

**Ministry of Higher Education and Scientific Research  
Scientific Supervision and Scientific Evaluation Apparatus  
Directorate of Quality Assurance and Academic Accreditation  
Accreditation Department**



# **Academic Program and Course Description Guide**

**2024**

## **Introduction:**

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

## **Concepts and terminology:**

**Academic Program Description:** The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

**Course Description:** Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

**Program Vision:** An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

**Program Mission:** Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

**Program Objectives:** They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

**Curriculum Structure:** All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

**Learning Outcomes:** A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

**Teaching and learning strategies:** They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

## Academic Program Description Form

**University Name: University of Diyala**

**Faculty/Institute: College of medicine**

**Scientific Department: Biochemistry branch**

**Academic or Professional Program Name: Human medicine**

**Final Certificate Name: Bachelor of Medicine and General Surgery**

**Academic System: Semesters**

**Description Preparation Date:**

**File Completion Date: 1/2/2024**

**Signature:**

**Head of Department Name:**

**Date:**

**Signature:**

**Scientific Associate Name:**

**Date:**

**The file is checked by:**

**Department of Quality Assurance and University Performance**

**Director of the Quality Assurance and University Performance Department:**

**Date:**

**Signature:**

**Approval of the Dean**

### **1. Program Vision**

- **Effective contribution to medical progress through education and the preparation of qualified doctors to provide the best medical services and the continuation of scientific research in all medical fields.**
- **Preparing physicians distinguished by competence and scientific experience, reinforced by an understanding of the biochemical bases of the vital processes that occur within the human body in normal and diseased cases.**

### **2. Program Mission**

- **Excellence in creating and following advanced scientific methods in conducting pathological analyzes and preparing medical scientific research that contributes to community service.**
- **Establishing solid relationships with researchers in international universities.**

### **3. Program Objectives**

- **Keeping abreast of scientific development in developing education programs and using the latest programs developed for medical education in accordance with the modern academic curriculum.**
- **Contribute to providing the community with scientifically distinguished doctors who have experience in the approved scientific foundations to conduct all pathological analyzes related to clinical biochemistry.**
- **Giving lectures to postgraduate students in the colleges of the university, as well as supervising their research projects.**

### **4. Program Accreditation**

**Theoretical and practical study and discussions of blended learning, attendance, and electronic (via the Classroom platform).**

### **5. Other external influences**

**A teaching hospital, library, internet, community, doctors' syndicate.**

<b>6. Program Structure</b>				
<b>Program Structure</b>	<b>Number of Courses</b>	<b>Credit hours</b>	<b>Percentage</b>	<b>Reviews*</b>
<b>Institution Requirements</b>	<b>2</b>	<b>6 for each course</b>	<b>100%</b>	<b>Basic</b>
<b>College Requirements</b>	<b>2</b>	<b>6 for each course</b>	<b>100%</b>	<b>Basic</b>
<b>Department Requirements</b>	<b>2</b>	<b>6 for each course</b>	<b>100%</b>	<b>Basic</b>
<b>Summer training</b>	<b>None</b>	<b>None</b>	<b>None</b>	<b>None</b>
<b>Other</b>	<b>None</b>	<b>None</b>	<b>None</b>	<b>None</b>

\* This can include notes whether the course is basic or optional.

7. Program Description				
Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
2023-2024/First	HR115	Medical chemistry and Biochemistry	90	60
2023-2024/Second	BIOC201 BIOC202	Biochemistry and metabolism	90	60

8. Expected learning outcomes of the program	
<b>Knowledge</b>	
<p>1- Preparing students with high competence in the theoretical and practical foundations of chemistry related to the medical fields and molecules of biochemistry and clinical chemistry.</p> <p>2- Providing them with information about the steps of vital metabolic reactions of carbohydrates, lipids and proteins within the human body.</p> <p>3- Teaching students how to conduct clinical chemistry and cancer analysis.</p>	<p>1- Identifying diseases and clinical conditions resulting from disorders of metabolic processes in the human body.</p> <p>2- Explaining the biochemical methods used in diagnosing some diseases and clinical conditions.</p>
<b>Skills</b>	
<p>1- Knowledge of the biochemical analyzes required for pathological cases and knowledge of the interactions and diagnosis.</p>	<p>1- Accurate clinical diagnosis of pathological conditions.</p>
<p>2- Teaching the subjects of medicinal chemistry, biochemistry, and clinical chemistry to students of the medical group colleges.</p>	<p>2- Conduct theoretical and practical clinical research.</p>
<b>Ethics</b>	
<p>Enhancing cooperation and teamwork to create a healthy environment suitable for humans.</p>	<p>Conducting community awareness and guidance campaigns to create a healthy environment and preserve human health.</p>
<p>Enhancing the ethical and humanitarian aspects that a doctor must possess.</p>	<p>Highlighting the human and ethical aspects of the doctor in dealing with the patient.</p>



## 9. Teaching and Learning Strategies

- Giving theoretical lectures.
- Conducting experiments in practical laboratories.
- Teaching small groups
- Field visits to hospitals and health centers.
- Display educational videos and images of clinical cases related to biochemical disorders within the human body.

## 10. Evaluation methods

- Quizzes
- Evaluation of practical experiments in the laboratory.
- Mid-course exam.
- The final exam of the course.

## 11. Faculty

### Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	B.Sc. Chemistry	Biochemistry			1	None
Asst. Professor	Medicine and General Surgery	Patho-chemistry			1	None
Lecturer	B.Sc. Chemistry	Biochemistry			2	None
Lecturer	B.Sc. Chemistry	Medical Biochemistry			1	None
Asst. lecturer	B.Sc. Chemistry	Biochemistry			5	None

## **Professional Development**

### **Mentoring new faculty members**

**Introductory seminars and symposia for new faculty members with periodic meetings to introduce them to the work with daily guidance and continuous follow up along with advising and instructing them.**

### **Professional development of faculty members**

**Continuous learning by searching for developments using the library and the Internet, in addition to attending seminars and specialized scientific symposium, along with active attendance in teaching hospitals to hone skills.**

## **12. Acceptance Criterion**

**Admission is carried out centrally through the Ministry of Higher Education and Scientific Research, based on the student's score in the twelfth grade (scientific branch) after preparing the online form for that.**

## **13. The most important sources of information about the program**

### **1- Prescribed books:**

- Harper's Biochemistry , 31 ST Edition , 2018
- Lippincott Illustrated Reviews : Biochemistry , Seventh Edition , 2018 .
- Lehninger Principle of Biochemistry , 4 th Edition , 2005 .
- Essentials of Medical Biochemistry with clinical cases , 3 rd Edition , 2022. By N.V.Bhagavan and chury – Eun Ha.

