

**Clinical chemistry Course Catalogue**

**2022-2023**

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

**Course Book**

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| * **Course overview:**   This is a lecture and laboratory course covering most areas of Clinical Chemistry. General principles of chemical analysis and clinical utility are reviewed. Analyses performed in the clinical chemistry laboratory are grouped according to function or organ system. Major groupings include carbohydrates metabolism and its respective disorders, proteins and its respective disorders, lipid and its respective disorders, kidney function tests (KFT), liver function tests (LFT), clinical enzymology, biochemical markers of bone metabolism, cardiac markers, tumor markers, and body water, electrolytes, acid-base balance and blood gases. The principles of testing methods and the physiologic and biochemical changes that occur in disease states are covered. General laboratory principles, laboratory safety, laboratory quality assessment will also be applied to the course. The laboratory practical will include collection and processing of blood specimens, quality control and diagnostic tests for common clinical tests. | | |
| **Course objective:**  The course aims for the students are to:  1. Define the following terms: quality assurance, quality control, accuracy, precision, reference interval, compare and contrast the specificity and sensitivity of the most commonly used diagnostic markers.  2. Describe the biochemical structure and metabolism of carbohydrate, proteins and lipids, their functions and describe the patterns associated with protein abnormalities shown in serum protein electrophoresis.  3. Discuss the tissue sources, major properties, methods of analysis, diagnostic significance, clinical use and sources of error in the analysis for enzymes and tumor markers.  4. Demonstrate how to calculate different important parameters in the field of clinical chemistry.  5. Discuss the basic disorders of the different organs and define which laboratory tests may be performed to diagnose them.  6. Gain practical Skills and common source of errors in clinical chemistry laboratory.  7. Show professional behaviour and receives criticism graciously.  8. Enhance critical reasoning and analytical skills in analyzing cases studies.  9. Develop communication skills in the presentation of scientific material via poster presentation.  10. Apply principles of safety regulations.  11. Participate in the biomedical activities | | |
| **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**   seminar and other activity practical reports -  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 Clinical chemistry and | 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, Glubolin | 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** | | |