li> </ul>

### Feedback and Evaluation:

Students are welcome to express feedbacks on course contents and learning experience through e-mail to the course teachers. A standard course evaluation questionnaire will be used to collect feedbacks from students at the end of the course.

### Posting of Course Contents and Announcements:

Course materials including lectures slides, notes are all provided in the course Blackboard eLearning platform (<https://elearn.cuhk.edu.hk/>). Students can download the course materials from Blackboard using their student username and password.

### Tutorials:

Tutorial 1 & 2 (optional): Time & Venue to be announced

## Course Outline:

Week	Date	Hrs	Topics	Teacher	
1	Sept 5 (Wed)	2	Overview of Our Immune System (2 L)	Prof. SK Kong (18 Lectures)	
	Sept 7 (Fri)	1	Nature of Antigens & Immunogens (1 L)		
2	Sept 12 (Wed)	2	Lymphoid Tissues & Immunocytes (2 L)		
	Sept 14 (Fri)	1	Immunoglobulin Structure & Functions (1 L)		
3	Sept 19 (Wed)	2	Immunoglobulin Structure & Functions (1 L) Antibody Diversity (1 L)		
	Sept 21 (Fri)	1	Antibody Diversity (1 L)		
4	Sept 26 (Wed)*	2	The Major Histocompatibility Complex (2 L)		
	Sept 28 (Fri)	1	T Cells & T Cell Receptors (1 L)		
5	Oct 3 (Wed)	2	T Cells & T Cell Receptors (1 L) Integration of Immune Responses (1 L)		
	Oct 5 (Fri)	1	Integration of Immune Responses (1 L)		
6	Oct 10 (Wed)*	2	Integration of Immune Responses (1 L) Immunological Tolerance (1L)		
	Oct 12 (Fri)	1	Immunological Tolerance (1L)		
7	Oct 17 (Wed)		Public holiday – Chung Yeung Festival		
	Oct 19 (Fri)	1	Host Defense Part 1 (1 L)		
8	Oct 24 (Wed)	2	<b>Mid-term Examination</b>		Dr. Iris Pang (17 Lectures)
	Oct 26 (Fri)	1	The Complement System (1 L)		
9	Oct 31 (Wed)	2	Host Defense Part 2 (1 L) Cytokines in Health & Diseases (1 L)		
	Nov 2 (Fri)	1	Cytokines in Health & Diseases (1 L)		
10	Nov 7 (Wed)	2	Emerging Infectious Diseases & Vaccine Strategies (2 L)		
	Nov 9 (Fri)	1	Emerging Infectious Diseases & Vaccine Strategies (1 L)		
11	Nov 14 (Wed)*	2	Allergy & Hypersensitivity Reactions (2 L)		
	Nov 16 (Fri)	1	Allergy & Hypersensitivity Reactions (1 L)		
12	Nov 21 (Wed)	2	Immunodeficiency & AIDS (2 L)		
	Nov 23 (Fri)	1	Immunodeficiency & AIDS (1 L)		
13	Nov 28 (Wed)	2	Transplant Immunology & Immunity to tumors (2 L)		
	Nov 30 (Fri)	1	Immunity to tumors (1 L)		

(\*Quiz, 5% final mark each; Format: MCQ, T/F, Short Qs etc.)

## Penalty Guidelines of the University's Procedures for Handling Cases of Academic Dishonesty:

"Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated *Procedures* are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>).

**REMINER:** Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>; please check them out."

- End -

**BCHE4070 Management and Accreditation of Biochemical Laboratory**  
(2018-19, 2<sup>nd</sup> Term)

Time: Saturday, 2:30 pm - 5:30 pm  
 Classroom: LT7, Yasumoto International Academic Park (YIA LT7)  
 Medium of Instruction: English  
 Unit: 3  
 Minimal Passing Grade: D

Course Coordination: Prof. SK Kong, MMWB Rm 609, Tel: 3943-6799, e-mail: [skkong@cuhk.edu.hk](mailto:skkong@cuhk.edu.hk)

**Course Outline:**

The aims of this course are to introduce basic concepts and adequate skills of laboratory management, safety and quality assurance in biochemical laboratories. Special topics such as biochemical testing and manufacturing process, good laboratory practice, laboratory accreditation, genetic testing and experimental protocols and method validation etc, will be discussed. **The class will be taught with MSc students under different course code (BBMS6300) and assessment scheme.**

**Time Table:**

Date	Lecture	Teacher	Title of the Lecture
12 Jan	1	Dr. Ken YEUNG <sup>1</sup>	Good Manufacturing Practice (GMP)
19 Jan	--	No Class (BCHE Picnic)	
26 Jan	2	Dr. CM LEE <sup>1</sup>	Management of R&D: from People to Lab
2 Feb	3	Dr. CM LEE <sup>1</sup>	Management of R&D: from Lab to Portfolio
9 Feb	--	No Class (Public holiday)	
16 Feb	4	Dr. Alice WONG <sup>2</sup>	Intellectual Property Rights Relevant to Biotechnology
23 Feb	5	Dr. Alice WONG <sup>2</sup>	Enforcement of IPRs, Agreement Basics and Licensing
2 Mar		Test I (2:30pm-4:30pm) Classroom: Room 703, Mong Man Wai Building	
9 Mar	6	Dr. Henry CHEUNG	Quality Programs for Forensic DNA Laboratory
16 Mar	7	Dr. William CHO <sup>3</sup>	Clinical Laboratory Sciences and Practice
23 Mar	8	Dr. William CHO <sup>3</sup>	Quality Assurance in Clinical Laboratory
30 Mar	9	Dr. Benson YEUNG <sup>4</sup>	Accreditation Program of AAALAC International for Care and Use of Laboratory Animals (1)
6 Apr	10	Dr. Benson YEUNG <sup>4</sup>	Accreditation Program of AAALAC International for Care and Use of Laboratory Animals (2)
13 Apr	11	Dr. John HO <sup>5</sup>	Guest Talk - What is accreditation? How laboratory quality management system can ensure the quality of results?
20 Apr	--	No Class (Public Holiday)	
27 Apr		Test II (2:30pm-4:30pm) Classroom: Room 305, Wu Ho Man Yuen Building	

<sup>1</sup> Office of Research and Knowledge Transfer Services, CUHK

<sup>2</sup> Intellectual Property Specialist at Albert Wai-Kit Chan Intellectual Property Limited

<sup>3</sup> Queen Elizabeth Hospital

<sup>4</sup> Research and Development Manager at Vanway Pharmaceutical Holdings Ltd.

<sup>5</sup> Hong Kong Accreditation Service, HKSAR

**BCHE4070 Management and Accreditation of Biochemical Laboratory**  
**(2018-19, 2<sup>nd</sup> Term)**

**Assessments:**

Term paper	: 20%
Test I	: 40% (Lectures 1-5)
Test II	: 40% (Lectures 6-10)

**References:**

To be recommended by individual teachers

**Term papers guidelines:**

**(For details, please go to [http://www.bch.cuhk.edu.hk/msc/How\\_to\\_write\\_a\\_Term\\_Paper.pdf](http://www.bch.cuhk.edu.hk/msc/How_to_write_a_Term_Paper.pdf))**

- Write a term paper on a topic taught in BBMS6300. Suggested term paper topics will be uploaded to CU eLearning System. The topic and content of your term paper should be something that you are interested in and want to explore more. You may discuss your term paper with a teacher in your class.
- Not more than 4 pages including figures, references, font-size 10, single-line spacing.
- Deadline: Please submit the term paper via CU eLearning System on or before **11:55 pm, 13 May 2019 (Monday)**.
- Attention is drawn to University policy and regulations on **honesty in academic work**, and to the disciplinary guidelines & procedures applicable to breaches of such policy & regulations. CUHK places very high importance on honesty in academic work submitted by students, and adopts a policy of *zero tolerance* on cheating and plagiarism. Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated *Procedures* are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>).
- **All assignments must FIRST be submitted to VeriGuide ([https://academic.veriguide.org/academic/login\\_CUHK.aspx](https://academic.veriguide.org/academic/login_CUHK.aspx)) for checking of plagiarism.** A VeriGuide receipt will be issued by the VeriGuide system upon students' uploading of the soft copy of the assignment online.
- Please attach the SIGNED VeriGuide receipt (sign electronically or scan the signed hardcopy) on the first page of your assignment and **submit it through CU eLearning System (<https://blackboard.cuhk.edu.hk/ultra/stream>) for marking.**
- **Submission through other means or assignment without VeriGuide receipt will not be marked.**
- Term papers submitted after the designated deadline will be penalized accordingly; one-day delay will be penalized for 5% of total marks of the term paper, two-day delay will be penalized for 10% of the total marks, and so on.
- **General organization:** The following sections should be included in your term paper.
  - (a) **Title:** Give an informative and concise title.
  - (b) **Summary:** Give your findings and a summary.
  - (c) **Introduction:** Give background information and relate the problem(s) you found with the current information.
  - (d) **Main body:** Present your ideas in a systematic and concise manner. When necessary, supply figures, diagrams and tables with legends, and source of information.
  - (e) **Discussion and conclusion:** Give a summary of your ideas, and provide thoughtful discussion about the implications of your suggestions.
  - (f) **References:** Make sure you provide accurate citations with the following format. List references alphabetically. Journal: Yoshida H, Kawane K, Koike M, Mori Y, Uchiyama Y, Nagata S. Phosphatidylserine-dependent engulfment by macrophages of nuclei from erythroid precursor cells. *Nature*, 2005, 437:754-8. Internet: [http://www ....](http://www....) (Date of access: XX. month year).

**Test format:**

- Section A: Close-notes test (MCQ / T/F)  
Section B: Open-notes test (Essay / short questions)
- Students need to return answer sheet/book for Section A before they can answer Section B open-notes test questions. Students cannot request to review their answers after they have handed in their answer sheet/book of Section A. For Section B, students will **ONLY** be allowed to bring in one piece of A4 paper to the examination hall. Students may write down/print out information on both sides of the paper.



**BCHE4070 Management and Accreditation of Biochemical Laboratory  
(2018-19, 2<sup>nd</sup> Term)**

**B.Sc. Attributes Table**

Graduate Skills	Teaching & Learning	Practice	Assessment
Effective communication (written, oral, interpersonal)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Core knowledge literacy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Problem solving	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Critical thinking and evaluation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work autonomously	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Work in teams (with classmate, supervisor & RA etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Creativity and innovation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Information technology (IT) literacy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lifelong learning skills	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ethical behaviours in social/professional/work environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Responsible, effective citizenship	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

**Grade Descriptors**

Grade	Overall course
A	Demonstrates the ability to synthesize and apply the principles or subject matter learnt in the course, to novel situations and/or in novel ways, in a manner that would surpass the normal expectation at this level, and typical of standards that may be common at higher levels of study or research. Has the ability to express the synthesis of ideas or application in a clear and cogent manner.
A-	Demonstrates the ability to state and apply the principles or subject matter learnt in the course to familiar and standard situations in a manner that is logical and comprehensive. Has the ability to express the knowledge or application with clarity.
B	Demonstrates the ability to state and partially apply the principles or subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive. Has the ability to express the knowledge or application in a satisfactory and unambiguous way.
C	Demonstrates the ability to state and apply the principles or subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is not incorrect but is somewhat fragmented. Has the ability to express the separate pieces of knowledge in an unambiguous way.
D	Demonstrates the ability to state and sometimes apply the principles or subject matter learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials. Has the ability to state the knowledge or application in simple terms.
F	Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

**REMINDER:** Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>; please check them out.

## BCHE4080 Biochemistry for Forensic Sciences 2018-19, 1<sup>st</sup> Term

### Course Description:

This course aims at introducing various biochemical principles and techniques for forensic analysis to the students. Students will learn how to observe, collect, analyze and evaluate evidence found at crime scenes. The first part addresses the identification of biological fluids such as blood, semen, and saliva from crime scene. The emphasis will be on the biochemical technologies used in the presumptive and confirmatory tests. The second part covers DNA analysis using RFLP and PCR-STR typing methods, interpretation of DNA typing results, and court presentation of such biological evidence. Mitochondrial DNA typing and Y chromosome DNA typing will also be discussed. It is anticipated that students will apply the biochemistry knowledge they have acquired in junior years in the course.

