

**Biochemistry Course Catalogue**

**2022-2023**

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| **College** | **Erbil Health Technical** | |
| **Department** | **Medical Laboratory Technology** | |
| **Module Name** | **Biochemistry** | |
| **Module Code** | **HUP** | |
| **Semester** | **3** | |
| **ECTS** | **6** | |
| **Module type** | **Core** | |
| **Weekly hours** | **2** |  |
| **Weekly hours (Theory)** | **(2) hr. Class** | **( )hr Workload** |
| **Weekly hours (Practical)** | **(3) hr. Class** | **( )hr Workload** |
| **Lecturer (Theory)** | **Lecturer Dr. Burhan Ahmed Salih** | |
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| **Lecturer (Practical)** | **Lecturer Shahlaa Shafiq Rozoqi** | |
| **Email** |  | |

**Course Book**

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| * **Course overview:**   Biochemistry is the use of molecular methods to investigate, explain and manipulate biological processes. The study of life at the molecular level continues to undergo dynamic expansion, leading to ever-increasing insights into topics as various as the origin of life, the nature of disease and the development of individual organisms.  This course provides an overview of the main aspects of biochemistry by relating molecular interactions to their effects on the organism as a whole, especially as related to human biology. | | |
| * **Course objective:**   Upon successful completion of this course, students will be able to   1. Possess a general understanding of the major types of biochemical molecules, including small, large and supermolecular components found in cells; 2. Be able to immediately recognize the different types of biochemical molecules and know their essential chemical characteristics that make them indispensible for life; 3. learns the chemistry of carbohydrate, lipid and proteins and its importance in the molecular level, structure, classification, function for living organisms, as it provide the body with energy. Identify the metabolic fate of carbohydrate (glycolysis) and lipids (β- oxidation). 4. explain the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways. 5. Identify some of common reaction mechanisms in biochemical processes; 6. Describe how enzymes work and know how to determine basic enzyme kinetics; 7. Recognize the value of the importance of biochemistry in everyday life 8. Comprehend the role biochemistry in the practice of medicine and medical research; | | |
| * **Student's obligation**   To expose you to a seeking mentality in a laboratory setting.  To expose you to an environment that will require you to problem solve when experimental failure occurs.  To produce an environment in which you collaborate with fellow students. | | |
| * **Forms of teaching**   Lecture halls with data show equipment for lecture presentations, white board, overhead projector, posters. Also E.learning and online learning are used.  My philosophy is to provide you with a comfortable learning environment where you can not only listen, but speak. I want to be an enthusiastic teacher, share my love for science and inspire you to do your best in this course. I am open to hearing your concerns and needs and will respect your ideas. | | |
| * **Assessment scheme**   ‌40% Assignments  4% Quiz  16% Midterm Exam  15% Final Theoretical Exam  25% Final Practical Exam | | |
| * **Specific learning outcome for theory:**   Be able to demonstrate foundation knowledge in the areas of chemistry.  Be able to integrate knowledge learned in discipline specific courses.  Be able to access, search and use the chemical literature.   * **Learning Outcomes for Lab**   Be knowledgeable in classical laboratory techniques and be able to use modern instrumentation.  Be able to design and conduct scientific experiments and analyze the resulting data.  Be able to work as a member of a team.  Be knowledgeable in proper procedures and regulations in handling and disposal of chemicals.  Be able to communicate (written and oral) scientific information to chemists and non-­‐chemists.   * Be knowledgeable of ethical practices in science. | | |
| * **Course Reading List and References‌:**   Clinical Chemistry (technic, Principle, correlation) by Michael.  Tietz Fundamentals of Clinical Chemistry.  Harper’s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange  Medical Books. 25th edition. | | |
| * **Course topics (Theory)** | **Week** | **Learning Outcome** |
| 1st lec. An overall view of cells-origin and evolution of cells. Cell theory. Classifications of cell- Prokaryotic and Eukaryotic cells. Composition of prokaryotic and eukaryotic cells. Molecular composition of Cells- Water, Carbohydrates, Lipids, Nucleic acids, and Proteins. | 1 |  |
| 2nd lec. **Carbohydrates**  a. List and define the major classes of carbohydrates and give examples of each.  b. Recognize the structure of the common stereoisomers of carbohydrates.  c. Review the digestion of carbohydrates from the role of salivary amylase to the final CO2 and H2O. Define the most common terms associated with carbohydrate metabolism. | 2 |  |