### **2- Recent and emerging research and studies.**

### **3- Reputable and reliable scientific websites linked to international scientific institutions and centers.**

## **14. Program Development Plan**

**Developing academic curricula annually to suit modern global developments in the field of biochemistry and techniques for conducting clinical chemical analyses.**

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
2023-2024/ First	HR115	Medical chemistry and Biochemistry	Basic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2023-2024/ Second	BIOC201 BIOC202	Biochemistry and Metabolism	Basic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

- Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

## Course Description Form

1. Course Name:	
Medical chemistry and Biochemistry.	
2. Course Code:	
HR115, BIOC201, BIOC202	
3. Semester / Year:	
First course + second course / 2024 - 2023	
4. Description Preparation Date:	
1 / 2 / 2024	
5. Available Attendance Forms:	
Mandatory attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
First stage : 150 hours / 6 units [90 hours (theoretical), 60 hours (practical)]	
Second stage : 150 hours / 6 units [90 hours (theoretical), 60 hours (practical)]	
7. Course administrator's name (mention all, if more than one name)	
<b>Name:</b> Prof. Dr. Zuhair M. Hussien <b>Email:</b> Zuhair@uodiyala.edu.iq Asst. Prof. Dr. Bushra M. Hussein                      bushra@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	<ul style="list-style-type: none"><li>• Preparing scientifically and practically competent students in the fields of medical and clinical chemistry.</li><li>• Understanding the basics of biochemical variables that occur in the case of disease, linking them clinically, and accurately diagnosing them</li><li>• Follow modern methods in pathological analysis techniques to obtain accurate results, qualify graduates scientifically and professionally, prepare competent researchers in clinical medical fields, and find solutions for health problems.</li></ul>
9. Teaching and Learning Strategies	
Strategy	<ul style="list-style-type: none"><li>• Theoretical lectures.</li><li>• Conducting experiments in special practical laboratories.</li><li>• Teaching small groups.</li><li>• Field visits to hospitals and health centers.</li><li>• Display educational videos and images of clinical cases related to biochemical disorders within the human body.</li></ul>

## 10. Course Structure

### The structure of the course for theoretical medical chemistry / first academic level / the first course

Week	Hours	Required educational goals	Unit name and/or topic	Evaluation method	education method
1	3	<ol style="list-style-type: none"> <li>1. Define body fluid and electrolytes.</li> <li>2. Know the volumes and main composition of body fluids.</li> <li>3. List the factors that determine body water content and describe the effect of each factor.</li> </ol>	Fluid and Electrolyte Balance	exams	lecture
2	3	<ol style="list-style-type: none"> <li>1. Describe the role of the body systems in regulating the body's fluid composition and volume.</li> <li>2. Describe mechanisms that regulate water intake and hormonal controls of water output in urine.</li> </ol>	Fluid and Electrolyte Balance	exams	lecture
3	3	<ol style="list-style-type: none"> <li>1. Defines acids, bases.</li> <li>2. Know the natural acids and bases ratio of the body.</li> <li>3. Recognize the types of acid and base.</li> <li>4. List the source of acids and bases of the body.</li> </ol>	Acid-Base Balance	exams	lecture
4	3	<ol style="list-style-type: none"> <li>1. Study the systems responsible for maintenance of the acid-base balance.</li> <li>2. Explain the role of buffer systems in regulating the pH of the intracellular fluid and the extracellular fluid.</li> <li>3. Discuss acid base disorders</li> <li>4. Analysis of Acid-Base Imbalances Report</li> </ol>	Acid-Base Balance	exams	lecture
5	3	<ol style="list-style-type: none"> <li>1. Define carbohydrate and the groups of saccharides</li> <li>2. Know the chemical structure of the common sugars.</li> <li>3. Understand the concepts of and</li> </ol>	Chemistry of Carbohydrates- 1 Monosaccharides & Disaccharides	exams	lecture

		isomerism in simple sugars anomers.			
<b>6</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Glycosides, sugar alcohols, sugar acids, phosphate esters, deoxy sugars and amino sugars.</li> <li>2. Understand the role saccharides play in biology</li> <li>3. Know the biochemical functions and differences between the various heteropolysaccharides</li> </ol>	Chemistry of Carbohydrates-1 Monosaccharides & Disaccharides	<b>exams</b>	<b>lecture</b>
<b>7</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Be able to recognize the N and O linked polysaccharides</li> <li>2. Know how dietary polysaccharides are digested by humans</li> </ol>	Chemistry of Carbohydrates-1 Monosaccharides & Disaccharides	<b>exams</b>	<b>lecture</b>
<b>8</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Study the chemical structure of polysaccharides</li> <li>2. Classify polysaccharides</li> </ol>	Chemistry of Carbohydrates-Polysaccharides Part-2	<b>exams</b>	<b>lecture</b>
<b>9</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Know the biochemical functions and differences between the various heteropolysaccharides</li> <li>2. Be able to recognize the N and O linked polysaccharides</li> </ol>	Chemistry of Carbohydrates-Polysaccharides Part-2	<b>exams</b>	<b>lecture</b>
<b>10</b>	<b>3</b>	- Know how dietary polysaccharides are digested by humans	Chemistry of Carbohydrates-Polysaccharides Part-2	<b>exams</b>	<b>lecture</b>
<b>11</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Have general idea about lipid structure and properties</li> <li>2. Classify lipids</li> <li>3. List the major physiological functions of fatty acids</li> <li>4. Derive the structure of saturated or unsaturated fatty acids.</li> </ol>	Fatty acids & Derivatives	<b>exams</b>	<b>lecture</b>
<b>12</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Study the relation between the structure and function of fatty acids</li> <li>2. Be able to specify the omega or delta ends. Recognize the alpha, beta and gamma carbons of fatty acids</li> <li>3. List and be able to identify the</li> </ol>	Fatty acids & Derivatives	<b>exams</b>	<b>lecture</b>

		general features of the eicosanoids. 4. Know the biochemical functions of the eicosanoids			
<b>13</b>	<b>3</b>	1. Classify lipids. 2. Know the main class of lipids 3. Have an idea about the structure of each class.	Glyceride , Non-glyceride & Complex lipids	<b>exams</b>	<b>lecture</b>
<b>14</b>	<b>3</b>	1. Understand the physical and chemical of the classes. 2. List the biological function of all classes. 3. Relate the structure and properties with the diseases come as a result of this lipids	Glyceride , Non-glyceride & Complex lipids	<b>exams</b>	<b>lecture</b>
<b>15</b>	<b>3</b>		Final first semester exam	<b>exams</b>	