### Learning Outcomes:

After finishing the course, students will be able to:

- 1) Develop an understanding of the concept and theory of forensic analysis.
- 2) Understand the analytical techniques involved.
- 3) Discuss the application of forensic science to crime detection.

### Assessment Scheme:

Mid-term Examination :	10 October (Wednesday)	30%
Final Examination :	14 December (Friday)	70%

### Grade Descriptors:

Grade	Overall course
A	Demonstrates a deep understanding of various biochemical principles and techniques for forensic analysis, and how to observe, collect, analyze and evaluate evidence found at crime scenes. Demonstrate the ability to apply different presumptive and confirmatory forensic tests for various samples and novel situations that would substantially surpass the normal expectation at this level and typical of standards that may be common at higher levels of study. Shows evidence of critical evaluation of different approaches to solving forensic problems. Demonstrates the ability to articulate the synthesis of new ideas or applications in a clear and cogent manner.
A-	Demonstrates high level of understanding of various biochemical principles and techniques for forensic analysis, and how to observe, collect, analyze and evaluate evidence found at crime scenes. Demonstrate the ability apply different presumptive and confirmatory tests for some novel samples and situations. Shows evidence of logical analysis of simple forensic problems. Demonstrates the ability to articulate the synthesis of new ideas or applications in a clear and cogent manner.
B	Demonstrate a competent grasp of the key concepts in various biochemical principles and techniques for forensic analysis, and how to observe, collect, analyze and evaluate evidence found at crime scenes. Demonstrates the ability to state and partially apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is usually logically persuasive. Demonstrate the ability to articulate scientific concepts or applications in a logical and coherent way.

C	<p>Demonstrate a basic understanding of various biochemical principles and techniques for forensic analysis, and how to observe, collect, analyze and evaluate evidence found at crime scenes.</p> <p>Demonstrates the ability to state and apply the subject matter learnt in the course to most (but not all) familiar and standard situations in a manner that is not incorrect but is somewhat fragmented.</p> <p>Shows the ability to articulate scientific concepts in a concise way.</p>
D	<p>Demonstrate the ability to apply certain learnt forensic biochemistry principles to simple situations in a manner that is broadly correct in its essentials or is somewhat ambiguous</p> <p>Demonstrates the ability to state and sometimes apply the subject matter learnt in the course to some simple and familiar situations in a manner that is broadly correct in its essentials.</p>
F	<p>Demonstrate an incomplete or incorrect biochemical principles and techniques for forensic analysis, and how to observe, collect, analyze and evaluate evidence found at crime scenes.</p> <p>Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.</p>

**Learning Resources:**

- (1) Forensic Science: From the Crime Scene to the Crime Lab. Richard Saferstein. Pearson 2013 [HV 8073 S214]
- (2) Forensic Science: An Introduction. Richard Saferstein. Prentice Hall 2011 [HV 8073 S214]
- (3) Forensic Biology. Richard Li, CRC press, Taylor and Francis Group 2008 [QH 313.5 F67 L5]
- (4) Advanced Topics in Forensic DNA Typing: Methodology. John M. Butler. Elsevier Academic Press 2012 [electronic resource]
- (5) Fundamentals of Forensic DNA Typing. John M. Butler. Academic Press 2010
- (6) Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers. John M. Butler. Academic Press 2005 [electronic resource]

## BCHE4080 Biochemistry for Forensic Sciences 2018-19, 1<sup>st</sup> Term

### Course Schedule:

Wednesday 2:30 pm - 4:15 pm (Weeks 1-6) Science Centre (SC) LG23

Friday 7:00 pm - 9:30 pm (Weeks 7-13) Yasumoto International Academic Park (YIA) LT7

Week	Date	Hour(s)	Topic	Teacher
1	5 Sep (Wed)	2	Introduction to Forensic Sciences	
2	12 Sep (Wed)	2	Forensic Serology & Blood Analysis	
3	19 Sep (Wed)	2	Detection of Saliva, Semen & Other Bodily Fluids	Prof. KF Lau
4	26 Sep (Wed)	2	Forensic Toxicology & ....	
5	3 Oct (Wed)	0	No Class (Study Week)	
6	<b>10 Oct (Wed)</b>	2	<b>Mid-term Examination</b>	
7*	19 Oct (Fri)	2	Forensic sciences and CSI <sup>#</sup>	
8*	26 Oct (Fri)	2	Development of DNA typing methods, and human DNA extraction and quantitation	
9*	2 Nov (Fri)	2	Forensic genetics and RFLP typing	
10*	9 Nov (Fri)	2	PCR-based typing methods	Prof. Henry Cheung
11*	16 Nov (Fri)	2	Results interpretation and forensic issues	
12*	23 Nov (Fri)	2	Evaluation and court presentation of DNA evidence	
13*	30 Nov. (Fri)	2	Y chromosome DNA typing, mitochondrial DNA typing and a special topic	
15	<b>14 Dec (Fri)</b>	<b>2</b>	<b>Final Examination</b>	

<sup>#</sup>Optional as the teaching material will be similar to lectures in the first four weeks.

\*Students in the M.Sc. programme (BBMS5120 Biochemical Genetics and Forensic Sciences) will join the class together in the lecture.

### Teachers:

Prof. Lau Kwok Fai SC 291 3943 1106 kflau@cuhk.edu.hk

Prof. Henry Cheung

### A Facility for Posting Course Announcements:

Course announcements and materials will be posted on the Blackboard course website. The powerpoint slides used will be posted on the Blackboard course website before the lecture. NO hard copies will be distributed in the class.

**Reminders:**

**Academic Honesty:** According to University regulations, students must submit an electronic version of their assignment to VeriGuide system for the purpose of checking for possible plagiarism. Read the University's policies on plagiarism carefully and do not plagiarise! CUHK has adopted a policy of zero tolerance for plagiarism. Instructors will send all suspected cases of plagiarism directly to the disciplinary committee for investigation. In the case of group report, plagiarism will affect all partners! Students submitting assignment done by third party is also a serious misconduct and regarded as fraud or academic dishonesty. The updated Procedures are available at the University's website "Honesty in Academic Work: A Guide for Students and Teachers" (<http://www.cuhk.edu.hk/policy/academichonesty/>). Students please note the aforementioned marking scheme, grade descriptors, academic honesty principle and the university penalty guideline are all applicable to this course. General university regulations are available on line: <http://www.res.cuhk.edu.hk/en-gb/general-information/university-regulations>

**BCHE4090 Biochemistry for Sport and Exercise**  
**2018-19, 2<sup>nd</sup> Term**

<b>Course code:</b>	BCHE4090
<b>Course title:</b>	Biochemistry for Sport and Exercise
<b>Venue:</b>	Y.C. Liang Hall G04
<b>Unit:</b>	2
<b>Period:</b>	9:30 – 11:15, Friday
<b>Instructor:</b>	FH Lo
<b>Office:</b>	MMW507B
<b>Email:</b>	lofaihang@cuhk.edu.hk
<b>Telephone:</b>	39435019

**Course Objectives:**

This course aims at introducing various biochemical aspects of sport and physical activities to the students. The course is designed to cover some basic anatomy, energy utilization, cardiac functions, injury mechanisms, sports therapeutic principles, endocrine effects on physical activities, nutrition for sports, physical activities in extreme conditions, and physical activities for the diseased population. The course welcomes students with basic knowledge in biological science, where various in-class activities are integrated so as to let the students apply, analyze, and evaluate the academic knowledge in daily life. The training of students' creativity, question asking, critical thinking, goal-setting, self-learning, and decision making skills will also be emphasized: students are encouraged to participate in the self-reflective activities, workshop, and group activities. Throughout the learning process, it is anticipated that the students will not only acquire the academic knowledge, they will also consolidate their learning and acquire useful skills for both personal and professional aspects.

**Learning Outcomes:**

- Master the fundamental knowledge of physiology and anatomy of the skeletomuscular system;
- Comprehend the basic knowledge of the selected topics of sports biochemistry;
- Experience and apply the knowledge of sports biochemistry in every-day-life scenarios;
- Identify, analyze, and comment on the relationship between biochemistry and physical activities;
- Develop practical skills in goal-setting, problem-solving, team-work, and communication skills;
- Gain learning methodologies that promote life-long learning in biochemistry and other related disciplines.

### Textbooks:

- ACSM's advanced exercise physiology (Farrell et al); [WE103 .A83 2012]
- ACSM's guidelines for exercise testing and prescription (Thompson et al); [WE103 .A45 2010]
- Biological psychology (James W Kalat); [WL102 .K33 2013]
- Essential haematology (Hoffbrand & Moss); [available online]
- Exercise physiology : nutrition, energy, and human performance (McArdle et al); [QT260 .M375 2010]
- Managing sports injuries (Christopher M Norris); [available online]
- Marks' basic medical biochemistry : a clinical approach (Lieberman et al); [available online]
- Medical biochemistry (Baynes & Dominiczak); [available online]
- Principles of anatomy & physiology (Tortora & Derrickson); [QS4 .T67 2012]
- Principles of athletic training (Arnheim & Prentice); [QT260 .A76 1995]
- Robbins and Cotran pathologic basis of disease (Robbins et al); [available online]
- Sports and exercise nutrition (McArdle et al); [TX361.A8 M38 2013]
- Wilderness medicine (Paul S Auerbach); [available online]

### Course Assessment

<b>Classwork</b>	<b>20%</b>
<i>Mind-map*</i>	<i>10%</i>
<i>In-class activities**</i>	<i>10%</i>
<b>Written assignment</b>	<b>30%</b>
<i>Group written assignment<sup>+</sup></i>	<i>25%</i>
<i>Individual written assignment<sup>#</sup></i>	<i>5%</i>
<b>Quiz and exam</b>	<b>50%</b>
<i>Quiz</i>	<i>10%</i>
<i>Final exam (T/F, MCQ, and SQ)</i>	<i>40%</i>
<b>Total</b>	<b>100%</b>

\*The mind-map of each student is assessed by the whole class in terms of the creativity;

\*\*Any FIVE of the class activities I to VII account for 10% of the total marks of the course (2% each);

<sup>+</sup>Group written assignment requires each group to discuss and reflect on the group activity in either week 13 or 14. Each group, with at least three students, is required to present 1) what did you learn from the course (5%), 2) what was the most interesting academic knowledge to you (5%), 3) how did you integrate what you learnt in the course to analyze the situation presented to you during the group activity (5%), 4) what

judgment did you make in the situation (5%), and 5) what did you plan to do in the situation (5%) in the written assignment;

#Individual written assignment requires each student to reflect on what did they learn from all the class activities.

