CIHAN UNIVERSITY-SULAIMANIYA

Course Outline

2024-2025

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MODULE DESCRIPTION FORM

Module Information					
Module Title	**Clinical Biochemistry**				
Module Type	Theory &practical			☐ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar** ☐ **Report** ☐ **Extra activity**	
Module Code					
Language	English				
ECTS Credits	**6**				
Module Level			**Semester of Delivery**	**1st**	
Administering Department	**MLA**		**College**	**Health Sciences**	
Lecturer	**Anvar Soleimani, Darya Shorsh**				
Academic Title	**Lecturer**		**Qualification**	**PhD**	
Module Tutor			**e-mail**	Anvar.soleimani@sulicihan.edu.krd Darya.shorsh@sulicihan.edu.krd	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		
Cycle of Study	Bachelor		**Form of Education**	Full time	

Relation with other Modules			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Cihan University-Sulaimaniya?

College of

Department:
MLA
Discipline:
Stage: 2

Total Contact Hours:	**56**
Total Self-Study Hours:	**106**
Total No. Hours:	**162**
ECTS:	**6**

No. of Weeks	Contact Hours					Self-Study					
	Theoretical	Practical	Lab	Project	Visit	Quiz	Reading	Assignment	Report	Midterm Exam.	Final Exam.
1st Week (Introduction)	2		1								
2nd Week	2	1	1				3	2			
3rd Week	2	1	1			2	3		2		
4th Week	2	1	1				3			10	
5th Week	2	1	1	1		2	3		2		
6th Week	2	1	1			2	3	3			
7th Week		1	1								
8th Week	2	1	1				3				
9th Week	2	1	1			2	3		2		
10th Week	2	1	1	1		2	3				
11th Week	2	1	1				3		2		
12th Week	2	1	1	1			3				
13th Week	2	1	1				3		2		
14th Week	2	1	1				3				
15th Week (Pr. Final Ex										15	
16th Week (Final Exam.)											20
TOTAL	**26**	**13**	**14**	**3**		10	**36**	**5**	**10**	**25**	**20**

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Clinical Biochemistry
Week 2	Disorders of Carbohydrate Metabolism: types of diabetes. Pathophysiology of diabetes, the clinical manifestation of diabetes. Glycogen storage diseases, galactosemia, Fructosemia
Week 3	Liver Physiology and Hepatic Function tests: hepatic function test. Hepatocellular damage tests, Bilirubin metabolism. Jaundice, types of jaundice
Week 4	Plasma Proteins: Total Protein. Albumin function. Edema, plasma enzymes, positive acute phase proteins, Negative acute phase proteins
Week 5	Kidney function tests.: structure and function of kidney. The content includes an overview of kidney anatomy and physiology, the significance of glomerular filtration rate (GFR) as a primary indicator of kidney health, and the methods for measuring GFR, including creatinine clearance and the use of serum creatinine levels. The syllabus also covers the interpretation of urine tests, such as urinalysis, urine osmolality, and specific gravity, to evaluate kidney concentrating ability. Additionally, it addresses the importance of electrolytes, particularly sodium and potassium, and their role in renal function, as well as the clinical implications of abnormalities in these parameters. The week concludes with discussions on common renal pathologies, such as acute kidney injury and chronic kidney disease, emphasizing how biochemical markers aid in diagnosis, monitoring, and management of these conditions. Practical sessions may include laboratory techniques for analyzing kidney function tests and case studies for clinical correlation.
Week 6	Uric acid, gout disease and purine metabolism: The week begins with an introduction to purine metabolism, detailing the biochemical pathways involved in the synthesis and degradation of purines, including adenine and guanine. Students will learn about the role of enzymes such as xanthine oxidase and the significance of their regulation in maintaining normal uric acid levels. The syllabus will then transition to the pathophysiology of gout, exploring its clinical manifestations, risk factors, and the relationship between elevated uric acid levels (hyperuricemia) and the formation of monosodium urate crystals in joints. Diagnostic techniques for assessing uric acid levels, including serum and synovial fluid analysis, will be discussed, along with the interpretation of results. The week will conclude with a review of therapeutic approaches for managing gout, including lifestyle modifications, pharmacological treatments such as nonsteroidal anti-inflammatory drugs (NSAIDs) and urate-lowering therapies (e.g., allopurinol and febuxostat), as well as potential future therapies targeting purine metabolism. Through lectures, case studies, and laboratory exercises, students will gain a comprehensive understanding of the biochemical underpinnings of uric acid-related disorders.
Week 7	**Midterm theoretical Exam**
Week 8	Lipid metabolism and disorders 1: focus on the foundation of lipid metabolism. Start with an overview of lipids, including their classification (simple lipids, compound lipids, and derived lipids). Discuss the importance of lipids in biological systems, covering their roles in energy storage, membrane structure, and signaling. Next, delve into the biochemical pathways of lipid metabolism, emphasizing the digestion and absorption of dietary lipids, transport mechanisms (including chylomicrons and lipoproteins), and the synthesis and degradation of fatty acids. Highlight key enzymes involved in lipid metabolism such as lipases, acyl-CoA synthetase, and fatty acid synthase. Finally, introduce the concept of homeostasis in lipid metabolism and the significance of maintaining balanced lipid levels in the body.
Week 9	Lipid metabolism and disorders 2:various disorders associated with lipid metabolism. Begin with a discussion of hyperlipidemias, examining the types (primary and secondary) and their causes, such as genetic factors or underlying diseases like diabetes and hypothyroidism. Explore specific disorders, including Familial Hypercholesterolemia, Familial Combined Hyperlipidemia, and Dysbetalipoproteinemia, detailing their pathophysiology, clinical manifestations, and laboratory findings. Discuss lipid storage diseases, such as Gaucher's disease and Niemann-Pick disease, along with their genetic basis and clinical features. Conclude with an overview of the diagnostic approaches for lipid metabolism disorders, including lipid