**The structure of the course for practical medical chemistry /first academic level / first course**

<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>2</b>	a. Understand the proper laboratory safety. b. Increase the awareness of the possible risks or hazards involved with laboratory work. c. Realize the laboratory is generally a safe place to work if safety guidelines are properly followed.	Laboratory safety	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>2</b>	<b>2</b>	a. Identify and categorize the different instruments and apparatuses with their parts and uses in practice. b. Identify the photometer with its main parts and uses	Laboratory instruments and apparatuses	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>3</b>	<b>2</b>	a. Recognize the principles of photometry and the related laws. b. Measure weight and volume	Units and references values	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>4</b>	<b>2</b>	a. Learn the purpose and proper use of a spectrophotometer.	Applications of	<b>chemistry laboratory</b>	<b>exam/lab</b>

		<p>b. Determine the relationship between light absorbance and the number of particles in a sample in a given volume.</p> <p>c. Apply different methods for expressing concentration .</p> <p>d. Prepare stock solutions and perform different dilutions</p>	spectrophotometers		
<b>5</b>	<b>2</b>	<p>a. Describe the blood components in details.</p> <p>b. Explain the blood samples in details.</p>	Blood components	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>6</b>	<b>2</b>	<p>a. Describe the blood samples in details.</p> <p>b. Outline the importance of blood samples.</p>	Preparation of plasma and serum for analysis	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>7</b>	<b>2</b>	<p>a. Outline the type of biological samples .</p> <p>b. Describe the Blood collection techniques.</p>	Sample collection, processing and handling	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>8</b>	<b>2</b>	<p>a. Explain the acid base balance.</p> <p>b. Describe the role of buffers in maintaining the pH of a solution in body fluids.</p>	pH and Buffer, Acid-Base Balance	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>9</b>	<b>2</b>	<p>a. Identify the most powerful buffer systems in the body.</p> <p>b. Outline the importance of the buffer systems.</p>	Buffers in blood	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>10</b>	<b>2</b>	<p>a. Outline the importance of urine samples</p> <p>b. Describe the collection of urine samples</p> <p>c. Describe urine examinations</p>	Urinalysis (UA)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>11</b>	<b>2</b>	<p>a. Describe the content of normal urine samples.</p> <p>b. Explain the results of urine examinations.</p>	Analysis of normal constituents of urine	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>12</b>	<b>2</b>	<p>a. Describe the content of abnormal urine samples.</p> <p>b. Explain the results of urine</p>	Analysis of abnormal constituents of urine	<b>chemistry laboratory</b>	<b>exam/lab</b>



		examinations for different cases.			
<b>13</b>	<b>2</b>	a. Outline the importance of stool samples b. Describe the collection of stool samples c. Describe stool examinations	General stool examination	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>14</b>	<b>2</b>	a. Outline the importance of hematological test b. Explain the hematological test	Hematological test	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>15</b>	<b>2</b>		First-semester practical examination	<b>chemistry laboratory</b>	<b>exam/lab</b>

**- The structure of the course for theoretical medical chemistry / first academic level / the second course**

<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>3</b>	1. Describe the general structure of an amino acid. 2. Recognize amino acids and classify them based on the characteristics of their side chains. 3. List the twenty common amino acids found in living organisms.	Amino Acids & Proteins Part 1	<b>exams</b>	<b>lecture</b>
<b>2</b>	<b>3</b>	1. Describe how a peptide bond forms. 2. Understand the biologic activities of peptides	Amino Acids & Proteins Part 1	<b>exams</b>	<b>lecture</b>
<b>3</b>	<b>3</b>	1. Understand that amino acids are linked via peptide bonds to make polypeptides and proteins 2. Understand that each protein molecule can be hundreds of amino acids long and the amino acids must be joined in a precise order. 3. Know that the side-chains (R groups) of the amino acids can interact with one another to fold the protein into a particular	Amino Acids & Proteins Part 2	<b>exams</b>	<b>lecture</b>

		shape, which is essential for the protein to function correctly.			
<b>4</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe, using examples, the relationship between protein structure and function.</li> <li>2. Define denaturation and list factors led to protein denaturation.</li> <li>3. List some medical application of denaturation</li> </ol>	Amino Acids & Proteins Part 2	<b>exams</b>	<b>lecture</b>
<b>5</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Classify proteins according to different parameters including chemical composition, shape, biological function, solubility in water.</li> <li>2. Describe, using examples, the relationship between protein structure and function</li> </ol>	Amino Acids & Proteins Part 3	<b>exams</b>	<b>lecture</b>
<b>6</b>	<b>3</b>	- Explain of biological activity of some important proteins	Amino Acids & Proteins Part 3	<b>exams</b>	<b>lecture</b>
<b>7</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe the structure of a nucleotide as being a phosphate group, pentose sugar (either ribose or deoxyribose), and a nitrogen containing base,</li> <li>2. Recall that the nitrogenous bases are adenine, cytosine, guanine, and thymine in DNA, or uracil in RNA, and the base pairings that occur,</li> <li>3. State that a nucleic acid is formed from many nucleotides, joined by condensation reactions,</li> </ol>	Nucleic Acids Part 1	<b>exams</b>	<b>lecture</b>
<b>8</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Compare and contrast the structures of DNA and RNA,</li> <li>2. Explain the importance of DNA in storing genetic material and safely transferring genetic information between organisms.</li> </ol>	Nucleic Acids Part 1	<b>exams</b>	<b>lecture</b>
<b>9</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Comprehend the universal nature of the gene.</li> <li>2. Be able to define replication of DNA.</li> <li>3. Know the roles</li> </ol>	Nucleic Acids Part 2 Protein Biosynthesis	<b>exams</b>	<b>lecture</b>