### Grade Descriptors for BCHE4090

Grade	Overall Course
<b>A</b>	<ul style="list-style-type: none"> <li>• Excellent achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent understanding of the core knowledge;</li> <li>• Excellent ability to apply the knowledge for problem solving;</li> <li>• Demonstration of excellent analytical skills for making judgement;</li> <li>• Excellent participation of in-class activities and group-project.</li> </ul>
<b>A-</b>	<ul style="list-style-type: none"> <li>• Excellent achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent understanding of the core knowledge;</li> <li>• Very good ability to apply the knowledge for problem solving;</li> <li>• Demonstration of very good analytical skills for making judgement;</li> <li>• Excellent participation of in-class activities and group-project.</li> </ul>
<b>B</b>	<ul style="list-style-type: none"> <li>• Very good achievement of all the stated learning outcomes;</li> <li>• Demonstration of very good understanding of the core knowledge;</li> <li>• Good ability to apply the knowledge for problem solving;</li> <li>• Demonstration of good analytical skills for making judgement;</li> <li>• Very good participation of in-class activities and group-project.</li> </ul>
<b>C</b>	<ul style="list-style-type: none"> <li>• Satisfactory achievement of all the stated learning outcomes;</li> <li>• Demonstration of good understanding of the core knowledge;</li> <li>• Satisfactory ability to apply the knowledge for problem solving;</li> <li>• Demonstration of satisfactory analytical skills for making judgement;</li> <li>• Good participation of in-class activities and group-project.</li> </ul>
<b>D</b>	<ul style="list-style-type: none"> <li>• Fair achievement of all the stated learning outcomes;</li> <li>• Demonstration of fair to satisfactory understanding of the core knowledge;</li> <li>• Fair ability to apply the knowledge for problem solving;</li> <li>• Demonstration of fair analytical skills for making judgement;</li> <li>• Fair to satisfactory participation of in-class activities and group-project.</li> </ul>
<b>F</b>	<ul style="list-style-type: none"> <li>• Poor achievement of all the stated learning outcomes;</li> <li>• Demonstration of poor understanding of the core knowledge;</li> <li>• Poor ability to apply the knowledge for problem solving;</li> <li>• Demonstration of poor analytical skills for making judgement;</li> <li>• Poor participation of in-class activities and group-project.</li> </ul>



## BCHE4090 Schedule

Week	Date	Contents
1	11 Jan	<ul style="list-style-type: none"><li>- Course introduction</li><li>- Skeletal system</li></ul>
2	18 Jan	<ul style="list-style-type: none"><li>- Muscular and nervous system</li><li>- Class activity I: body posture</li></ul>
3	25 Jan	<ul style="list-style-type: none"><li>- Neuromuscular control</li><li>- Muscle contraction and synthesis</li><li>- Bone synthesis and soft tissue biochemistry</li><li>- Class activity II: balancing the body</li></ul>
4	1 Feb	<ul style="list-style-type: none"><li>- Energy utilization at rest and during physical activities</li><li>- Class activity III: estimation of basal metabolic rate</li></ul>
	8 Feb	<ul style="list-style-type: none"><li>- Chinese New Year</li></ul>
5	15 Feb	<ul style="list-style-type: none"><li>- Blood</li><li>- Cardiac functions for physical activities</li><li>- Cardiovascular system during physical activities</li><li>- Class activities IV: blood pressure measurement</li></ul>
6	22 Feb	<ul style="list-style-type: none"><li>- Quiz: skeletomuscular system</li><li>- Molecular mechanism of cellular injury and recovery</li><li>- Ischemia, inflammation, and spasm</li><li>- Fatigue and rest</li></ul>
7	1 Mar	<ul style="list-style-type: none"><li>- Adaptation mechanisms to extreme environments</li><li>- Class activity V: mind-map drawing</li></ul>
8	8 Mar	<ul style="list-style-type: none"><li>- Endocrine effect on physical activities</li><li>- Biochemical principles of training and doping</li><li>- Class activity VI: how fit you are?</li></ul>
9	15 Mar	<ul style="list-style-type: none"><li>- Nutrition for sports</li><li>- Fat cell biology</li><li>- Class activity VII: measurement of body fat composition</li></ul>
10	22 Mar	<ul style="list-style-type: none"><li>- Physical activities in extreme conditions</li><li>- Class activity VIII: measurement of blood O<sub>2</sub> saturation</li></ul>
11	29 Mar	<ul style="list-style-type: none"><li>- Stress and pain</li><li>- Biochemical principles of sports therapeutics</li><li>- Class activity IV: how stressed you are?</li></ul>
	5 Apr	<ul style="list-style-type: none"><li>- Easter</li></ul>
12	12 Apr	<ul style="list-style-type: none"><li>- Creative workshop</li><li>- Critique on mind-map</li></ul>

### **Creative self-reflection**

Self-reflective activity will be conducted in the form of mind-map drawing; each student will assign a specific topic for him/herself during the preparation of the mind-map, according to the guidelines provided in Class Activity V. The students will briefly introduce the ideas of their maps to the class during the Critique on mind-map. The assessment criterion of the mind-map will be based on the creativity of the mind-map, which will be assessed collectively by the whole class during the critique.

### **Group activity for learning integration**

Group activity will be held at the end of the course; where students will be divided into groups (depending on the final class size, the group activity will be conducted on the mark-up class day, 22 or 23 April, Tuesday or Wednesday) and create scientific stories with the application of the knowledge acquired from the course; thus, the group activity require students to revise the materials covered by the course and to do extra self-study about (wilderness) emergency rescue. During each 1 to 2 hour(s) group activity, students will play the stores they create: some students act as the patients; while the other will act as the rescuers. The rescuer group will have to apply their skills to comprehend and analyze the situation, to apply their knowledge and creativity, and to make judgment to act as a team. The rescuer group will be allowed to debrief among themselves after the activity. The students will rotate their roles once the activity has been completed. The activity will take place within the classroom and each student will have to make use of their imagination.

### **Academic Honesty**

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at <http://www.cuhk.edu.hk/policy/academichonesty/>. For ALL written assignment, students will have to submit a statement that they are aware of these policies, regulations, guidelines and procedures.

## BCHE4130 Molecular Endocrinology

2017-18 Second Term (Not Offered in 2018-19)

Time: T3-4 (10:30 am to 12:15 pm) and H6 (1:30 pm to 2:15 pm)

Venue: SC L4

This course describes the chemical structures and biological functions of hormones in vertebrates with emphasis but not focus only on human subjects. The organization and operation of different hypothalamus- pituitary- peripheral endocrine gland axes will be discussed. The molecular aspects of endocrine action through hormone secretion and interactions with their specific receptors and downstream signaling pathways in target cells to elicit specific functions will be explored. Current advances in molecular endocrinology techniques will also be discussed.

### Textbooks:

Hadley, ME & Levine, JE (2007). **Endocrinology**, 6<sup>th</sup> Ed. Upper Saddle River, N.J., 500 p.  
(WK100. H17 2007; UL reserved)

Molina, PE (2013). **Endocrine Physiology**, 4<sup>th</sup> Ed., McGraw Hill  
(<http://accessmedicine.mhmedical.com/book.aspx?bookid=507>)

Nussey, SS & Whitehead, SA (2001). **Endocrinology, An Integrated Approach**, BIOS, 359p.  
<http://www.ncbi.nlm.nih.gov/books/NBK22/> (NCBI Textbook On-line)

### Outline and Teaching Schedule:

Week	Date	Topic (Text Chapters in Hadley and Levine, 2007)	Teachers
1	Jan 9 (2 h) Jan 11 (1 h)	1. Mechanisms of Hormone Action (1, 2, 3)	<b>KM Chan (Coordinator)</b>  SC184  Tel: 3943-4420  Email: <a href="mailto:kingchan@cuhk.edu.hk">kingchan@cuhk.edu.hk</a>
2	Jan 16 (2 h) Jan 18 (1 h)	2. Endocrine Methodologies and Signal Transductions (4)	
3	Jan 23 (2 h) Jan 25 (1 h)	3. Hypothalamic and Pituitary Hormones (5, 6, 12)	
4	Jan 30 (2 h) Feb 1 (1 h)	4. Posterior Pituitary Hormones & POMC (7, 8)	
5	Feb 6 (2 h) Feb 8 (1 h)	5. Pancreatic Hormones and Metabolic Regulation (11)	
6	Feb 13 (2 h) Feb 22 (1 h)	6. Hypothalamic-Pituitary-IGF Axis and Growth Control (12)	
7	Feb 27 (2 h) Mar 1 (1 h)	7. Hypothalamic-Pituitary-Thyroid Axis (13, 14)	
8	Mar 6 (2 h) Mar 8 (1 h)	8. Hypothalamic-Pituitary-Gonads Axis (17-19)	
9	Mar 13 (2 h) Mar 15 (1 h)	<b>9. Presentation on hormone techniques <sup>\$</sup></b>	
10	Mar 20 (2 h) Mar 22 (1 h)	10. Reproduction, Sex Hormones and Contraceptives	<b>FH Lo</b>  MMW507B  Tel: 3943-4359  Email: <a href="mailto:lofaihang@cuhk.edu.hk">lofaihang@cuhk.edu.hk</a>
11	Mar 27 (2 h)	11. Steroid hormones and their actions (15- 16)	
12	Apr 10 (2 h) Apr 12 (1 h)	12. Gastrointestinal (GI) Hormones (10)	
13	Apr 17 (2 h) Apr 19 (1 h)	13. Calcium Homeostasis and Bone Metabolism (9)	

**Feb 15-21, Lunar New Year holidays; March 29- April 3, reading week**

## Evaluations:

1. § **Presentation (group) on Hormone Techniques (15%)**: 5% peer-assessment; 10% based on oral presentation and slides submitted as group project. *Please include one multiple-choice question in your presentation.*
2. ^ **Assignment (25% covering week 3-8)**: students should answer any 2 questions posted on lecture notes, students are required to write research proposal or design experiments to test hypothesis or discuss case study. All students are encouraged to apply critical thinking, creativity, and problem-solving skills to solve a research problem. **Warning: no two assignments could have similar contents and that would be regarded as plagiarism (DEADLINE: APRIL 8, 2018).**
3. # **Poster (group) Presentation (20%)**: covering all endocrinology research topics (**DEADLINE: May 2, 2018**).
4. \* **FINAL EXAMINATION (40%)**: covering all topics taught from Week 1 to 13, date to be confirmed in centralized exam period.

§ **Oral Presentation on Hormone Techniques**: students in a group of 3-4 students should select and present in 10 minutes a special and advanced technique to detect hormones or study the effects of hormones in animals. Power point slides (<12) should be submitted one day ahead of presentation. Please include one multiple-choice question in your presentation.

