

**Mutah University**

**Academic development and Quality Assurance Center**

**Course Plan Specification Form**

**Course: Biochemistry**

**Faculty of Medicine**

**Department: Biochemistry and Molecular Biology**

**Academic Year: 2020-2021**

A. Course specification and |General information:

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| University of Mutah | Course Title: Biochemistry |
| Faculty of Medicine | Code: 1503101 |
| Department: Biochemistry and Molecular Biology | Credit Hours: 3 hours |
| Semester/Academic year: Second / 2020-2021 | Instructors: Teaching staff |
| Office hours: Variable according to the staff members | Course level: First year |

**B. Objectives and Expected Learning Outcomes:**

This three-credit hour course is mandatory for first-year medical students. The course is designed to introduce medical students to general biochemistry. It focuses on the basic concepts of structures and functions of macromolecules: Carbohydrates, Proteins, Lipids and Nucleic acids. A large portion of the course will also cover detailed information of enzymes, their mechanisms of action, their regulation, and their uses in biology and medicine with an emphasis to cofactors critical for enzyme function and mechanism of actions, clinical enzymology, and isoenzymes.

1. Knowledge:

A. Lectures:

- Understand the involvement of biochemistry in medicine

- Differentiate the types and characteristics of chemical forces or bonds and their involvement in chemical reactions

- Recall the concepts of acids, bases, amphoteric molecules, ionization of water and weak acids, pH and buffers

- Know the chemical concept of different types of buffers, buffering capacity, midpoint, and apply the Henderson-Hasselbalch equation and mechanisms of buffer actions and their significance in physiological conditions

- Review of basic organic chemistry and functional groups in biomolecules

- Carbohydrates: introduction, chemistry, classification (e.g. monosaccharides, disaccharides and polysaccharides) and their medical importance

- Lipids: introduction, definition, classifications, structure and function of lipids (fatty acids, triglycerides, waxes, phospholipids, glycolipids, and steroids)

- Amino acids: List of the 20 Standard amino acids, categories, structures, classifications, stereochemistry, isomerism, modified and specialized amino acids

- Identify the ionization states of amino acids and know the concept of isoelectric point

- Proteins: introduction, definition, classifications, structure and function

- Recall of features of peptide bond and the four levels of protein structure

- Define enzymes and recall the general properties and functions of enzymes, their inhibition and regulation

- Understand role of cofactors in enzyme function with emphasis of vitamins

- Understand the concept of bioenergetics

- Define and list vitamins and understands their uses and deficiency states

- Define and list minerals and understands their uses and deficiency states

- Identify the composition of various body fluids

B. Laboratory:

- Be acquainted of laboratory safety, data collection and reporting

- Be proficient in liquid handling and pipetting

- Preparation of solutions, buffers and determination of pH

- Determination of protein measurements

- Performance of protein electrophoresis

- Quantification of proteins by spectrophotometry

- Isolation of proteins by sized-exclusion chromatography

- Qualitative tests for detection and identification of carbohydrates

- Determination of optimum conditions for enzymatic activity

2. Skills:

- Identify the different biomolecules (Carbohydrates, Proteins, Lipids), understand the concept of metabolism and recognize how they are related to physiological and pathological functions

- Be able to read and comprehend biochemistry textbooks

- Using the laboratory instruments and understand the scientific basis of their usage

- The use of the special instructions for the laboratory investigations

- Analyzing the results of the experiments and establishing the scientific conclusions

C. Course Plan Distribution and Learning Resources

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|  | **Topics to be Covered** |
| **Lectures** | |
|  | **Introduction into biochemistry**  **Chemical composition of biomolecules**  Functional groups Chemical reactions  **Classes of macromolecules**  **pH and buffers**  **Amino acids** Classes Properties  **Polypeptides**  Peptide formation  Structure (examples of fibrous and globular proteins) Ionic properties  Folding  Physiological significance  **Proteins**  Structure Denaturation Classification General functions  **Enzymes-General description**  Nomenclature Classification Specificity Isozymes  **Enzyme-Kinetics**  Michaelis-Menten equation Lineweaver-Burke plot  Competitive versus non-competitive inhibition Other influencing factors (pH, temperature)  **Enzyme-Regulation**  **Enzymes-Cofactors and vitamins**  Types and physiological roles Clinical enzymology  **Chemistry of carbohydrates**  Classification,  Isomerization  **Chemistry of lipids**  Chemical structure, function with clinical correlations of different lipid classes (fatty acids, acylglycerols, phospholipids, glycolipids, lipoproteins, steroids and bile acids)  **Vitamins**  Chemical structure, metabolic role and deficiency syndromes of fat soluble vitamins (A, D, E, K) as well as water-soluble vitamins (Thiamins, Riboflavin, Niacin, Cobalamin and folic acid)  **Minerals**  Chemical structure, absorption, metabolic role and deficiency  syndromes  **Body Fluids**  Brief introduction to various types of body fluids and their main  composition |

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| **Learning resources** |

* Marks' Basic Medical Biochemistry: A Clinical Approach, Smith,

C. Lippincott Williams & Wilkins, (Latest version).

* Lippincott's Illustrated Reviews: Biochemistry (Lippincotts' Illustrated Reviews). Champe, P. C., Harvey, R. A, and Ferrier, D.

R. Lippincott's Williams, and Wilkins, (Latest version).

* [Biochemistry](http://www.ncbi.nlm.nih.gov/books/bv.fcgi?call=bv.View..ShowTOC&rid=stryer.TOC&depth=2). Berg, J. M., Tymoczko, J. L., and Stryer, L. [W. H.](http://bcs.whfreeman.com/biochem5/default.asp?s&n&i&v&o&ns=0&uid=0&rau=0) [Freeman and Co.](http://bcs.whfreeman.com/biochem5/default.asp?s&n&i&v&o&ns=0&uid=0&rau=0); (Latest version).
* Biochemistry Voet, D., Voet, J. G. Wiley. (Latest version).

D. Teaching strategies

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| No. |  |
| 1 | Lectures |
| 2 | Laboratories |

**E. Methods of Assessment**

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| No. | Assessment Task | Proportion of Final Assessment |
| 1 | Midterm Exam | 40% out of the final mark (including 5% questions of the practical course) |
| 2 | Final Exam | 60% out of the final mark (including 10% questions of the practical course) |
| Total | | 100% |

**F. General Instructions**

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| No. |  |
| 1 | All University rules are adopted strictly by the department |