	panels and genetic testing, and potential therapeutic strategies such as lifestyle changes, pharmacotherapy (e.g., statins), and emerging treatments. Discuss the importance of early diagnosis and management in preventing cardiovascular diseases associated with lipid disorders.
Week 10	Electrolytes: Cations and Anions, Physiological role of Electrolytes, Anion GAP
Week 11	Blood Gases and Disorders of Acid-Base Balance: Acid-base Balance: pH definition, Physiological Buffer systems, acid-base disorders
Week 12	Cardiac Markers: encompasses the understanding of biochemical substances that are released into the bloodstream during myocardial injury. Key components include an overview of the pathophysiology of acute coronary syndromes and the role of specific markers such as troponins (I and T), creatine kinase (CK-MB), and myoglobin in diagnosing myocardial infarction. The syllabus also emphasizes the importance of timing and sensitivity of these markers, including their kinetics and the significance of serial testing. Additionally, it may cover the interpretation of results in conjunction with clinical findings and other diagnostic tools, as well as advancements in point-of-care testing and emerging biomarkers like high-sensitivity troponin assays. Understanding the clinical implications and guidelines for the use of these markers in patient management is also a crucial aspect of the syllabus.
Week 13	Laboratory Diagnostics in Gastroenterology: The syllabus also covers tests related to pancreatic function, including amylase and lipase levels, and the evaluation of gastrointestinal malabsorption through stool tests and serological assays for celiac disease. Additionally, it addresses the role of tumor markers in gastrointestinal cancers, such as carcinoembryonic antigen (CEA) and alpha-fetoprotein (AFP), and the interpretation of endoscopic findings in conjunction with histopathological examinations. Understanding the clinical significance and limitations of these laboratory tests is emphasized, along with the integration of laboratory data into clinical practice for effective patient management and treatment strategies.
Week 14	Disorders of amino acid metabolism: encompasses several key topics aimed at understanding the biochemical basis and clinical implications of these disorders. It includes an overview of amino acid metabolism, focusing on the catabolism and biosynthesis pathways, as well as the role of enzymes and transport systems. Specific disorders such as phenylketonuria (PKU), maple syrup urine disease (MSUD), homocystinuria, and tyrosinemia are examined in detail, highlighting their genetic basis, metabolic consequences, and associated clinical manifestations. The syllabus also addresses diagnostic approaches, including the use of blood and urine tests to detect abnormal metabolite levels, and the importance of dietary management and therapeutic interventions. Additionally, it may cover emerging research and potential future therapies related to amino acid metabolism disorders.
Week 15	**Final Practical Exam**
Week 16	**Final Theoretical Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction to laboratory safety procedures, proper use of equipment, safety gear, and emergency protocols. Emphasis on maintaining a safe and organized lab environment.
Week 2	Exploring the principles of spectrophotometry and the interaction between light and matter. Understanding the significance of absorption spectra in analytical chemistry.
Week 3	Practical session to determine the maximum absorbance wavelength (λ max) for specific compounds using a spectrophotometer. Analyzing absorption spectra for various analytes.
Week 4	Enzymatic methods to quantify glucose levels in serum. Clinical significance in diagnosing diabetes and metabolic disorders, as well as understanding glucose metabolism.
Week 5	Colorimetric methods to measure serum urea concentration, interpreting results in the context of kidney function, hydration status, and renal disorders.
Week 6	Quantification of creatinine in serum using specific assays. Clinical importance in evaluating renal function and diagnosing kidney diseases such as nephritis and renal failure.
Week 7	Laboratory procedure to measure triglyceride concentration in serum. Discussing the role of triglycerides in metabolic disorders and cardiovascular risk assessment.
Week8	Quantifying total cholesterol levels in serum using colorimetric methods. Analyzing the implications of cholesterol levels in heart disease and overall health.
Week9	Techniques for quantifying total and direct bilirubin levels in serum. Clinical significance in diagnosing jaundice, liver diseases, and biliary obstruction
Week 10	Measuring Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT) enzyme levels in serum. Relevance to liver health and detecting liver damage or disease.
Week 11	Measurement of Alkaline Phosphatase (ALP) and Lactate Dehydrogenase (LDH) in serum. Understanding their roles in liver function and their use in diagnosing liver, bone, and muscle diseases.
Week 12	Quantification of serum amylase levels. Application in diagnosing pancreatic disorders, including pancreatitis, and its role in digestive enzyme analysis.
Week 13	**Review**
Week 14	**Final Exam**