		<p>of mRNA, ribosomes, tRNA and amino acids in the process of translation.</p> <ol style="list-style-type: none"> <li>Understand what start codons and stop codons are.</li> <li>Understand how a polypeptide is built, one amino acid at a time, in the different docking sites of the ribosome.</li> <li>Understand how tRNAs are 'charged' with amino acids.</li> <li>Know that ribosomes consist of a large and a small subunit.</li> <li>Be able to define polysome.</li> </ol>			
<b>10</b>	<b>3</b>	<ol style="list-style-type: none"> <li>Define how errors by DNA polymerase create mutations</li> <li>Identify the types of gene mutations.</li> <li>Describe what occurs during each type of mutation.</li> <li>Explain the structure and shape of viruses.</li> <li>Know the viral replication, viral transcription and viral protein biosynthesis.</li> <li>Discuss how to prevent viral transcription and viral protein biosynthesis</li> </ol>	Nucleic Acids Part 3	<b>exams</b>	<b>lecture</b>
<b>11</b>	<b>3</b>	<ol style="list-style-type: none"> <li>Define enzyme and explain basic functions of enzymes</li> <li>Explain basic properties of enzymes</li> <li>Discover and defines the enzyme components.</li> <li>Express localization of enzymes in the cell</li> </ol>	Enzymes Part 1	<b>exams</b>	<b>lecture</b>
<b>12</b>	<b>3</b>	<ol style="list-style-type: none"> <li>Defines the active site and catalytic activity of enzyme</li> <li>Discuss working principle of enzymes.</li> <li>Express the relationship between enzyme and substrate</li> </ol>	Enzymes Part 1	<b>exams</b>	<b>lecture</b>
<b>13</b>	<b>3</b>	<ol style="list-style-type: none"> <li>Explain what an enzyme inhibitor is.</li> <li>Distinguish between reversible</li> </ol>	Enzymes Part 2	<b>exams</b>	<b>lecture</b>

		and irreversible inhibitors. 3. Differentiate between competitive and noncompetitive inhibitors.			
<b>14</b>	<b>3</b>	1. Discuss the biological role of isoenzymes and their use in clinical diagnosis. 2. Understand the bases of enzyme catalysis and the mechanisms of enzyme regulation. 3. Know the role of regulatory enzymes in controlling metabolic pathways and cellular responses.	Enzymes Part 2	<b>exams</b>	<b>lecture</b>
<b>15</b>	<b>3</b>		Final second semester exam	<b>exams</b>	

**- The structure of the course for Practical medical chemistry /first academic level / the second course**

<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>2</b>	a. Identify the principles of the blood glucose test. b. Calculation of glucose concentration in the unknown sample	Blood Glucose Test	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>2</b>	<b>2</b>	a. Explain the types of the blood glucose tests. b. Define the Oral Glucose Tolerance Test	Oral Glucose Tolerance Test	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>3</b>	<b>2</b>	a. Describe diabetes mellitus. b. Explain its diagnosis and classification.	Diabetes mellitus	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>4</b>	<b>2</b>	a. Describe Type I diabetes mellitus. b. Illustration of case studies on Type I Diabetes Mellitus.	Case scenario of diabetes mellitus (Type I)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>5</b>	<b>2</b>	a. Describe Type II diabetes mellitus. b. Illustration of case studies on Type II Diabetes Mellitus.	Case scenario of diabetes mellitus (Type II)	<b>chemistry laboratory</b>	<b>exam/lab</b>

<b>6</b>	<b>2</b>	a. Identify the principles of the lipid profile test. b. Calculation of total cholesterol concentration in the unknown sample	Lipid Profile	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>7</b>	<b>2</b>	a. Identify the lipoproteins. b. Estimate the concentration of HDL and LDL in the unknown sample	Lipoproteins	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>8</b>	<b>2</b>	a. Describe disorders of lipid metabolism. b. Illustration of case study	Plasma lipids and lipoproteins	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>9</b>	<b>2</b>	a. Describe hypercholesterolemia. b. Illustration of case studies on hypercholesterolemia.	Case scenario of hypercholesterolemia	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>10</b>	<b>2</b>	a. Describe hypercholesterolemia in patients with diabetes mellitus. b. Illustration of case studies on hypercholesterolemia in patients with diabetes mellitus.	Case scenario of hypercholesterolemia in patients with diabetes mellitus	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>11</b>	<b>2</b>	a. Identify the principles of the triglycerides test. b. Calculation of TG concentration in the unknown sample	Triglycerides	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>12</b>	<b>2</b>	a. Describe hyperlipidaemia. b. Illustration of case studies on hyperlipidaemia .	Case scenario of hyperlipidaemia	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>13</b>	<b>2</b>	a. Describe hyperlipidaemia in patients with diabetes mellitus. b. Illustration of case studies on hyperlipidaemia in patients with diabetes mellitus.	Case scenario of hyperlipidaemia in patients with diabetes mellitus	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>14</b>	<b>2</b>	a. Describe hypercholesterolemia and hyperlipidaemia in patients with diabetes mellitus. b. Illustration of case studies on hypercholesterolemia and hyperlipidaemia in patients with diabetes mellitus.	Case scenario of hypercholesterolemia and hyperlipidaemia in patients with diabetes	<b>chemistry laboratory</b>	<b>exam/lab</b>

			mellitus		
<b>15</b>	<b>2</b>		Second-semester examination	<b>chemistry laboratory</b>	<b>exam/lab</b>