^ **Assignments**: each student should submit a written assignment describing their original approach to solve a research problem. In the assignment, 1) a research problem relevant to the course should be clearly identified; 2) the hypothesis should be clearly defined; 3) the method followed by the hypothesis should be described; 4) how the data should be analyzed in order to get conclusion should be mentioned; 5) the reference of scientific information should be cited; 6) student full name and student ID should be included. (Page limits: 10; max word counts: 6,000)

# **Poster presentation**: students in a group of 2-3 students would select a research paper within last 5 years (2013-18) and write an overview (commentary) on the major findings of the paper(s), rationales and merit of the study, and discuss the perspective or future experiments that can be performed to extend the study and the understanding of the subject matter. All posters should be finished within one page (maximum word count is 2000, with 3- 4 figures or tables) in a pdf file to be uploaded to blackboard with the signed VeriGuide statement (on page 2). Contents of the poster include [1] the title of the poster, [2] student names (id), [3] full name(s) of the article(s) reviewed (with links and downloaded dates), [4] abstracts, [5] keywords, [6] major findings with 2-3 figures or tables, [5] critiques, [6] discussions (e.g. accuracy of techniques involved), [7] conclusions, [8] perspectives, and [9] references.

\* **Final Examination**: this is an open note examination and students may take only one A4 paper with their own notes to finish this exam consists of mainly multiple choice or short-answer questions on concepts of endocrinology.

## Expected learning outcomes

After completing the course, students should be able to:

1. Understand the homeostatic controls in our body using the endocrine system;
2. Understand how polypeptide hormones and lipid soluble hormones act on their target cells to activate various intracellular signaling pathways;
3. Understand the concepts of hormonal control via feedback mechanisms;
4. Understand the etiology and diagnosis of diseases from hormone defects, such as gigantism and Cushing Syndrome.

By the end of the course, students will be able to appreciate and find information about the complexes of hormonal control of growth, metabolism, reproduction and development.

### Grade Descriptors for BCHE 4130 Molecular Endocrinology

Grade	Marks	Contents and Examinations	Data Presentation and Term Paper Writing
A	>85	Able to address and discuss the topics in endocrinology up to a high standard with a potential to do hormone research. Could provide correct answers to 80% of the questions in final exam.	Able to write nice term essays on selected topics up to a publication standard with quality data presentation and discussion. Able to present a poster on a research topic related to hormone research with detailed information and discussions on the topic chosen to its perfection with enough citations of recent papers.
A-	80- 85	Able to address the topics in endocrinology up to a high standard, and answer at least 70% of the questions in the final examination.	Able to write a nice review paper on selected topics and present a group poster on a research topic in a good standard with clarity and enough citations of recent papers.
B+	75-79	Able to address the topics in endocrinology up to a good standard with all terms and their relationships identified; and manage to answer more than half of the questions correctly.	Up to a good standard with enough data, but lack of statistical analysis; poster presentation with identified goals
B	70-75	Able to address some topics in the research up to a good standard, and manage to answer more than half of the questions correctly.	Up to a good standard, but failed to provide sufficient and up to dated citations in both term essays.
B-	65-69	Able to identify and address the topic in Endocrinology up to a good standard, and manage to answer more than half of the questions correctly.	Limited data provided, weak in data interpretations or little interpretation at all; posters and term essays received in good order and shapes.
C+	60-64	Weak to address the topic in endocrinology with less than half of the final examination questions done correctly.	Invalid and very limited data presented in poster and term essays.
C	55-59	Weak to address the topic in endocrinology with less than half of the final examination questions done correctly.	Invalid and very limited data presented in poster and term essays.
C-/D	50-54	Very weak to address the topic in endocrinology with less than half of the final examination questions done correctly.	Invalid and very limited data presented in poster and term essays.
F	< 50	Unable to address the topic in endocrinology with less than 30% of the final examination questions done correctly.	Failed to submit any term assay nor poster. Assignments found with plagiarized materials.

The range of marks is an approximation suggested for reference only. The actual grade shall reflect the overall performance in the course which comprises the descriptors for all sessions and the final examination.

**Course code:** BCHE4640  
**Course title:** Aspects of neuroscience laboratory  
**Venue:** Lab check-in, lab examination, and oral presentation: LSK 515  
Course introduction: UCA 105  
Practical sessions: Science Centre Room 190 and 152  
Advanced practical three: Pi ' Chiu Bldg Rm 102 Training Room 1  
Library workshop: User Education Room 2, University Library  
**Unit:** 2  
**Term** 1  
**Period:** 2:30 – 6:15 pm, Tuesday  
**Maximum class size:** 20

**Course Objectives:**

This course aims at introducing various aspects of neuroscience, in particular the research skills and laboratory techniques, to the students. The course is designed to focus on the basic principles and technical skills of cell biology and cellular pathology; where students will participate in two basic and three advanced practical sessions specialized in the themes of tissue culture reagent preparation, basic tissue culture techniques, two fundamental laboratory techniques for neurological diagnostics, and data analytics. The training of students' self-learning, problem-solving, and communication skills will also be emphasized: students are encouraged to give presentations with topics in neuroscience they are interested in; they will be fully supported and provided with the optimal learning environment to reflect on the topics they select. Furthermore, a tailored library training workshop will be integrated in the course. Throughout the learning process, it is anticipated that the students will not only acquire the academic knowledge and practical skills in neuroscience, they will also consolidate their learning and acquire other skills of self-learning, problem-solving, and communication.

**Learning Outcomes:**

- Comprehend the basic knowledge and laboratory skills in cell biology and neurological diagnosis;
- Recognize how various aspects of neuroscience are important that benefit our daily life;
- Recognize, analyze, and comment on the scientific and ethical issues of certain topics of neuroscience;
- Develop practical skills in problem-solving and communication through different types of learning activities;
- Gain learning methodologies that promote life-long learning in neuroscience and other life science-related discipline.

**Textbook:**

- Laboratory Diagnosis in Neurology (Brigitte Wildemann et al) [available online];

**References:**

- Clinical chemistry: concepts and applications (Shauna C. Anderson & Susan Cockayne) QY90.C6423 (2003);
- Introduction to cell and tissue culture: theory and technique (Jennie Mather) QS525.M38 (1998);
- Tietz textbook of clinical chemistry and molecular diagnostics (Carl A. Burtis et al) QY90.T49 (2012);
- SPSS statistics for dummies [electronic resource] (Keith McCormick et al) (2015);
- Using statistics in the social and health sciences with SPSS and Excel [electronic resource] (Martin L. Abbott) QA276.45.M53 A23 (2017)

**Staff Correspondence**

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ZHAI Yuqi	SC 294	3943-6119	354722951@qq.com

**Course Assessment**

<b>Participation and performance</b>	<b>10%</b>
<b>Written assignment</b>	<b>25%</b>
<b>Presentation</b>	<b>25%</b>
<i>Preparation</i>	5%
<i>Coordinator</i>	10%
<i>Demonstrators</i>	5%
<i>Peers</i>	5%
<b>Lab Exam</b>	<b>40%</b>
<b>Total</b>	<b>100%</b>

## Schedule

Week	Date	Experiment	Venue	Staff
1	4 Sept	- Lab Check-In/student consultation - Grouping/presentation topic selection	LSK 515	LFH
2	11 Sept	- Study week		
3	18 Sept	- Course induction	UCA 105	LFH
4	25 Sept	- Public Holiday – The day following the Chinese Mid-Autumn Festival		
5	2 Oct	- Basic Practical One: Reagent preparation	SC 190 & 152	Kelvin, An Ying & others
6	9 Oct	- Basic Practical Two: freezing and thawing neural cell line/cell counting/splitting cell (Session A)	SC 190 & 152	Kelvin, Emma & others
7	16 Oct	- Basic Practical Two: freezing and thawing neural cell line/cell counting/splitting cell (Session B)		TBA
8	23 Oct	- Advanced Practical One: cerebrospinal fluid and cytospin	SC 190	Kelvin, Yuqi & others
9	30 Oct	- Library workshop	User Education Room 2, UL	University Library expert
10	6 Nov	- Advanced Practical Two: cerebrospinal fluid and real time-PCR	SC 190	Kelvin, Susan & others
11	13 Nov	- Advanced Practical Three: SPSS Techniques and Applications	Pi'Chiu Bldg Rm 107 Training Room 3	LFH & Kelvin
12	20 Nov	- Oral presentation	LSK 515	All
13	27 Nov	- Lab examination	LSK 515	All



## Discussion

Week	Date	Time	Venue
5	2 Oct	4:30 pm	SC 297
6	9 Oct	4:30 pm	SC 297
7	16 Oct	4:30 pm	SC 297
8	23 Oct	4:30 pm	SC 190
10	6 Nov	4:30 pm	SC 297

## Presentation topics

- Autoimmune disease of the nervous system
- Biochemical basis of drug abuse
- Biochemical basis of psychiatric disorders
- Biochemical mechanism(s) of balance and hearing
- Biochemical mechanism(s) of vision
- Biochemistry of happiness
- Biochemistry of spicy hot food
- Biomarkers for neurological diseases
- Biology of personality
- Blood brain barrier and the flow/pressure of cerebrospinal fluid
- Botox cosmetics
- Brain tumours
- Cerebral ischemia: hypoxic versus haemorrhagic
- Cerebrospinal fluid versus serum
- Discovery of anaesthesia
- Epilepsy and genetics
- Genetics of hearing
- Infectious diseases of the nervous system
- Meningitis and encephalitis
- Metabolic diseases of the nervous system
- Neurological venom of snakes
- Neurotransmitter diseases
- Nitrous oxide (笑氣)
- Rabies
- Sarin (沙林毒氣) as a biological weapon
- Theory of pain
- **Or, any other proposed topics**

## BCHE4640 Grade descriptors

Grade	Overall course
<b>A</b>	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent conceptual, procedural, and application knowledge;</li> <li>• Demonstration of excellent practical skills in terms of data accuracy;</li> <li>• Demonstration of excellent generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of excellent teamwork, leadership, and professionalism;</li> <li>• Excellent understanding of the social impact of immunology;</li> </ul>
<b>A-</b>	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent conceptual, procedural, and application knowledge;</li> <li>• Demonstration of very good practical skills in terms of data accuracy;</li> <li>• Demonstration of excellent generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of excellent teamwork, leadership, and professionalism;</li> <li>• Excellent understanding of the social impact of immunology;</li> </ul>
<b>B</b>	<ul style="list-style-type: none"> <li>• Substantial achievement of all the stated learning outcomes;</li> <li>• Demonstration of very good conceptual, procedural, and application knowledge;</li> <li>• Demonstration of satisfactory to very good practical skills in terms of data accuracy;</li> <li>• Demonstration of good to very good generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of good to very good teamwork, leadership, and professionalism;</li> <li>• Good to very good understanding of the social impact of immunology;</li> </ul>
<b>C</b>	<ul style="list-style-type: none"> <li>• Satisfactory achievement of all the stated learning outcomes;</li> <li>• Demonstration of satisfactory conceptual, procedural, and application knowledge;</li> <li>• Demonstration of fair to satisfactory practical skills in terms of data accuracy;</li> <li>• Demonstration of satisfactory generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of satisfactory teamwork, leadership, and professionalism;</li> <li>• Satisfactory understanding of the social impact of immunology;</li> </ul>
<b>D</b>	<ul style="list-style-type: none"> <li>• Minimal achievement of all the stated learning outcomes;</li> <li>• Demonstration of fair conceptual, procedural, and application knowledge;</li> <li>• Demonstration of minimum practical skills in terms of data accuracy;</li> <li>• Demonstration of fair generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of fair teamwork, leadership, and professionalism;</li> <li>• Fair understanding of the social impact of immunology;</li> </ul>

