

Macao Polytechnic Institute
School of Health Sciences and Sports
Bachelor of Science in Biomedical Technology
(Medical Laboratory & Pharmacy Technology)
Module Outline

Academic Year 2020 / 2021 Semester 2

Learning Module	Biochemistry (生物化學)			Class Code	BSBC1102
Pre-requisite Course	Nil				
Language of Instruction	Cantonese & English			Credit	4
Lecture Hours	46 hrs	Lab/Practice Hours	14 hrs	Total Hours	60 hrs
Instructor	Lam Im Fong, Cristina		E-mail	iflam@ipm.edu.mo	
Office	Rm. M706, Meng Tak Building, Main Campus		Telephone	8599 3432	

Description

This 45-hour learning module is one of the foundation modules of the biomedical sciences program. It involves the study of the molecular composition of living cells. This course focuses on the organization, the structure, the function and the metabolic mechanisms of biological molecules within the cell. Along with the study of the macromolecules, we provide several laboratory practices with methods and approaches used in biochemical research will be presented as will the biochemical basis of some disease states.

Learning Outcomes

After completing the learning module, students will be able to:

1. Understand basic biochemistry theory.
2. Master the basic biochemistry laboratory techniques.
3. Study successive modules; Clinical biochemistry, Molecular biology, Molecular Genetics ...etc.

Content

Theory

1. Introduction to biochemistry (1 class hour)
 - 1.1 Universe arose
 - 1.2 Cellular foundations
 - 1.3 Evolutionary foundations

2. Cell and Molecules (1 class hour)
 - 2.1 Eukaryocytes
 - 2.2 Archaea
 - 2.3 Prokaryocytes
 - 2.4 Water
 - 2.5 pH
 - 2.6 Interactions between the molecules

3. Amino acids and Peptides (2 class hours)
 - 3.1 Structural features
 - 3.2 Acid base role
 - 3.3 Formation of peptides
 - 3.4 Ionization behavior

4. Proteins (4 class hours)
 - 4.1 Biological functions
 - 4.2 Covalent structure
 - 4.3 Sequence and evolution
 - 4.4 Primary, secondary, tertiary and quaternary structure

5. Nucleotides and nucleic acids (4 class hours)
 - 5.1 Structure
 - 5.2 Biological function

6. Lipids (2 class hours)
 - 6.1 Storage
 - 6.2 Structure in membrane
 - 6.3 Role of lipids

7. Carbohydrates and Glycobiology (4 class hours)
 - 7.1 Monosaccharides and disaccharides
 - 7.2 Polysaccharides
 - 7.3 Sugar code

8. Enzyme (4 class hours)
 - 8.1 Nomination
 - 8.2 Kinetics
 - 8.3 Enzymatic reactions
 - 8.4 Specificity
 - 8.5 Regulation
 - 8.6 Mechanisms of enzyme action

9. Glycolysis, Gluconeogenesis and Pentose phosphate pathway (4 class hours)
 - 9.1 Glycolysis overview
 - 9.2 Glycolysis pathway
 - 9.3 Fates of Pyruvate fermentation
 - 9.4 Gluconeogenesis
 - 9.5 Pentose phosphate pathway of glucose oxidation

10. Metabolic regulation of glucose and glycogen (4 class hours)
 - 10.1 Metabolism of glycogen in animals
 - 10.2 Regulation of metabolic pathways
 - 10.3 Coordinated regulation of glycolysis and gluconeogenesis
 - 10.4 Coordinated regulation of glycogen synthesis and breakdown

11. Citric acid cycle (4 class hours)
 - 11.1 Production of Acetyl-CoA
 - 11.2 Reactions of the Citric acid cycle
 - 11.3 Regulation of the Citric acid cycle

12. Fatty acid catabolism (4 class hours)
 - 12.1 Digestion, mobilization and transport
 - 12.2 Oxidation of fatty acid
 - 12.3 Ketone bodies

13. Lipid biosynthesis (4 class hours)
 - 13.1 Biosynthesis of Fatty acids and Eicosanoids
 - 13.2 Biosynthesis of Triacylglycerols
 - 13.3 Biosynthesis of membrane Phospholipids
 - 13.4 Biosynthesis of Cholesterol, Steroids and Isoprenoids

14. Test (2 class hours)

15. Final-term exam (2 class hours)

16. Laboratory experiments (14 class hours)

Teaching Method

Lectures, discussion, videos

Practice

Laboratory

1. Total protein and Albumin detection (4 class hours)
(Master: apply knowledge, familiar through practicing)
Students per group: 4
Requirement: Laboratory operation & Report
2. Calcium detection and Liver protein extraction (5 class hours)
Students per group: 4
Requirement: Laboratory operation & Report
3. Human DNA extraction (5 class hours)
(Master: apply knowledge, familiar through practicing)
Students per group: 4
Requirement: Laboratory operation & Report

Attendance

Attendance requirements are governed by the “Academic Regulations Governing Bachelor’s Degree Programmes of Macao Polytechnic Institute”. Students are not eligible to attend the final examination and re-sit examination if the absence rate exceeds 30%. Moreover, an “F” will be given as the final grade to students who have less than the stated attendance for this enrolled module.

Assessment

Any students scoring less than 35% of the total mark in the final examination will be given an “F” grade for the learning module even if the overall grade is 50% or higher.

Any student whose final score is below 35% is not entitled to take the re-sit examination.

Examinations

The examinations are graded according to the percentage, with 100 being the full score and 50 the passing score.

Item	Description	Percentage	Submit Date
Mid-term exam	Lecture 1 – Lecture 16	35%	30/Mar/21
Final examination	The remain lectures	50%	21/May/21
Re-sit	All lectures		

Laboratory reports

The reports are graded according to the percentage, with 100 being the full score and 50 the passing score.

Item	Description	Percentage	Submit Date
Lab Report 1	Experiment: Total protein and Albumin detection	3%	
Lab Report 2	Experiment: Calcium detection and Liver protein extraction	3%	
Lab Report 3	Experiment: Human DNA extraction	4%	

Laboratory reports

The reports are graded according to the percentage, with 100 being the full score and 50 the passing score.

Item	Description	Percentage	Submit Date
Quiz or assignment	To be followed	5%	

Total Percentage: 100%

Reference

Reference Books:

- Biochemistry 6th ed./2017 Reginald H. · Charles M. Grisham , ISBN 978-1-305-88604-9
- Lehninger Principles of Biochemistry 7th ed./2017 David L. Nelson · Michael M. Cox, W. H. Freeman, ISBN 978-1464126116
- Biochemistry 9th ed./2019 Jeremy M. Berg · Lubert Stryer · John Tymoczko · Gregory J. Gatto, W. H. Freeman, ISBN 978-1-319-24806-2