<b>- The structure of the course for theoretical biochemistry / second academic level / the first course</b>					
<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Identify the major saccharides found in the human body and diet.</li> <li>2. What is the process of carbohydrate metabolism?</li> <li>3. Draw diagram of how glucose transported across intestinal epithelial cells and into the blood stream and describe the protein involved.</li> </ol>	Introduction to Carbohydrate metabolism	<b>exams</b>	<b>lecture</b>
<b>2</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe the overall purpose of glycolysis, its cellular reactants and products, its cellular localization and its tissue distribution.</li> <li>2. Differentiate the roles of hexokinase and glucokinase in blood glucose regulation.</li> <li>3. Describe the purpose of the reaction catalyzed by LDH.</li> <li>4. Predict the results of a CBC in a person with PK deficiency who is in hemolytic crisis.</li> <li>5. Explain the biochemical basis of the hemolytic anemia observed in deficiency of erythrocyte pyruvate kinase.</li> </ol>	Glycolysis	<b>exams</b>	<b>lecture</b>
<b>3</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe the overall purpose of the TCA cycle, its reactants and products, its cellular localization and its tissue distribution.</li> <li>2. Explain the effect of the ATP and citrate on the activity of the TCA cycle.</li> <li>3. Describe the role of the TCA</li> </ol>	TCA Cycle	<b>exams</b>	<b>lecture</b>

		Cycle intermediates as sources of reactants for biosynthetic pathways.			
<b>4</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Differentiate the enzymes involved in glycolysis and gluconeogenesis.</li> <li>2. Explain the contribution of gluconeogenesis to blood glucose regulation.</li> <li>3. Evaluate the relative importance of different precursors for gluconeogenesis in feeding, fasting and exercise.</li> <li>4. Describe the overall purpose of gluconeogenesis and glycogenolysis, their reactants and products, their cellular localization and their tissue distribution.</li> <li>5. Explain how glycogen synthesis and glycogenolysis are regulated by insulin, glucagon and catecholamines.</li> <li>6. Select laboratory tests that would contribute to the diagnosis of glycogen storage disease.</li> </ol>	Gluconeogenesis, Glycogen metabolism	<b>exams</b>	<b>lecture</b>
<b>5</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe the overall purpose of the PPP, its reactants and products and its cellular localization.</li> <li>2. Describe the role of reduced glutathione in the body.</li> <li>3. Explain the biochemical basis of the drug induced hemolytic anemia observed in G6PD deficiency.</li> <li>3. Select laboratory tests used to diagnose G6PD deficiency.</li> </ol>	Pentose-phosphate pathway	<b>exams</b>	<b>lecture</b>
<b>6</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Compare and contrast type 1 and type 2 diabetes mellitus with respect to incidence, age of onset and distinguishing characteristics.</li> <li>2. Describe abnormalities in blood glucose homeostasis in patients with type 1 diabetes.</li> </ol>	Diabetes Mellitus	<b>exams</b>	<b>lecture</b>

		<ol style="list-style-type: none"> <li>3. Recognize the clinical presentation of type 1 diabetes mellitus.</li> <li>4. Discuss how lifestyle factors impact the development of type 2 diabetes.</li> </ol>			
<b>7</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Identify the metabolic products of ethanol metabolism including acetyl CoA.</li> <li>2. Evaluate the metabolic effects and clinical significance of ethanol and its metabolites.</li> <li>3. Explain the biochemical basis for the effects of alcohol ingestion on gluconeogenesis.</li> <li>4. Generate a problem list with potential biochemical causes of hypoglycemia, hepatomegaly or lactic acidosis.</li> </ol>	Ethanol metabolism	<b>exams</b>	<b>lecture</b>
<b>8</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe the characteristics feature of hemolytic anemia.</li> <li>2. Identify G6PD genetic variant.</li> <li>3. Recognize the clinical manifestation of G6PD deficiency.</li> <li>4. Describe diagnosis of G6PD deficiency.</li> <li>5. Discuss the treatment of G6PD deficiency.</li> </ol>	G6PD Deficiency	<b>exams</b>	<b>lecture</b>
<b>9</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Definition of inborn error of metabolism.</li> <li>2. Sample collection procedure.</li> <li>3. Molecular basis of urea cycle disorders.</li> <li>4. Genetic basis of phenylketonuria.</li> </ol>	Inborn errors of metabolism	<b>exams</b>	<b>lecture</b>
<b>10</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Identify types of protein.</li> <li>2. Describe digestion of protein by gastric secretion.</li> <li>3. Illustrate the action of rennin.</li> <li>4. Discuss the intestinal secretion of protein.</li> </ol>	Digestion and absorption of protein	<b>exams</b>	<b>lecture</b>
<b>11</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Definition of minerals.</li> <li>2. Definition of trace element.</li> <li>3. Illustrate factors that promote</li> </ol>	Mineral metabolism	<b>exams</b>	<b>lecture</b>



		<p>calcium absorption.</p> <p>4. Describe function of calcium.</p> <p>5. Discuss causes of hypercalcemia.</p>			
<b>12</b>	<b>3</b>	<p>1. Differentiate the contribution of diet and endogenous synthesis to lipid levels.</p> <p>2. Describe the pathway of fatty acid synthesis.</p> <p>3. Describe the synthesis of triglycerides.</p> <p>4. Distinguish the composition of different sphingolipids.</p>	Lipid metabolism	<b>exams</b>	<b>lecture</b>
<b>13</b>	<b>3</b>	<p>1. Describe the pathway of fatty acid synthesis.</p> <p>2. Distinguish the effect of the feeding, fasting, exercise and hormonal regulation on body lipid.</p> <p>4. Describe endocrine function of adipose tissue.</p>	Fatty acid synthesis	<b>exams</b>	<b>lecture</b>
<b>14</b>	<b>3</b>	<p>1. Describe the mechanism for activation and transport of fatty acids into mitochondria for catabolism.</p> <p>2. Outline the sequence of reactions involved in oxidation of fatty acids in mitochondria.</p> <p>3. Explain the mechanism for the formation of KBs and identify the physiological and pathological roles of those molecules.</p> <p>4. Distinguish the mechanisms by which cholesterol biosynthesis is regulated by hormones and food intake.</p>	Beta - oxidation ,cholesterol and ketone bodys	<b>exams</b>	<b>lecture</b>
<b>15</b>	<b>3</b>		Final first semester exam	<b>exams</b>	

