Course Description

College of Medicine/ University of Mosul

1. Course Name:
Medical Chemistry
2. Course Code:
MCAN101
3. Semester / Year:
First and Second / 2025-2026
4. Description Preparation Date:
7/10/2025
5. Available Attendance Forms:
Register attendance in person
6. Number of Credit Hours (Total) / Number of Units (Total)
Practical hours= 60 Theoretical hours= 60 Total credit hours = 120 Total units = 6
7. Course administrator's name (mention all, if more than one name)
1. Lecturer. Dr. ruaa Qasim al-ajar 2. Lecturer. Dr. ahmad salem 3. Assist. Lecturer. Nashwan Sadeq Nashwan.sadeq@uomosul.edu.iq
8. Course Objectives
The aim of the course is scientific building of knowledge, employing the ability and refining the skill in order to assimilate the scientific foundations in the topics of organic, inorganic and analytical chemistry and the foundations and priorities of biochemistry for the purpose of learning, understanding and comprehending the chemical reactions that occur inside the human body, both natural and pathological, and for later understanding the mechanism of diseases and their causes through the study of biochemistry and clinical Details, resulting from imbalances in natural chemical reactions and the means to repair them within the human body By the end of this course the student will be able to:

Course Objectives	**Knowledge outcomes:** **K1. Describe the structure, properties, and reactivity of organic molecules by identifying functional groups and explaining their role in reaction mechanisms.** **K2. Select and justify appropriate analytical techniques to qualitatively identify a quantitatively measure chemical substances in a given sample.** **K3. Classify inorganic compounds and correlate their structures and bonding (e.g., crystal field theory) with their observed properties and reactivity.** **K4. Explain how the structure of fundamental biomolecules (proteins, nucleic aci etc.) determines their function in metabolic pathways and cellular processes.** **Skill outcomes:**

	S1. Design how and the possibility of synthesizing a number of organic substanc from their primary resources inside or outside the body **S2. Manage the analyzing and measuring of number of basic materials inside the body and analyzing different models** **S3. use of materials and equipment and the necessities that support them in verification, measurement and evaluation** **Attitude outcomes** **A1: Demonstrate respect for colleagues and adhere to strict ethical standards when handling biological samples and discussing patient-related biochemical data. (ETW1)** **A2: Work effectively in a team to solve complex problems, such as drug design case studies, demonstrating both collaboration and leadership. (ETW3)** **A3: Show responsibility and a commitment to safety by rigorously following protocols when handling chemicals, pharmaceuticals, and laboratory equipment. (CSP2)**

9. Teaching and Learning Strategies

Strategy	1- theoretical lectures 2- practical labs

10. Course Structure يضاف صفوف حسب الحاجة

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-10	40	1. Name and draw the structures of fundamental organic compounds (alkanes, alkenes, alkynes, aromatics, and key functional groups) using IUPAC nomenclature. 2. Identify and classify the common	organic chemistry and safety lab	Theoretical lectures And practical lab	Med exam Final exam Unknown exam

		functional groups in organic molecules (e.g., alcohols, carbonyls, amines, carboxylic acids). 3. Recognize and explain different types of isomerism (constitutional, stereoisomerism, including enantiomers and diastereomers). 4. Safely perform fundamental laboratory techniques (e.g., purification, separation, characterization) to synthesize and analyze organic compounds.			
11-14	16	1. Define carbohydrates and recognize their basic empirical formula. 2. Classify carbohydrates based on molecular size and complexity into monosaccharaides, disaccharides, oligosaccharides, and polysaccharides. 3. Classify monosaccharides based on carbonyl group (aldose vs. ketose) and number of carbon atoms (e.g., triose, pentose, and hexose).	Carbohydrates	Theoretical lectures And practical lab	Med exam Final exam Unknown exam

		4. Differentiate between the linear and cyclic forms (furanose and pyranose) of monosaccharides. 5. Explain the formation of a glycosidic bond and recognize it in the structures of disaccharides and polysaccharides.			
15-17	10	1. Define lipids and list their major biological roles (e.g., energy storage, structural components, Signaling). 2. Classify the major types of lipids (e.g.,fattyacids, triacylglycerols, phospholipids, steroids) based on their chemical Structure. 3. Differentiate between saturated, monounsaturated, and polyunsaturated fatty acids and predict their effect on membrane fluidity. 4. Describe the structure of Cholesterol and its role in membrane fluidity and as a precursor for Steroid hormones.	Lipid	Theoretical lectures And practical lab	Med exam Final exam Unknown exam

		5. Explain the chemical basis of lipid hydrolysis and saponification Reactions.			
18-22	20	1. Recognize the general structure of an amino acid, identifying the alpha carbon, amino group, carboxyl group, and R group (side chain). 2. Classify the 20 standard amino acids based on the chemical properties of their side chains (e.g., nonpolar, polar, acidic, basic). 3. Predict the ionic state of an amino acid and calculate its isoelectric point (pI) at different pH values. 4. Describe and differentiate between the four levels of protein organization: primary, secondary (alpha-helices, beta-sheets), tertiary, and quaternary structures. 5. Explain the concept of protein denaturation, including its causes (e.g., heat, pH changes) and its	Amino acid and protein	Theoretical lectures And practical lab	Med exam Final exam Unknown exam

		consequences on structure and function.			
23-28	26	1. Differentiate between qualitative and quantitative analysis and describe the key steps in a general analytical process. 2. Explain the principles and applications of key separation techniques such as chromatography (e.g., HPLC, GC). 3. Interpret analytical data from various sources to draw valid conclusions about the identity, purity, and concentration of analytes. 4. Describe the different types of chemical bonding (ionic, covalent, metallic) and their effect on physical properties.	Analytical chemistry and inorganic chemistry	Theoretical lectures And practical lab	Med exam Final exam Unknown exam
29-30	8	1. Define enzymes as biological catalysts and explain their key characteristics, including high efficiency and specificity. 2. classify enzymes into the six major classes (oxidoreductases, transferases,	Enzymes	Theoretical lectures And practical lab	Med exam Final exam Unknown exam

		hydrolases, lyases, isomerases, ligases) based on the type of reaction they catalyze. 3. Explain the concept of enzyme-substrate interaction using models such as the lock-and-key and induced-fit theories. 4. Define the active site and describe how enzymes lower the activation energy of a reaction. 5. Differentiate between competitive, non-competitive, and uncompetitive inhibition based on their effects on kinetic parameters.			

11. Course Evaluation
Practical 30% Theoretical 70%

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Textbooks for medical chemistry Chemical basis of life George H Schmidt
Main references (sources)	Lippincott textbooks
Recommended books and references (scientific journals, reports...)	Principle of biochemistry David L. Nelson Michael M Co
Electronic References, Websites	