<b>F</b>	<ul style="list-style-type: none"><li>• Poor achievement of all the stated learning outcomes;</li><li>• Demonstration of poor conceptual, procedural, and application knowledge;</li><li>• Demonstration of poor practical skills in terms of data accuracy;</li><li>• Demonstration of poor generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li><li>• Demonstration of poor teamwork, leadership, and professionalism;</li><li>• Poor understanding of the social impact of immunology;</li></ul>
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For reference only

**Course code:** BCHE4760  
**Course title:** Immunology and Haematology laboratory  
**Venue:** Course introduction and lab examination: NAH 11  
Oral presentation: UCC 111  
Practical sessions: Science Centre Room 188, 190  
**Unit:** 2  
**Term:** 1  
**Period:** 2:30 – 6:15 pm, Thursday

**Course descriptions:**

This course focuses on the practical work in the field of immunology and haematology; where students will participate in five practical sessions specialized in specific themes of immunology and haematology, such as innate immunity, humoral immunity, haematological specimens, red blood cells (RBCs), white blood cells (WBCs), and immunological assays. The practice of 'flipped classroom' allows students to do self-study of the e-learning courseware to get adequately prepared for each class. In other words, the laboratory is a place for the students to practise, to experience, to solve problems, and to discuss with autonomy. During each practical session, discussion time will be available to facilitate in-depth learning. Towards the end of the course, students will be giving presentations related to topics they are interested in for learning consolidation. In the course, impact of the academic knowledge on the society as well as other important generic skills, such as team building, self-learning, problem-solving, teamwork, and scientific communication skills, are emphasized. Throughout the various learning processes, it is anticipated that the students will not only acquire the academic knowledge and laboratory skills in immunology and haematology, they will also consolidate their learning and acquire other generic skills for future career development as well as applications in the society.

**Learning goals:**

- Comprehend the core knowledge and relevant laboratory skills in immunology and haematology;
- Develop generic skills in scientific communication and working in a team through diverse types of learning activities;
- Appreciate the applications and societal impact of the academic knowledge acquired from the course;
- Gain learning methodologies that promote life-long learning in immunology, haematology, and other life science-related discipline.

**Textbooks:**

- Refer to lecture course (BCHE4060 Basic and Applied Immunology and BCHE4030 Clinical Biochemistry)

**Supplementary References:**

- Practical Immunology (Hay & Westwood)  
[available online];
- Laboratory Hematology Practice (Kottke-Marchant & Davis)  
[available online];
- Laboratory Diagnosis of Infectious Diseases: Essentials of Diagnostic Microbiology (Engelkirk & Duben-Engelkirk)  
QW25 .E54 (2008);
- Diagnostic Techniques in Hematological Malignancies (Erber WN, ed)  
WH525 .D53 (2010);

**Staff Correspondence**

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## Course Assessment

<sup>1</sup> <b>Performance &amp; participation</b>	<b>10%</b>
<sup>2</sup> <b>Pre-lab quiz</b>	<b>10%</b>
<sup>3</sup> <b>Written assignment</b>	<b>10%</b>
<b>Data</b>	<b>20%</b>
<sup>4</sup> <i>Raw data</i>	10%
<sup>5</sup> <i>Presentable data</i>	10%
<b>Presentation</b>	<b>25%</b>
<i>Preparation</i>	4%
<i>Coordinators</i>	10%
<i>Demonstrators</i>	5%
<sup>6</sup> <i>Peers</i>	6%
<b>Lab Exam</b>	<b>25%</b>
<sup>7</sup> <b>Total</b>	<b>100%</b>

<sup>1</sup>Each student has to sign in (at 2:30 pm) and sign out (before 5:15 pm) for all the 5 practical sessions;

<sup>2</sup>There is a pre-lab quiz before each practical session to ensure students to have adequate preparation in advance. Each pre-lab quiz carries 2% of the total mark of the course;

<sup>3</sup>There is a set of critical thinking questions for each practical session. Students are required to complete the questions before each practical session and have discussion with the coordinator during class. After finishing the practical, the group will have to submit their answers together with the presentable data onto *Blackboard* by the due date;

<sup>4</sup>Each group has to write down all of the raw data after each practical session for assessment in terms of the quality/accuracy of the data obtained. The raw data of each practical session accounts for 2% of the total mark of the course;

<sup>5</sup>Each group has to present their raw data and submit the answers of the critical thinking questions onto *Blackboard*. Each group has to work out the most appropriate way to present their raw data. The presentable data of each practical session accounts for 2% of the total mark of the course. The assessment is based on how the raw data is being presented;

<sup>6</sup>Five marks will be allocated for the quality of the presentations and a maximum of 1 mark will be awarded to good teams nominated by peers.

<sup>7</sup>For students who take part in the optional multi-dimensional development modules to receive the bonus points and result in total marks >100, the highest mark of the class will be the full mark. The marks of the whole class will then be converted to the 100-point scale based on the highest mark.

## Schedule

Week	Date	Experiment	Venue	Staff
1	6 Sept	- Lab Check-In/student consultation - Grouping/presentation topic selection	NAH 11	LFH
2	13 Sept	- Preparation of oral presentation		
3	20 Sept	- Assay for Innate Immunity - Assay for Humoral Immunity (I)	SC 188/190	Ada and demonstrators
4	27 Sept	- Assay for Humoral Immunity (II)		
5	4 Oct	- Preparation of oral presentation		
6	11 Oct	- Assays of Haematological Specimens	SC	Ada and
7	18 Oct	- Assays of Red Blood Cells (RBCs)	188/190	demonstrators
8	25 Oct	- Preparation of oral presentation		
9	1 Nov	- Flow Cytometric Analysis and Immunological Assay	SC 188/190	Ada and demonstrators
10	8 Nov	- Preparation of oral presentation		
11	15 Nov	- University Ceremony		
12	22 Nov	- Lab examination	NAH 11	All
13	29 Nov	- Group Presentation & Sharing	UCC 111	All

## BCHE4760 Grade Descriptors

<p><b>A-</b></p>	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent conceptual, procedural, and application knowledge;</li> <li>• Demonstration of very good practical skills in terms of data accuracy;</li> <li>• Demonstration of excellent generic skills, such as making scientific judgement, conducting self-learning, analytical and communication skills;</li> <li>• Demonstration of excellent teamwork, leadership, and professionalism;</li> <li>• Excellent understanding of the social impact of immunology;</li> </ul>
<p><b>B</b></p>	<ul style="list-style-type: none"> <li>• Substantial achievement of all the stated learning outcomes;</li> <li>• Demonstration of very good conceptual, procedural, and application knowledge;</li> <li>• Demonstration of satisfactory to very good practical skills in terms of data accuracy;</li> <li>• Demonstration of good to very good generic skills, such as making scientific judgement, conducting self-learning, analytical and communication skills;</li> <li>• Demonstration of good to very good teamwork, leadership, and professionalism;</li> <li>• Good to very good understanding of the social impact of immunology;</li> </ul>
<p><b>C</b></p>	<ul style="list-style-type: none"> <li>• Satisfactory achievement of all the stated learning outcomes;</li> <li>• Demonstration of satisfactory conceptual, procedural, and application knowledge;</li> <li>• Demonstration of fair to satisfactory practical skills in terms of data accuracy;</li> <li>• Demonstration of satisfactory generic skills, such as making scientific judgement, conducting self-learning, analytical and communication skills;</li> <li>• Demonstration of satisfactory teamwork, leadership, and professionalism;</li> <li>• Satisfactory understanding of the social impact of immunology;</li> </ul>
<p><b>D</b></p>	<ul style="list-style-type: none"> <li>• Minimal achievement of all the stated learning outcomes;</li> <li>• Demonstration of fair conceptual, procedural, and application knowledge;</li> <li>• Demonstration of minimum practical skills in terms of data accuracy;</li> <li>• Demonstration of fair generic skills, such as making scientific judgement, conducting self-learning, analytical and communication skills;</li> <li>• Demonstration of fair teamwork, leadership, and professionalism;</li> <li>• Fair understanding of the social impact of immunology;</li> </ul>
<p><b>F</b></p>	<ul style="list-style-type: none"> <li>• Poor achievement of all the stated learning outcomes;</li> <li>• Demonstration of poor conceptual, procedural, and application knowledge;</li> <li>• Demonstration of poor practical skills in terms of data accuracy;</li> <li>• Demonstration of poor generic skills, such as making scientific judgement, conducting self-learning, analytical and communication skills;</li> <li>• Demonstration of poor teamwork, leadership, and professionalism;</li> <li>• Poor understanding of the social impact of immunology;</li> </ul>



**Course code:** BCHE4830  
**Course title:** Medical biochemistry laboratory  
**Venue:** Classrooms: Mong Man Wai Building Room 705  
Cheng Yu Tung Building Room 209B  
Laboratory: Science Centre East Block Room 408-411  
**Unit:** 2  
**Term:** 2  
**Period:** 2:30 – 6:15 pm, Monday

**Course Objectives:**

In this course, students will be introduced to a series of practical sessions specialized in representative themes, such as the analysis of diabetes mellitus, liver function, endocrine function, tumour marker, which supplements the knowledge acquired from BCHE4030 Clinical Biochemistry/BCHE4130 Molecular Endocrinology and provides an experiential learning opportunities of the practical skills. In addition to the academic knowledge and laboratory techniques, other learning activities are also integrated into the course to equip our students for the professional and daily life scenarios they may encounter in the future; the holistic training of students' self-learning, problem-solving, team work, and communication skills will be emphasized: all students are required to work on self-reflection about the impact of medical biochemistry on our society. The students will participate class activity together to apply their knowledge in real life situations. They will also be encouraged to form groups and explore specific topics interesting to them, as well as to visit sites out of the campus. Throughout the diversified learning experiences in the course, it is anticipated that the students will not only acquire the academic knowledge and laboratory techniques in medical biochemistry, but also develop useful generic skills, apply their learning in real life scenarios, and equip themselves for their further studies and career development.

**Learning Outcomes:**

- Comprehend and apply the basic knowledge and laboratory skills in medical biochemistry;
- Recognize, analyze, and comment on the importance, as well as the scientific and social issues of medical biochemistry in clinical practice;
- Develop practical skills in goal-setting, self-learning, critical thinking, problem-solving, team-work, and communication skills through the various types of learning activities offered by the course;
- Gain learning methodologies that promote life-long learning in medical biochemistry and other life science-related discipline.