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	This course is an introduction to clinical chemistry, and students are urged to learn and understand the principles, procedures, physiological basis, and significance of testing performed in clinical chemistry laboratories. Clinical assessment of Biochemical processes enables the distinction between the normality of health and the disordered function of disease in a wide range of organ systems to be made by carefully chosen, quality-controlled testing/assessment. The course aims to give students a good grounding in theoretical and practical aspects of clinical biochemistry. During the course, a range of important metabolic disorders include diabetes, lipid dysfunction, renal, liver, Pancreas, and bone disorders. This course emphasizes a problem-solving approach integrating information from prior life history, behavior, symptoms, and signs to optimize biochemical testing and interpretation: a universal approach in healthcare and indeed in animal welfare and interpretation of models of disease. Healthcare approaches to populations is also dealt with in covering current approaches to the very common metabolic syndrome disorders (diabetes, obesity, hypertension and hyperlipidemia) utilizing evidence-based risk factors and testing to target resources and treatment where benefits of treatment are greatest. The wide perspective from molecules to populations is of considerable interest and provides valuable background to Honours programmes in Medical Sciences and Biomedical Sciences.
Module Learning Outcomes	Ability to develop basic knowledge about Clinical chemistry and medical laboratory technology. 2. Knowledge about how changes to the normal physiology of cells and systems can underlie human diseases and disorders 3. Evaluate suitability and prepare specimens for chemical chemistry analysis. 4. Explain, perform and evaluate clinical chemistry procedures and correlate test results with patient conditions. 5. Exhibit knowledge of body chemistry levels under healthy or abnormal conditions 6. Ability to browse for up-to-date information about Clinical biochemistry from a variety of sources.

Learning and Teaching Strategies

Strategies	This module will utilize a combination of lectures, laboratory practical, group discussions, and independent study to ensure students develop both theoretical understanding and practical skills. In the clinical biochemistry module, effective learning and teaching strategies will encompass a blend of theoretical and practical approaches to ensure comprehensive understanding and application of the subject matter. Interactive lectures will introduce core concepts, utilizing multimedia presentations and real-world case studies to enhance engagement and facilitate critical thinking. To reinforce learning, small group discussions and peer-led tutorials will encourage collaborative problem-solving, allowing students to share insights and deepen their understanding of complex biochemical processes. Laboratory sessions will provide hands-on experience with analytical techniques, fostering practical skills and reinforcing the connection between theory and practice. Additionally, formative assessments, such as quizzes and reflective journals, will be integrated to monitor progress and provide timely feedback, while online resources and discussion forums will support ongoing learning and foster a sense of community among students. This multifaceted approach aims to cultivate not only knowledge retention but also the ability to apply clinical biochemistry principles in real-world scenarios.

Module Evaluation

Assessment Types		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Attendance (Th & Pr)	4	4%		
	Assignments (Th)	2	2%		
	Activity (Th)	2	2%		
	Lab. Report (Pr)	8	8%		
	Quizzes (Th & Pr)	8	8%		
	Lab. rep. Presentation	4	4%		
	Lab. Attitude (Pr)	2	2%		
Summative assessment	Midterm Exam (Th)	2hr	20%	7th	
	Final Pr. Exam	2hr	20%	15th	
	Final Exam (Th)	3hr	30%	16th	
Total assessment			100% (100 Marks)		

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Clinical Biochemistry illustrated textbook	

Recommended Texts	Henry's Clinical Diagnosis and management by laboratory methods, Henry	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب)قيد المعالجة(	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

- **Cycle of studies - choose one of the three options: Bachelor «1», Master «2», PhD. «3»**
- **(Exam: Oral Examination, Written Exam), and (Continous Evaluation(CE), Portfolio).**
- **Discipline status (Content) - for the Bachelor level, choose one of the options: FD (Fundamental (General) Discipline), PF (Preparatory Disciplines in the Field), SD (Specialty Disciplines), CD (Complementary Disciplines), DU (Disciplines based on the University's options).**
- **Discipline status (compulsoriness) - choose one of the options**
  a. MD (Mandatory discipline)
  b. OD (Optional Discipline)
  c. ED (Elective (Facultative) Discipline).

Approved by Head of the Branch / Department	
Signature	
Date	

Name	

Approved by Curriculum Development Committee and Bologna Process Committee	
Signature	
Date	
Name	