| 3nd lec. d. Briefly summarize the three major biochemical pathways associated with carbohydrate metabolism.  e. List the various hormones that affect carbohydrate metabolism and summarize their functions (gland and action).  f. Compare and contrast the main characteristics of the two major types of diabetes mellitus (DM) (type 1 and type 2).  g. Review other carbohydrate disorders, including   1. Gestational diabetes 4 2. ii. Other types of diabetes (secondary diabetes mellitus) iii. Impaired glucose tolerance h. List and explain the changes that occur in the body with hyperglycemia (complications of DM, impaired glucose tolerance, and impaired fasting glucose. | 3 |  |
| 4rd lec. Define hypoglycemia and discuss the common causes of drug-induced, reactive, and fasting hypoglycemia.  k. Summarize the common enzymatic glucose methodologies: glucose oxidase and hexokinase.  l. Review urine and cerebrospinal fluid glucose clinical significance | 4 |  |
| 5th lec. **Lipids and Lipoproteins**  a.Review cholesterol metabolism, absorption, synthesis, and catabolism.  b. Outline and describe classes of clinically significant lipids.  c. Define unsaturated and saturated fatty acids.  d. List and explain the role of the major apolipoproteins. | 5 |  |
| 6th lec. . Summarize lipid metabolism, including exogenous, endogenous, and reverse cholesterol pathways.  f. List the major components and the percentage composition of the major lipoproteins—for example, apoproteins, cholesterol, and triglycerides. | 6 |  |
| 7th lec. g. Review the four major lipoproteins and their density and function. h. List conditions associated with hypercholesterolemia and hypocholesterolemia.  i. Summarize the major cholesterol methodologies.  j. Identify causes of hypertriglyceridemia and hypotriglyceridemia.  k. Review triglyceride methodologies.  l. Summarize HDL-C methodologies.  m. Calculate LDL-C using the Friedewald formula. | 7 |  |
| 8th lec. **Amino Acids and Proteins**  a.Describe protein structure.  b. List the major functions of protein.  . | 8 |  |
| 9th lec. c. Discuss clinically significant proteins, including function, clinical significance, and protein band in electrophoresis.  d. Discuss causes of hyperproteinemia.  e. Discuss causes of hypoproteinemia.  f. Explain the principle of major protein methodologies. | 9 |  |
| 10th lec g. Describe urinary protein screening, clinical significance, and methodologies.  h. Describe cerebrospinal fluid protein, clinical significance, and methodologies.  i. List major functions of albumin.  j. List causes of hypoalbuminemia.  k. Discuss the major cause of hyperalbuminemia: dehydration. | 10 |  |
| 11th lec. l. Explain major albumin methodologies.  m. Discuss the major components of protein electrophoresis.  n. List in order the protein electrophoresis bands and approximate percentages of total protein.  o. Explain changes in the protein electrophoresis associated with the more common causes of abnormal patterns.  p. Calculate A/G ratio. | 11 |  |
| 12th lec. **Enzymes**  a.Define enzyme and list general functions of enzymes.  b. Write the formula for enzyme-catalyzed reactions.  c. List the six major groups of enzymes and the reactions catalyzed by each group. 5  d. Review enzyme catalysis, including the role of enzymes in decreasing activation energy.  e. Define apoenzyme, prosthetic groups, and holoenzyme.  f. Define cofactor, coenzyme, and metalloenzyme and give examples of each. | 12 |  |
| 13th f. Define cofactor, coenzyme, and metalloenzyme and give examples of each.  g. Explain how various factors affect enzyme reactions—for example, pH, temperature, and substrate concentration.  h. Examine the differences among competitive, noncompetitive, and uncompetitive inhibition. | 13 |  |
| 4th Overview | 14 |  |
| * **Practical Topics** | **Week** | **Learning Outcome** |
| 1st lab . Lab safety and introduction to equipment’s | 1 |  |
| 2nd lab.. Qualitative identification of carbohydrate | 2 |  |
| 3rd lab. Estimation of FBG,RBG,2hrpBG | 3 |  |
| 4th  lab. . Estimation of OGTT | 4 |  |
| 5th lab Qualitative identification of proteins | 5 |  |
| 6th lab. Estimation of Total protein, Albumin, Globulin | 6 |  |
| 7th lab. Estimation of ACP and ALP | 7 |  |
| 8th lab. Estimation of GOT and GPT | 8 |  |
| 9th lab. Qualitative identification of lipids | 9 |  |
| 10th lab. Estimation of Total cholesterol and triglyceride | 10 |  |
| 11th lab. Estimation of HDL and LDL | 11 |  |
| 12th lab. Estimation of Lipid profile test | 12 |  |
| 13th Unknown sample | 13 |  |
| 14th Activity | 14 |  |
| * **Examinations (question design):** * ***Single choice Questions*** * Proteins are polymer chains made of amino acids linked together by * ionic bonds b- glycosidic bond   c- hydroxide bond d- peptide bond  **Short answer**  **Draw structures of the following biochemical compounds**:  Glucose and cholesterol  **Definition**  ***1.* Define the following terms:**   1. carbohydrate   B- Enzyme  **Problem situation**   1. Compare between fat and oil | | |
| * **Extra notes:**   This year should be care about the distance between students by making sub groups also wearing gloves and mask especially practical experiments. | | |
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| * **External Evaluator** | | |