**Textbook:**

- Clinical Chemistry (Marshall & angert)  
(available online)
- Medical Biochemistry (Baynes & Dominiczak)  
(available online)
- Henry's Clinical Diagnosis and Management by Laboratory Methods (McPherson & Pincus)  
(available online)

**References:**

- Tietz textbook of clinical chemistry and molecular diagnostics (Carl A. Burtis et al)  
(available online);

**Schedule**

Week	Date	Activity/Experiment	Venue	Staff
1	7 Jan	- Lab Check-In/Grouping - Course introduction	MMW705	LFH
2	14 Jan	- Sway report		
3	21 Jan	- Sway report		
4	28 Jan	- Part One (a & b)	SC E408-411	Anita and Demonstrators
	4 Feb	- Chinese New Year		
5	11 Feb	- Sway report		
6	18 Feb	- Part Two (a & b)	SC E408-411	Anita and Demonstrators
7	25 Feb	- Sway report		
8	4 Mar	- Part Two (b & c)	SC E408-411	Anita and Demonstrators
9	11 Mar	- ICAC Talk - VR trial workshop	MMW 705	ICAC representatives
10	18 Mar	- Part Three (a & b)	SC E408-411	All students
11	25 Mar	- Sway report peer assessment - Tutorial of lab exam	MMW 705	ALL
	1 Apr	- Easter		
12	8 Apr	- Part 4	SC	Anita and
	9 Apr	- Part 4 follow-up	E408-411	Demonstrators
13	15 Apr	- Lab exam	CYT 209B	ALL

## Staff Correspondence

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## Course Assessment

<sup>1</sup> Performance & participation	10%
<sup>2</sup> Pre-lab quiz	20%
Data	20%
<sup>3</sup> Raw data	10%
<sup>4</sup> Presentable data	10%
Written assignment	30%
<sup>5</sup> Write-up form	20%
Sway report	10%
Lab exam	20%
Total	100%

<sup>1</sup>Each student has to sign in (at 2:30 pm) and sign out (before 5:15 pm) for all the 5 practical sessions;

<sup>2</sup>There is a pre-lab quiz before each practical session to ensure students to have adequate preparation in advance;

<sup>3</sup>Each group has to write down all of the raw data after each practical session for assessment in terms of the quality/accuracy of the data obtained. The raw data of each practical session accounts for 2% of the total mark of the course;

<sup>4</sup>Each group has to present their raw data and submit the answers of the critical thinking questions onto *Blackboard*. Each group has to work out the most appropriate way to present their raw data. The presentable data of each practical session accounts for 2% of the total mark of the course. The assessment is based on how the raw data is being presented;

<sup>5</sup>There is a set of critical thinking questions for each practical session. Students are required to complete the questions before each practical session and have discussion with the coordinator during class. After finishing the practical, the group will have to submit their answers together with the presentable data onto *Blackboard*;

### BCHE4830 Grade descriptors

Grade	Overall course
<b>A</b>	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent conceptual, procedural, and application knowledge;</li> <li>• Demonstration of excellent practical skills in terms of data accuracy;</li> <li>• Demonstration of excellent generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of excellent teamwork, leadership, and professionalism;</li> <li>• Excellent understanding of the social impact of medical biochemistry.</li> </ul>
<b>A-</b>	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent conceptual, procedural, and application knowledge;</li> <li>• Demonstration of very good practical skills in terms of data accuracy;</li> <li>• Demonstration of excellent generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of excellent teamwork, leadership, and professionalism;</li> <li>• Excellent understanding of the social impact of medical biochemistry.</li> </ul>
<b>B</b>	<ul style="list-style-type: none"> <li>• Substantial achievement of all the stated learning outcomes;</li> <li>• Demonstration of very good conceptual, procedural, and application knowledge;</li> <li>• Demonstration of satisfactory to very good practical skills in terms of data accuracy;</li> <li>• Demonstration of good to very good generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of good to very good teamwork, leadership, and professionalism;</li> <li>• Good to very good understanding of the social impact of medical biochemistry.</li> </ul>
<b>C</b>	<ul style="list-style-type: none"> <li>• Satisfactory achievement of all the stated learning outcomes;</li> <li>• Demonstration of satisfactory conceptual, procedural, and application knowledge;</li> <li>• Demonstration of fair to satisfactory practical skills in terms of data accuracy;</li> <li>• Demonstration of satisfactory generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of satisfactory teamwork, leadership, and professionalism;</li> <li>• Satisfactory understanding of the social impact of medical biochemistry.</li> </ul>
<b>D</b>	<ul style="list-style-type: none"> <li>• Minimal achievement of all the stated learning outcomes;</li> <li>• Demonstration of fair conceptual, procedural, and application knowledge;</li> <li>• Demonstration of minimum practical skills in terms of data accuracy;</li> <li>• Demonstration of fair generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li> <li>• Demonstration of fair teamwork, leadership, and professionalism;</li> <li>• Fair understanding of the social impact of medical biochemistry.</li> </ul>
<b>F</b>	<ul style="list-style-type: none"> <li>• Poor achievement of all the stated learning outcomes;</li> </ul>

- |  |  |
|--|--|
|  | <ul style="list-style-type: none"><li>• Demonstration of poor conceptual, procedural, and application knowledge;</li><li>• Demonstration of poor practical skills in terms of data accuracy;</li><li>• Demonstration of poor generic skills, such as making scientific judgement, conducting self learning, analytical and communication skills;</li><li>• Demonstration of poor teamwork, leadership, and professionalism;</li><li>• Poor understanding of the social impact of medical biochemistry.</li></ul> |
|--|--|

For reference only

## BCHE4901 Senior Experimental Project I (2018-19)

### Course Description

In this course, students carry out an independent laboratory research project either provided by the supervisor or jointly decided with the student. To fulfill the course requirement, students are required to discuss their progress with their supervisors regularly and submit a research proposal.

### Learning Outcome

Students taken this course are expected to develop the following abilities:

1. Integrate the knowledge and skills learnt previously in other courses
2. Survey scientific literature relevant to their research project
3. Read scientific literature critically to identify the scientific questions or problems
4. Design independent research project to address the scientific questions
5. Acquire hands-on research techniques in conducting experiments
6. Develop problem-solving abilities
7. Improve skills in writing scientific proposal
8. Develop a sense of responsibility and term spirit

### Course Syllabus

The students should take the initiative to discuss with their supervisors and compromise a topic for the independent research project. The students should first survey the background of their research project and identify the scientific questions they want to address. The students then design and perform the experiments for this project under the guidance of the supervisors and submit a research proposal in the term end.

### Assessment Scheme

Essays	40%
Other	60%

### Required and Recommended Readings

Relevant reference materials will be provided by the supervisor.

### Enrollment Requirements

Prerequisite: BCHE3090 (or BCHE3092)

### BCHE4901 Grade Descriptors

Grade	Overall Course
A	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent research skills;</li> <li>• Demonstration of excellent research attitude;</li> <li>• Demonstration of excellent research plan and/or outcome;</li> </ul>
A-	<ul style="list-style-type: none"> <li>• Outstanding achievement of most of the stated learning outcomes;</li> <li>• Demonstration of very good research skills;</li> <li>• Demonstration of excellent research attitude;</li> <li>• Demonstration of very good research plan and/or outcome;</li> </ul>
B	<ul style="list-style-type: none"> <li>• Substantial achievement of the stated learning outcomes;</li> <li>• Demonstration of good research skills;</li> <li>• Demonstration of good research attitude;</li> <li>• Demonstration of good research plan and/or outcome;</li> </ul>
C	<ul style="list-style-type: none"> <li>• Fair to satisfactory achievement of the stated learning outcomes;</li> <li>• Demonstration of satisfactory research skills;</li> <li>• Demonstration of satisfactory research attitude;</li> <li>• Demonstration of satisfactory research plan and/or outcome;</li> </ul>
D	<ul style="list-style-type: none"> <li>• Fair achievement of the essential parts of the stated learning outcomes;</li> <li>• Demonstration of fair research skills;</li> <li>• Demonstration of fair research attitude;</li> <li>• Demonstration of satisfactory research plan and/or outcome;</li> </ul>
F	<ul style="list-style-type: none"> <li>• Poor achievement of the stated learning outcomes;</li> <li>• Demonstration of poor research skills;</li> <li>• Demonstration of poor research attitude;</li> <li>• Demonstration of poor research plan and/or outcome;</li> </ul>

## BCHE4902 Senior Experimental Project II (2018-19)

### Course Description

Students are required to discuss their progress with their supervisor(s) regularly and submit a progress report at the end of the term. For student who will not be enrolled in BCHE4903, a final report in the form of a manuscript and an oral presentation are assessed at the end of term for performance.

### Learning Outcome

Students taken this course are expected to develop the following abilities:

1. Integrate the knowledge and skills learnt previously in other courses
2. Survey scientific literature relevant to their research project
3. Read scientific literature critically to identify the scientific questions or problems
4. Design independent research project to address the scientific questions
5. Acquire hands-on research techniques in conducting experiments
6. Develop problem-solving abilities
7. Develop data analysis and interpretation skills in logical and scientific ways
8. Improve skills in scientific writing and oral presentation
9. Develop a sense of responsibility and term spirit

### Course Syllabus

The students should continue to work on the research project from BCHE4901. Students should discuss the progress with their supervisors and submit a progress report in the term end. If the students will not continue to work on the research project in BCHE4903, they should submit a final report in the form of manuscript and present orally in the term end.

### Assessment Scheme

Essays	40%
Other	60%

### Required and Recommended Readings

Relevant reference materials will be provided by the supervisor.

### Enrollment Requirements

Pre-requisite: BCHE3090 (or BCHE3092)



### BCHE4902 Grade Descriptors

Grade	Overall Course
A	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent research skills;</li> <li>• Demonstration of excellent research attitude;</li> <li>• Demonstration of excellent research plan and/or outcome;</li> <li>• Excellent ability of problem solving;</li> </ul>
A-	<ul style="list-style-type: none"> <li>• Outstanding achievement of most of the stated learning outcomes;</li> <li>• Demonstration of very good research skills;</li> <li>• Demonstration of excellent research attitude;</li> <li>• Demonstration of very good research plan and/or outcome;</li> <li>• Very good ability of problem solving;</li> </ul>
B	<ul style="list-style-type: none"> <li>• Substantial achievement of the stated learning outcomes;</li> <li>• Demonstration of good research skills;</li> <li>• Demonstration of good research attitude;</li> <li>• Demonstration of good research plan and/or outcome;</li> <li>• Good ability of problem solving;</li> </ul>
C	<ul style="list-style-type: none"> <li>• Fair to satisfactory achievement of the stated learning outcomes;</li> <li>• Demonstration of satisfactory research skills;</li> <li>• Demonstration of satisfactory research attitude;</li> <li>• Demonstration of satisfactory research plan and/or outcome;</li> <li>• Satisfactory ability of problem solving;</li> </ul>
D	<ul style="list-style-type: none"> <li>• Fair achievement of the essential parts of the stated learning outcomes;</li> <li>• Demonstration of fair research skills;</li> <li>• Demonstration of fair research attitude;</li> <li>• Demonstration of satisfactory research plan and/or outcome;</li> <li>• Fair ability of problem solving;</li> </ul>
F	<ul style="list-style-type: none"> <li>• Poor achievement of the stated learning outcomes;</li> <li>• Demonstration of poor research skills;</li> <li>• Demonstration of poor research attitude;</li> <li>• Demonstration of poor research plan and/or outcome;</li> <li>• Poor ability of problem solving;</li> </ul>

## **BCHE4903 Senior Experimental Project III (2018-19)**

### **Course Description**

In this course, students continue to work on and finish up the research project from BCHE4902. Relevant data analysis and conclusion formulation are performed after discussion with supervisors. A final report in the form of a manuscript and an oral presentation are assessed at the end of term for performance.