**- The structure of the course for Practical biochemistry /second academic level / the first course**

<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>2</b>	1- To make the students aware about the possible safety issue. 2- To describe the ideal appearance and attitude of the student during the lab time. 3- To describe the proper costume that the students should wear during the lab time.  To learn the students what they should do in case of accident.	Laboratory safety	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>2</b>	<b>2</b>	1- To describe how to obtain blood samples. 2- To demonstrate blood draw. 3- To identify the ideal blood draw sites. 4- To learn the student what are the blood collection tubes available and which one they should use for each group of tests.  To teach the students what is the anti-coagulant tubes and how does it work.	Collection and handling of blood samples	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>3</b>	<b>2</b>	1- To describe what is the properties of the urine. 2- To make the student appreciated the importance of urine analysis. 3- To learn the student the procedure followed to analyse urine sample. 4- What is the basic types of clinically used urine samples?	Collection and handling of urine samples	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>4</b>	<b>2</b>	1- To demonstrate what kind of instrument we used in clinical biochemistry lab. 2- The explain the principles of	Analytical techniques and instrumentation	<b>chemistry laboratory</b>	<b>exam/lab</b>

		<p>each device.</p> <p>3- Explain the basic concepts of each device.</p> <p>Explain the possible mistake in using in these devices.</p>			
<b>5</b>	<b>2</b>	<p>1- Explain the importance of Glucose test.</p> <p>2- Describe the principles of glucose test.</p> <p>3- The types of glucose test and the reference range.</p> <p>4- The clinical significance of glucose test.</p> <p>5- Cause and consequence of hyper- and hypo-glycaemia.</p>	Glucose	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>6</b>	<b>2</b>	<p>1- Explain the importance of AbA1c test and what is the result means.</p> <p>2- Describe the principles of HbA1c test.</p> <p>3- Teach the student what is the HbA1c reference range and the interpretations the result for diabetes and non-diabetes patients.</p> <p>The clinical significance of HbA1c test.</p>	HbA1c	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>7</b>	<b>2</b>	<p>1- Explain the importance of GTT test and what is the result means.</p> <p>2- Explain in which health conditions the test should order.</p> <p>3- Describe the principles of GGT test.</p> <p>4- Teach the student what is the GGT reference range and the interpretations the result for diabetes and non-diabetes patients.</p> <p>5- The clinical significance of GGT test. what is the pre-test preparations</p>	Glucose tolerance test (GTT)	<b>chemistry laboratory</b>	<b>exam/lab</b>

8	2	<ol style="list-style-type: none"> <li>1- Explain the importance of Insulin and Glucagon test and what is the result means.</li> <li>2- Explain why the doctor's order Insulin and Glucagon test.</li> <li>3- Describe the principles of Insulin and Glucagon test .</li> <li>4- Learn the student what is the Insulin and Glucagon reference range and the interpretations the result for diabetes and non-diabetes patients .</li> <li>5- The clinical significance of Insulin and Glucagon test. what is the pre-test preparations.</li> </ol>	Insulin and Glucagon	<b>chemistry laboratory</b>	<b>exam/lab</b>
9	2	<ol style="list-style-type: none"> <li>1- Explain the importance of C-peptide test and what is the result means.</li> <li>2- Explain why the doctor's order C-peptide test.</li> <li>3- Describe the principles of C-peptide test.</li> <li>4- Learn the student what is the C-peptide reference range and the interpretations the result for diabetes and non-diabetes patients.</li> <li>5- The clinical significance of C-peptide test. What is the pre-test preparations.</li> </ol>	C-peptide	<b>chemistry laboratory</b>	<b>exam/lab</b>
10	2	<ol style="list-style-type: none"> <li>1- Explain the importance of Cholesterol and Triglyceride test and what is the result means.</li> <li>2- Explain why the doctor's order Cholesterol and Triglyceride test.</li> <li>3- Describe the principles of Cholesterol and Triglyceride test.</li> <li>4- Teach the student what is the</li> </ol>	Plasma lipids and lipoproteins (Cholesterol and Triglyceride)	<b>chemistry laboratory</b>	<b>exam/lab</b>

		<p>Cholesterol and Triglyceride reference range.</p> <p>5- The clinical significance of Cholesterol and Triglyceride test.</p> <p>What is the pre-test preparations.</p>			
<b>11</b>	<b>2</b>	<p>1- Explain the importance of HDL, LDL, and VLDL test and what is the result means.</p> <p>2- Explain why the doctor's order HDL, LDL, and VLDL test.</p> <p>3- Describe the principles of HDL, LDL, and VLDL test.</p> <p>4- Learn the student what is the HDL, LDL, and VLDL reference range.</p> <p>5- The clinical significance of HDL, LDL, and VLDL test.</p> <p>What is the pre-test preparations.</p>	Plasma lipids and lipoproteins (HDL, LDL, and VLDL)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>12</b>	<b>2</b>	<p>1- Explain the importance of Protein and albumin test and what is the result means.</p> <p>2- Explain why the doctor's order Protein and albumin test.</p> <p>3- Describe the principles of Protein and albumin test.</p> <p>4- Learn the student what is the Protein and albumin reference range.</p> <p>The clinical significance of Protein and albumin test.</p>	Protein and albumin	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>13</b>	<b>2</b>	<p>1- Explain the importance of G6PDH test and what is the result means.</p> <p>2- Explain why the doctor's order G6PDH test.</p> <p>3- Describe the principles of G6PDH test .</p> <p>4- Learn the student what is the G6PDH reference range. The clinical significance of</p>	G6PDH	<b>chemistry laboratory</b>	<b>exam/lab</b>

		G6PDH test.			
<b>14</b>	<b>2</b>	1- Explain the importance of Urea test, Creatinine Test and what is the result means. 2- Explain why the doctor's order Urea test, Creatinine Test. 3- Describe the principles of Urea test, Creatinine Test. 4- Teach the student what is the Urea, Creatinine reference range. The clinical significance of Urea test, Creatinine Test.	Kidney function test (Urea Test), (Creatinine Test)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>15</b>	<b>2</b>		First- semester practical examination	<b>chemistry laboratory</b>	<b>exam/lab</b>

**- The structure of the course for theoretical biochemistry / second academic level / the Second course**

<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>3</b>	1. Describe factors affecting nitrogen balance in health and disease. 2. Describe the biosynthesis of melanin and catecholamine's hormones from essential amino acids. 3. Describe the biosynthesis of EAAs and NEAAs from intermediates of glycolytic pathway and TCA cycle. 4. Describe the role of folic acid. 5. Compare and contrast dopamine levels in Parkinson's disease. 6. Describe the role of tyrosinase in albinism.	Amino acids and protein	<b>exams</b>	<b>lecture</b>
<b>2</b>	<b>3</b>	1. Describe the reactions of the urea cycle. 2. List the causes of hyperammonemia and treatments to reduce blood	Urea cycle	<b>exams</b>	<b>lecture</b>