### **Learning Outcome**

Students taken this course are expected to develop the following abilities:

1. Integrate the knowledge and skills learnt previously in other courses
2. Survey scientific literature relevant to their research project
3. Read scientific literature critically to identify the scientific questions or problems
4. Design independent research project to address the scientific questions
5. Acquire hands-on research techniques in conducting experiments
6. Develop problem-solving abilities
7. Develop data analysis and interpretation skills in a logical and scientific ways
8. Improve skills in scientific writing and oral presentation
9. Develop a sense of responsibility and team spirit

### **Course Syllabus**

The students should continue to work on the research project from BCHE4902. Students should discuss the progress with their supervisors and submit a final report in the form of manuscript and present orally in the term end.

### **Assessment Scheme**

Essays	40%
Presentation	40%
Other	20%

### **Required and Recommended Readings**

Relevant reference materials will be provided by the supervisor.

### **Enrollment Requirements**

Pre-requisite(s): BCHE3090 (or BCHE3092) & BCHE4902.

## BCHE4903 Grade Descriptors

Grade	Overall Course
A	<ul style="list-style-type: none"> <li>• Outstanding achievement of all the stated learning outcomes;</li> <li>• Demonstration of excellent research and critical thinking skills;</li> <li>• Demonstration of excellent research attitude;</li> <li>• Demonstration of excellent research planning and problem solving skills;</li> <li>• Demonstration of excellent understanding of research methodologies and data analysis;</li> <li>• Demonstration of excellent scientific communication skills;</li> <li>• Excellent research output;</li> </ul>
A-	<ul style="list-style-type: none"> <li>• Outstanding achievement of most of the stated learning outcomes;</li> <li>• Demonstration of excellent research and critical thinking skills;</li> <li>• Demonstration of excellent research attitude;</li> <li>• Demonstration of excellent research planning and problem solving skills;</li> <li>• Demonstration of excellent understanding of research methodologies and data analysis;</li> <li>• Demonstration of excellent scientific communication skills;</li> <li>• Very good research output;</li> </ul>
B	<ul style="list-style-type: none"> <li>• Substantial achievement of the stated learning outcomes;</li> <li>• Demonstration of very good research and critical thinking skills;</li> <li>• Demonstration of very good research attitude;</li> <li>• Demonstration of good to very good research planning and problem solving skills;</li> <li>• Demonstration of good to very good understanding of research methodologies and data analysis;</li> <li>• Demonstration of very good scientific communication skills;</li> <li>• Good to very good research output;</li> </ul>
C	<ul style="list-style-type: none"> <li>• Fair to satisfactory achievement of the stated learning outcomes;</li> <li>• Demonstration of satisfactory to good research and critical thinking skills;</li> <li>• Demonstration of good research attitude;</li> <li>• Demonstration of satisfactory to good research planning and problem solving skills;</li> <li>• Demonstration of satisfactory to good understanding of research methodologies and data analysis;</li> <li>• Demonstration of good scientific communication skills;</li> <li>• Satisfactory to good research output;</li> </ul>

D	<ul style="list-style-type: none"> <li>• Fair achievement of the essential parts of the stated learning outcomes;</li> <li>• Demonstration of fair to satisfactory research and critical thinking skills;</li> <li>• Demonstration of satisfactory research attitude;</li> <li>• Demonstration of fair to satisfactory research planning and problem solving skills;</li> <li>• Demonstration of fair to satisfactory understanding of research methodologies and data analysis;</li> <li>• Demonstration of satisfactory scientific communication skills;</li> <li>• Minimal research output;</li> </ul>
F	<ul style="list-style-type: none"> <li>• Poor achievement of the stated learning outcomes;</li> <li>• Demonstration of poor research and critical thinking skills;</li> <li>• Demonstration of poor research attitude;</li> <li>• Demonstration of poor to fair research planning and problem solving skills;</li> <li>• Demonstration of poor understanding of research methodologies and data analysis;</li> <li>• Demonstration of poor scientific communication skills;</li> <li>• Poor research output;</li> </ul>

## **BCHE4910 Group Research in Biochemistry (2018-19)**

### **Course Description**

This course is a capstone course consists of group projects to investigate the heated topics related to Biochemistry, such that students will be inspired by how Biochemistry has made its impact on the globalized knowledge-based society of Hong Kong.

### **Learning Outcome**

1. Recognize how biochemistry makes various impacts on the society of Hong Kong;
2. Develop practical research skills of information search from various types of databases;
3. Recognize, analyze, and comment on the scientific and ethical issues of certain applications of Biochemistry in Hong Kong;
4. Develop practical skills in team building, problem-solving and communication through different types of learning activities;
5. Gain learning methodologies that promote life-long learning in Biochemistry to promote its impact on the society.

### **Course Syllabus**

Students should form groups with three to four students at the beginning of Term 1. Students in one group should identify a project area and confirm their project title and content by the end of the ADD/DROP period with a written proposal. The project will last for 6-8 weeks, where the students in a group are required to investigate a specific topic with team work and team building elements. This project should not be just a purely academic research study but a project related to various impact of biochemistry on the society of Hong Kong with or without some wet laboratory components. At the end of the course, the students will present their findings and conclusions in an open poster presentation and submit a written report.

Potential projects should include components as follows,

#### **1. Knowledge-oriented sessions-**

Students should attend workshop or tutorials, in which the core knowledge of relevant scientific knowledge of biochemistry, including scientific paper reading and writing and basic calculation and statistics in Biochemistry, etc. are given.

#### **2. Technical skill-orientated sessions-**

Students should arrange their practical training, including information technology and data search, computer software for data analysis, etc. for their projects.

### 3. Experience and exposure sessions-

Students should participate in various learning activities such as 1) surveys, 2) site visits, 3) field studies, etc. and learn to appreciate the applications of Biochemistry for social enterprises.

### 4. Team work and team building-

Students should learn the importance of good collaboration among the people working in a group to achieve a shared goal. The team members should share the vision to complete the project effectively and efficiently before a deadline. Also, students working in a team should learn to trust and respect each other and every member should have its own duties and responsibilities.

### Assessment Scheme

Essays	40
Presentation	30
Other	30

### Grade Descriptors

Grade	Overall Course
A	<ul style="list-style-type: none"><li>• Outstanding achievement of all the stated learning outcomes;</li><li>• Demonstration of excellent critical thinking skills;</li><li>• Demonstration of excellent professionalism;</li><li>• Demonstration of excellent project planning and problem solving skills;</li><li>• Demonstration of excellent understanding of literature research and data analysis;</li><li>• Demonstration of excellent communication skills and team work;</li><li>• Project findings with excellent social relevance;</li></ul>
A-	<ul style="list-style-type: none"><li>• Outstanding achievement of most of the stated learning outcomes;</li><li>• Demonstration of excellent critical thinking skills;</li><li>• Demonstration of excellent professionalism;</li><li>• Demonstration of excellent project planning and problem solving skills;</li><li>• Demonstration of excellent understanding of literature research and data analysis;</li><li>• Demonstration of excellent communication skills and team work;</li><li>• Project findings with very good social relevance;</li></ul>

B	<ul style="list-style-type: none"> <li>• Substantial achievement of the stated learning outcomes;</li> <li>• Demonstration of very good critical thinking skills;</li> <li>• Demonstration of very good professionalism;</li> <li>• Demonstration of good to very good project planning and problem solving skills;</li> <li>• Demonstration of good to very good understanding of literature research and data analysis;</li> <li>• Demonstration of very good communication skills and team work;</li> <li>• Project findings with good to very good social relevance;</li> </ul>
C	<ul style="list-style-type: none"> <li>• Fair to satisfactory achievement of the stated learning outcomes;</li> <li>• Demonstration of satisfactory to good critical thinking skills;</li> <li>• Demonstration of professionalism;</li> <li>• Demonstration of satisfactory to good project planning and problem solving skills;</li> <li>• Demonstration of satisfactory to good understanding of literature research and data analysis;</li> <li>• Demonstration of good communication skills and team work;</li> <li>• Project findings with satisfactory to good social relevance;</li> </ul>
D	<ul style="list-style-type: none"> <li>• Fair achievement of the essential parts of the stated learning outcomes;</li> <li>• Demonstration of fair to satisfactory critical thinking skills;</li> <li>• Demonstration of minimal professionalism;</li> <li>• Demonstration of fair to satisfactory project planning and problem solving skills;</li> <li>• Demonstration of fair to satisfactory understanding of literature research and data analysis;</li> <li>• Demonstration of satisfactory communication skills and team work;</li> <li>• Project findings with minimal social relevance;</li> </ul>
F	<ul style="list-style-type: none"> <li>• Poor achievement of the stated learning outcomes;</li> <li>• Demonstration of poor critical thinking skills;</li> <li>• Demonstration of poor professionalism;</li> <li>• Demonstration of poor to fair project planning and problem solving skills;</li> <li>• Demonstration of poor understanding of literature research and data analysis;</li> <li>• Demonstration of poor communication skills and team work;</li> <li>• Project findings with poor social relevance;</li> </ul>

### **Required and Recommended Readings**

- Stuart Johnson & Jon Scott. (2014). Study & Communication Skills for the Biosciences, 2nd ed. Oxford University Press.
- Stephanie Evergreen. (2017). Presenting Data Effectively: Communicating Your Findings for Maximum Impact. SAGE Publications, Inc.
- Andrew Blann. (2014). Data Handling and Analysis. OUP Oxford.
- Nessar Ahmed, Hedley Glencross & Qiuyu Wang. (2016). Biomedical Science Practice, 2nd ed. OUP Oxford.

### **Enrollment Requirements**

Pre-requisite(s): BCHE3090 (or BCHE3092).

Other requirement(s): Not for students who have taken BCHE4902 or LSCI4000.

- END -



## Guidelines for LSCI4000 (Literature Research in Life Sciences)

### 生命科學文獻專題研究

#### Course Description:

Students, with the help of the supervisor, will find an interesting research topic in life sciences to perform a literature research, and critically assess the scientific basis of the conclusions drawn. Students will discuss regularly with a supervisor, summarize the research findings in an oral presentation and a written report.

學生將會在導師的指導下，找一個有關於生命科學的課題進行文獻研究，從以了解論文所得之結論的科學依據。學生須定期與導師討論，並將研究總結作口頭簡報及提交論文。

#### Course Syllabus:

Students, with the help of the supervisor, will find an interesting research topic in life sciences to perform a literature research. The students will first search for the relevant scientific literatures using online databases such as PubMed ([www.pubmed.org](http://www.pubmed.org)). The scientific literatures should cover both reviews articles as well as **original research papers**. The students should understand the methodology of research described so that they can critically assess the experimental basis of the conclusions drawn in these papers. After reading a number of relevant papers in the selected topics, the students will summarize the research findings, critically analyze the information obtain and propose the way forward; platform and written presentations are required.