		<p>ammonia levels.</p> <p>3. Identify the connections and common intermediates between the urea cycle and TCA cycle.</p>			
<b>3</b>	<b>3</b>	<p>1. Describe porphyrin and heme synthesis.</p> <p>2. Describe the difference between total, direct and indirect bilirubin.</p> <p>3. Describe heme catabolism.</p>	Porphyrrias	<b>exams</b>	<b>lecture</b>
<b>4</b>	<b>3</b>	<p>1. Definition of vitamins.</p> <p>2. Describe the common classification of vitamins.</p> <p>3. Describe the role of vitamin A.</p> <p>4. Identify the common problems associated with vitamin A deficiency.</p>	Vitamins	<b>exams</b>	<b>lecture</b>
<b>5</b>	<b>3</b>	<p>1. List the water-soluble vitamins.</p> <p>2. Discuss the problems associated with vitamin B deficiency.</p> <p>3. List the causes of vitamin B deficiency.</p>	Water soluble vitamins	<b>exams</b>	<b>lecture</b>
<b>6</b>	<b>3</b>	<p>1. Introduction to endocrinology.</p> <p>2. Identify the common factors, which regulate the release of anterior pituitary hormone.</p> <p>3. Describe the hormones that release from the anterior pituitary gland.</p> <p>4. Identify clinical problems associated with growth hormone deficiency.</p>	Disorders of the hypothalamus and pituitary	<b>exams</b>	<b>lecture</b>
<b>7</b>	<b>3</b>	<p>1. Describe the physiology of thyroid gland.</p> <p>2. Illustrate the hormones that regulate thyroid hormone secretion.</p> <p>3. Discuss thyroid function test.</p>	Thyroid gland	<b>exams</b>	<b>lecture</b>
<b>8</b>	<b>3</b>	<p>1. Definition of hypothyroidism.</p> <p>2. Describe symptoms of hypothyroidism.</p>	Thyroid gland disease	<b>exams</b>	<b>lecture</b>

		<ol style="list-style-type: none"> <li>3. Identify the pathophysiology of hypothyroidism.</li> <li>4. Diagnosis of hypothyroidism.</li> <li>5. Describe factors contribute to hypothyroidism.</li> <li>6. Identify the causes of hyperthyroidism.</li> <li>7. Pathophysiology of hyperthyroidism.</li> <li>8. Describe laboratory investigation of hyperthyroidism.</li> <li>9. Describe the treatment of hyperthyroidism.</li> </ol>			
<b>9</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe the function of cell membrane.</li> <li>2. Meaning of transport function.</li> <li>3. Types of transport mechanisms.</li> <li>4. Describe the factors that influence diffusion rates.</li> <li>5. Describe osmolarity and tonicity.</li> </ol>	Biological membrane and transport	<b>exams</b>	<b>lecture</b>
<b>10</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. Describe major function of the liver.</li> <li>2. Identify the substance that are excreted by the liver.</li> <li>3. Describe how jaundice occur.</li> <li>4. Describe why unconjugated bilirubin occur.</li> <li>5. Identify the disease of the liver.</li> </ol>	Liver	<b>exams</b>	<b>lecture</b>
<b>11</b>	<b>3</b>	<ol style="list-style-type: none"> <li>1. General description of kidney.</li> <li>2. Describe the function of kidney.</li> <li>3. Identify the causes of impaired renal function.</li> <li>4. Definition of acute kidney injury.</li> <li>5. Identify the diagnostic feature of acute kidney injury.</li> <li>6. Describe the phases of acute kidney injury.</li> <li>7. Identify the investigation of low urinary output.</li> </ol>	Kidney, Renal Failure	<b>exams</b>	<b>lecture</b>



		8. Describe the classification of chronic kidney injury.			
<b>12</b>	<b>3</b>	1. General definition of cancer. 2. Describe how tumor growth effect on body organs. 3. Illustrate the symptoms of tumor. 4. Describe why renal failure occur in-patient with tumor. 5. Identify cancer treatment and its consequences.	Cancer and its consequences	<b>exams</b>	<b>lecture</b>
<b>13</b>	<b>3</b>	1. Definition of tumor marker. 2. Illustrate uses of tumor marker. 3. Identify types of tumor marker.	Tumor marker	<b>exams</b>	<b>lecture</b>
<b>14</b>	<b>3</b>	1. Definition of nutrition. 2. Illustrate how trauma and sepsis effect on nutrition of individual. 3. Definition of starvation and under nutrition. 5. Describe nutritional assessment.	Nutrition	<b>exams</b>	<b>lecture</b>
<b>15</b>	<b>3</b>		Final second semester exam	<b>exams</b>	

**- The structure of the course for Practical biochemistry /second academic level / the second course**

<b>Week</b>	<b>Hours</b>	<b>Required educational goals</b>	<b>Unit name and/or topic</b>	<b>Evaluation method</b>	<b>Education method</b>
<b>1</b>	<b>2</b>	1- Explain the importance of Uric acid test and what is the result means. 2- Explain why the doctor's order Uric acid test. 3- Describe the principles of Uric acid test. 4- Learn the student what is the Uric acid reference range. The clinical significance of Uric acid test.	Gout (Uric acid Test)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>2</b>	<b>2</b>	1- Explain the importance of albumin test in LFT and what	Liver function test LFT	<b>chemistry laboratory</b>	<b>exam/lab</b>

		<p>is the result means.</p> <p>2- Explain why the doctor's order albumin test for patient has liver disease.</p> <p>3- Describe the principles of albumin test.</p> <p>4- Learn the student what is the albumin reference range.</p> <p>The clinical significance of albumin test for patient has liver disease.</p>	(Protein synthesis (albumin))		
<b>3</b>	<b>2</b>	<p>1- Explain the importance of bilirubin test in LFT and what is the result means.</p> <p>2- Explain why the doctor's order bilirubin test for patient has liver disease.</p> <p>3- Describe the principles of bilirubin test.</p> <p>4- What is the difference between direct and indirect bilirubin?</p> <p>5- Learn the student what is the bilirubin reference range.</p> <p>6- The clinical significance of bilirubin test for patient has liver disease.</p> <p>How testing direct and indirect bilirubin are important for distinguish between different types of liver disease.</p>	Liver function test (Hepatic anion transport (bilirubin))	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>4</b>	<b>2</b>	<p>1- Explain the importance of GOT and GPT test in LFT and what is the result means.</p> <p>2- Explain why the doctor's order GOT and GPT test for patient has liver disease.</p> <p>3- Describe the principles of GOT and GPT test.</p> <p>4- Learn the student what is the GOT and GPT reference range.</p> <p>5- The clinical significance of GOT and GPT test for patient has liver disease.</p>	Liver function test (Hepatocellular integrity (GOT and GPT))	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>5</b>	<b>2</b>	<p>1- Explain the importance of ALP test in LFT and what is the result means.</p>	Liver function test (Presence of cholestasis)	<b>chemistry laboratory</b>	<b>exam/lab</b>

		<p>2- Explain why the doctor's order ALP test for patient has liver disease.</p> <p>3- Describe the principles of ALP test.</p> <p>4- Learn the student what is the ALP reference range.</p> <p>The clinical significance of ALP test for patient has liver disease.</p>	(alkaline phosphatase ALP))		
6	2	<p>1- Explain the importance of Vitamin D3 test and what is the result means.</p> <p>2- Explain why the doctor's order Vitamin D3.</p> <p>3- Describe the principles of Vitamin D3 test .</p> <p>4- Learn the student what is the Vitamin D3 reference range.</p> <p>The clinical significance of Vitamin D3 test.</p>	Vitamin (Vitamin D3 Test)	<b>chemistry laboratory</b>	<b>exam/lab</b>
7	2	<p>1- Explain the importance of Trace elements and metals test and what is the result means.</p> <p>2- Explain why the doctor's order Trace elements and metals test.</p> <p>3- Describe the principles of Trace elements and metals test.</p> <p>4- Learn the student what is the Trace elements and metals test reference range.</p> <p>5- The clinical significance of Trace elements and metals test.</p>	Trace elements and metals	<b>chemistry laboratory</b>	<b>exam/lab</b>
8	2	<p>1- Explain the importance of Calcium test and what is the result means.</p> <p>2- Explain why the doctor's order Calcium test.</p> <p>3- Describe the principles of Calcium test.</p> <p>4- Learn the student what is the Calcium test reference range.</p> <p>The clinical significance of Calcium test.</p>	Electrolytes (Calcium)	<b>chemistry laboratory</b>	<b>exam/lab</b>

<b>9</b>	<b>2</b>	<ol style="list-style-type: none"> <li>1- Explain the importance of Sodium test and what is the result means.</li> <li>2- Explain why the doctor's order Sodium test.</li> <li>3- Describe the principles of Sodium test.</li> <li>4- Learn the student what is the Sodium test reference range. The clinical significance of Sodium test.</li> </ol>	Electrolytes (Sodium)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>10</b>	<b>2</b>	<ol style="list-style-type: none"> <li>1- Explain the importance of Potassium test and what is the result means.</li> <li>2- Explain why the doctor's order Potassium test.</li> <li>3- Describe the principles of Potassium test.</li> <li>4- Learn the student what is the Potassium test reference range. The clinical significance of Potassium test.</li> </ol>	Electrolytes (Potassium)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>11</b>	<b>2</b>	<ol style="list-style-type: none"> <li>1- Explain the importance of Chloride test and what is the result means.</li> <li>2- Explain why the doctor's order Chloride test.</li> <li>3- Describe the principles of Chloride test.</li> <li>4- Learn the student what is the Chloride test reference range. The clinical significance of Chloride test.</li> </ol>	Electrolytes (Chloride)	<b>chemistry laboratory</b>	<b>exam/lab</b>
<b>12</b>	<b>2</b>	<ol style="list-style-type: none"> <li>1- Explain the importance of T3, T4 and TSH test and what is the result means.</li> <li>2- Explain why the doctor's order T3, T4 and TSH test.</li> <li>3- Describe the principles of T3, T4 and TSH test .</li> <li>4- Learn the student what is the T3, T4 and TSH test reference range. The clinical significance of T3, T4 and TSH test.</li> </ol>	Thyroid Function test T3, T4 and TSH	<b>chemistry laboratory</b>	<b>exam/lab</b>

13	2	<p>1- Explain the importance of Lipase and Amylase test and what is the result means.</p> <p>2- Explain why the doctor's order Lipase and Amylase test.</p> <p>3- Describe the principles of Lipase and Amylase test .</p> <p>4- Learn the student what is the Lipase and Amylase test reference range.</p> <p>The clinical significance of Lipase and Amylase test.</p>	Lipase and Amylase	<b>chemistry laboratory</b>	<b>exam/lab</b>
14	2	<p>1- Explain the importance of CPK test, Troponin test and what is the result means.</p> <p>2- Explain why the doctor's order CPK test, Troponin test.</p> <p>3- Describe the principles of CPK test, Troponin test.</p> <p>4- Learn the student what is the CPK test, Troponin test reference range.</p> <p>5- The clinical significance of CPK test, Troponin test.</p>	Cardiac marker (CPK) , (Troponin)	<b>chemistry laboratory</b>	<b>exam/lab</b>
15	2		Second-semester practical examination	<b>chemistry laboratory</b>	<b>exam/lab</b>

## 11. Cours Evaluation

- Daily exams.
- Evaluating the performance of conducting practical experiments in the laboratory.
- The student's scientific and practical ability to solve health problems.
- Reports preparation
- Mid-course exam.
- End of course exam.

## 12. Learning and Teaching Resources

Required textbooks (curricular book , if any) :	-Harper's Illustrated Biochemistry (31st Edition). -Lippincott Illustrated Reviews: Biochemistry, Seventh Edition, 2018.
Main references (source)	- Basic Medical Biochemistry (4st Edition). - Lehninger Principles of Biochemistry (7st Edition).
Recommended book and references (scientific journals, reports .....)	Scientific journals in clinical biochemistry.
Electronic References , Website...	The website of the Faculty of Medicine in addition to the Internet.