#### Learning Outcome:

The students will be able to:

1. find relevant scientific literature in life sciences
2. interpret and analyze the experimental data presented in the scientific literature
3. understand the research methodology
4. summarize the findings in the scientific literature, and present them to the peers
5. write a review article on a current research topic in life sciences

#### 1. Oral presentation: 40%

Each student will have 15 minutes for presentation, and 5 minutes for discussion. The oral presentation will be graded according to the following criteria:

(1) **Content** (15%): Can the students demonstrate that they have provided an in-depth understanding of the topics they have chosen? (5%) Have they presented original research findings with relevant citations? (5%) Have they demonstrated that they understand the methodology of how these research findings are obtained? (5%)

(2) **Critical Thinking** (10%): Do the students understand the limitation of the research methodology they presented? (4%) Can the students formulate alternative interpretation of

the experimental data? (3%) Can the students provide insights into future direction of research? (3%)

(3) **Presentation Skill** (10 %) Are the slides clear and of good quality? (5%) Is the presentation in logical flow and well organized? (5%)

(4) **Discussion** (5 %): Can the student respond well to the questions raised (2.5%), and demonstrate that they have a thorough understanding of the topic presented? (2.5%)

(5) **Time management**: 1 mark will be deducted per minute of over-time.

(6) **Participation in Q&A bonus**: In each Q&A section, the students are encouraged to ask questions. The students will receive 2 marks for each excellent question asked, and 1 mark for good question. The maximum bonus marks a student can obtain is 5.

### Attendance of the oral presentation

For students who are late for their presentations, no extra time will be compensated (e.g. if s/he is late for 10 minutes, the maximum time allowed for his/her presentation will be 20 minutes; if s/he is late for 20 minutes, the time allowed will be 10 minutes; if s/he is late for 30 minutes or more, it assumes that s/he gives up his/her presentation). One sub-grade (e.g. A- to B+) will be deducted when a student fails to attend his/her whole day (both morning and afternoon sessions) oral presentation session.

### Score Sheet:

Items	Descriptions	Marks
<b>Content</b> (15%)	<ul style="list-style-type: none"> <li>Can the student demonstrate that s/he has provided an in-depth review on the topics s/he chosen? (5%)</li> <li>Has s/he presented original research findings? (5%)</li> <li>Has s/he demonstrated that they understand the methodology of how these research findings are obtained? (5%)</li> </ul>	
<b>Critical Thinking</b> (10%)	<ul style="list-style-type: none"> <li>Does the student understand the limitation of the research methodology they presented? (4%)</li> <li>Can the student formulate alternative interpretation of the experimental data? (3%)</li> <li>Can the student provide insights into future direction of research? (3%)</li> </ul>	
<b>Presentation Skill</b> (10%)	<ul style="list-style-type: none"> <li>Are the slides clear and of good quality? (5%)</li> <li>Is the presentation in logical flow and well organized? (5%)</li> </ul>	
<b>Discussion</b> (5%)	<ul style="list-style-type: none"> <li>Can the student respond well to the questions raised, and demonstrate that s/he has a thorough understanding of topic presented?</li> </ul>	

## 2. Written Report (40%)

The students are required to submit a written report on the topics they have selected. The detailed format should follow those described for the Annual Reviews. You should refer to the “Author Handbooks” at the web page of Annual Reviews

<http://www.annualreviews.org/page/authors/author-instructions/preparing/handbooks>). **Each written report must contain at least 5,000 words and no more than 8,000 words; around 8 to 10 figures/tables/diagrams must be included.** Any experimental data or other published information must be cited in accordance to the University guidelines on Honesty in Academic Work.

In brief, the manuscript should contain the following components:

1. Title
2. Abstract (within 400 words)
3. Keywords
4. Graphical Abstract (optional)
5. List of abbreviations and acronyms
6. Introduction (background), with aims of the paper at the end
7. Contents – with listing of section headings and page numbers
8. Main text – divided into section headings
9. Conclusions and future perspectives
10. References

The length of the review article should be around ~50 A4 pages (12pt fonts; top/bottom/right/left margin = 2.5/2.5/2.5/3.0 cm; double-line spacing)

The review article will be graded according to:

Items	Descriptions	Marks
<b>Content (15%)</b>	<ul style="list-style-type: none"> <li>• Can the student demonstrate that s/he has provided an in-depth review on the topics s/he chosen? (5%)</li> <li>• Has s/he presented original research findings? (5%)</li> <li>• Has s/he demonstrated that they understand the methodology of how these research findings are obtained? (5%)</li> </ul>	
<b>Critical Thinking (10%)</b>	<ul style="list-style-type: none"> <li>• Does the student understand the limitation of the research methodology they presented? (4%)</li> <li>• Can the student formulate alternative interpretation of the experimental data? (3%)</li> <li>• Can the student provide insights into future direction of research? (3%)</li> </ul>	
<b>Presentation Skill (10%)</b>	<ul style="list-style-type: none"> <li>• Is the report clear and nicely written? (5%)</li> <li>• Is the presentation in logical flow and well organized? (5%)</li> </ul>	

### Late submission of the written report

**One sub-grade (e.g. A- to B+) will be deducted for each day of late-submission.**

### 3. Supervisor marks: 20%

The supervisors will give marks according to their students' attitudes and engagement.

### Meeting with supervisor

The students are required to meet their supervisors at least three times within a term. Marks will be deducted from the supervisor marks if the students fail to do so (**Note: failure to meet supervisors as required may lead to failure of the course**). It is the responsibility of the students to take the initiative to make appointment with their supervisor. The students should plan your meeting schedule ahead, and 'supervisor cannot be reached' is not an excuse for failure to meet this requirement.

As a general guideline, in the 1<sup>st</sup> meeting (preferable in the first month of the term), the students are expected to discuss with their supervisors on potential topics of literature reviews. The students should then perform a preliminary survey of literatures and finalized the reviews topics with the supervisor in the 2<sup>nd</sup> meeting. In the 3<sup>rd</sup> meeting, the students should discuss with the supervisor on the final outline of the oral presentation and draft the abstract of the presentation.

Meeting Date	Meeting check-list (completed by supervisor)	Supervisor Signature
September or January	<input type="checkbox"/> Has the student discussed the literature research topic with you? <input type="checkbox"/> Was the student well prepared for the discussion with you? <input type="checkbox"/> Other comments	<input type="checkbox"/> Requirement met <input type="checkbox"/> Requirement not met Signature:
September or January	<input type="checkbox"/> Has the student discussed the plan of the final year project with you? <input type="checkbox"/> Has the student taken an initiative to work on the final year project? <input type="checkbox"/> Has the student reasonably read the required books? <input type="checkbox"/> Other comments	<input type="checkbox"/> Requirement met <input type="checkbox"/> Requirement not met Signature:
October or February	<input type="checkbox"/> Has the student discussed the outline of the oral presentation with you? <input type="checkbox"/> Has the student discussed the abstract of the oral presentation with you? <input type="checkbox"/> Has the student reasonably read the required books? <input type="checkbox"/> Other comments	<input type="checkbox"/> Requirement met <input type="checkbox"/> Requirement not met Signature:
November or March	<input type="checkbox"/> Has the student reasonably read the required books? <input type="checkbox"/> Has the student rehearsed the oral presentation with you? <input type="checkbox"/> Others, please specify	<input type="checkbox"/> Requirement met <input type="checkbox"/> Requirement not met Signature:
November or March	<input type="checkbox"/> Has the student discussed the manuscript with you? <input type="checkbox"/> Has the student gone through any sample	<input type="checkbox"/> Requirement met <input type="checkbox"/> Requirement

	manuscripts of your former students? <input type="checkbox"/> Has the student let you preview the manuscript? <input type="checkbox"/> Other comments	not met Signature:
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### Required reading for generic skill development:

Johnson & Scott. (2014). Study and communication skills for the biosciences, 2<sup>nd</sup> ed. Oxford: Oxford University Press. (QH315.J64 2014)

Blann, AD. (2015). Data handling and analysis. Oxford: Oxford University Press. (WA950.B5853 2015)

### Grade Descriptors

Grade	Overall Course
A	<ul style="list-style-type: none"> <li>Outstanding achievement of all the stated learning outcomes;</li> <li>Demonstration of excellent critical thinking skills</li> <li>Demonstration of excellent understanding of research methodologies;</li> <li>Demonstration of excellent understanding of data analysis and interpretation;</li> <li>Demonstration of excellent scientific communication skills;</li> <li>Excellent contents of literature research;</li> </ul>
A-	<ul style="list-style-type: none"> <li>Outstanding achievement of most of the stated learning outcomes;</li> <li>Demonstration of very good critical thinking skills</li> <li>Demonstration of very good understanding of research methodologies;</li> <li>Demonstration of very good understanding of data analysis and interpretation;</li> <li>Demonstration of very good scientific communication skills;</li> <li>Very good contents of literature research;</li> </ul>
B	<ul style="list-style-type: none"> <li>Substantial achievement of the stated learning outcomes;</li> <li>Demonstration of good critical thinking skills</li> <li>Demonstration of good understanding of research methodologies;</li> <li>Demonstration of good understanding of data analysis and interpretation;</li> <li>Demonstration of good scientific communication skills;</li> <li>Good contents of literature research;</li> </ul>
C	<ul style="list-style-type: none"> <li>Fair to satisfactory achievement of the stated learning outcomes;</li> <li>Demonstration of satisfactory critical thinking skills</li> <li>Demonstration of satisfactory understanding of research methodologies;</li> <li>Demonstration of satisfactory understanding of data analysis and interpretation;</li> <li>Demonstration of satisfactory scientific communication skills;</li> <li>Satisfactory contents of literature research;</li> </ul>
D	<ul style="list-style-type: none"> <li>Fair achievement of the essential parts of the stated learning outcomes;</li> <li>Demonstration of fair critical thinking skills</li> <li>Demonstration of fair understanding of research methodologies;</li> <li>Demonstration of fair understanding of data analysis and interpretation;</li> <li>Demonstration of satisfactory scientific communication skills;</li> <li>Fair contents of literature research;</li> </ul>
F	<ul style="list-style-type: none"> <li>Poor achievement of the stated learning outcomes;</li> <li>Demonstration of poor critical thinking skills</li> <li>Demonstration of poor understanding of research methodologies;</li> <li>Demonstration of poor understanding of data analysis and interpretation;</li> <li>Demonstration of poor scientific communication skills;</li> <li>Poor contents of literature research;</li> <li><b>Plagiarized materials found.</b></li> </ul>

## Research Ethics

In compliance with the University's Guidelines on Research Ethics and Policies, graduates of SLS are encouraged to complete the online research ethics training (<https://www.research-ethics.cuhk.edu.hk/orctsResearch/>) and obtain the certificate awarded.

## Plagiarism

The University adopts a policy of zero tolerance on plagiarism. Any related offence will lead to disciplinary action including termination of studies at the University. All students must also submit a softcopy of the manuscript to the Veriguide System at <http://www.cuhk.edu.hk/veriguide>. A signed veriguide form should be submitted together with the report.

The students should visit <http://www.cuhk.edu.hk/policy/academichonesty/> for the CUHK's guideline for plagiarism. In particular, the Appendix A and B of the web page give detailed examples on the proper use of source material. "I didn't know this is plagiarism" is not an acceptable excuse. **Using other people to write the report for you is also a fraud and unacceptable.**