



Course Specification For Pharmaceutical Biochemistry (I)

I. Course Identification and General Information:						
1	Course Title:	Pharmaceutical Biochemistry (I)				
2	Course Number & Code:	Ph741				
3	Credit hours:	C.H				Total
		Theoretical	Practical	Training	Seminar	
		2	2	-	-	3
4	Study level/ semester at which this course is offered:	2 nd semester of 2 nd Level				
5	Pre –requisite (if any):	General Pharmaceutical Chemistry, Pharmaceutical Organic Chemistry & Pharmaceutical Analytical Chemistry				
6	Co –requisite (if any):	Physiology II				
7	Program (s) in which the course is offered:	Bachelor of Pharmacy				
8	Language of teaching the course:	English				
9	Location of teaching the course:	Faculty of Pharmacy - Sana`a University.				
10	Prepared by:	Assoc. Prof. Badria A. Shamsan				
11	Date of approval:					

II. Course description:

The course is designed to provide candidate with good knowledge about structure and function of carbohydrates, lipids and proteins. It also provides candidate with a basic knowledge in modern biochemistry and molecular biology necessary for an understanding of the life sciences at the molecular level, in addition to help students to become familiar with the biochemical knowledge and skills necessary to understand other related subjects.

I. Intended learning outcomes (ILOs) of the course:

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At the end of this course the students should be able to:

1. Define the types, structures, classification, physical, chemical properties, & functions, of different types of carbohydrates, and their derivative compounds resulted, illustrating the relationship between their structure and function.
2. Define the types, structures, classification, physical, chemical properties, & functions, of different types biological molecules of lipids and the relationship between their structure and function.
3. Describe the classes of amino acids & their structures, functions, and the effective biological compounds produced from them.
4. Explain types of protein classifications, structures, function and denaturation & re-naturation processes and their relation-ship in health and diseases .
5. Define the types, structures& classification, of different types of enzymes, and their isozymes, illustrating their function in the diagnosis of diseases.
6. Describe the sources, types, structures, classification, & functions, of vitamins, and their derivative compounds, illustrating their function and deficiency diseases resulted or hypervitaminosis.
7. Discuss the types, structures, properties of nucleic acids (DNA & RNA), and mechanisms of flow of genetic information, and protein synthesis, (the replications, transcriptions, and translations processes).
8. Point-out the different types of biological molecules, e.g. (sugars, amino acids, proteins & fatty acids), and differentiate between the essential, and the non-essential ones.
9. Summarize and categorize some enzymes & isoenzymes reactions, with their clinical & diagnostic significance.
10. Interpret symptoms, signs and biochemical lab. findings (deficiency diseases), of some macro and trace elements, as some plasma proteins, enzymes, vitamins, and minerals as (Ca^{++} , Na^+ , K^+ , Iron, etc.)
11. Consolidate & illustrating the different types of mutations, to construct the normal and abnormal (mutant) samples, as sickle cell anemia
12. Identify of many genetic diseases due to deficiency of certain biological molecules.
13. Identify the physical & chemical properties of carbohydrates and to differentiate between the reducing substances present in urine in health & disease.
14. Identify the physical & chemical properties of different types of amino acids and proteins, using different methods (electrophoresis, chromatography, ppt. methods etc.).
15. Perform the physical and chemical tests to study the properties of lipids, fatty acids, triglycerides, cholesterol, and lipoproteins
16. Practice the qualitative determinations of macromolecules and write a small report to discuss the result or themethod.
17. Dialogue and discuss medical conditions of patients depending on biochemical lab investigations.
18. Deal & cooperative with information technology, and utilize the resources of biomedical information including the available electronic facilities to update knowledge and solve emerging problems.
19. Adopt the principles of lifelong and communicate effectively with a group in lab. or during preparation of seminars.
20. Work independently, or collaboratively as a medical teamwork member, during certain community crisis.
21. Write reports or proposals.

III. Intended learning outcomes (ILOs) of the course:

(A) Knowledge and Understanding:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Knowledge and Understanding.**

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Program Intended Learning Outcomes (Sub-PILOs) in: Knowledge and Understanding		Course Intended Learning Outcomes (CILOs) in: Knowledge and Understanding	
After completing this program, students will be able to:		After completing this course, students will be able to:	
A1-	Recognize the principles of physical, chemical, clinical, social, behavioral, health and pharmaceutical sciences.	a1-	Define the types, structures, classification, physical, chemical properties, & functions, of different types of carbohydrates, and their derivative compounds resulted, illustrating the relationship between their structure and function.
A3-	Describe the general cellular, biochemical and physiological aspects of human body and recognize the pharmacokinetics, pharmacodynamics, disease pathophysiology, and pharmacogenetic of therapeutic agents to provide pharmaceutical care and facilitate management of patient's medication, rationalize drug use and overall health needs.	a2-	Define the types, structures, classification, physical, chemical properties, & functions, of different types biological molecules of lipids and the relationship between their structure and function.
		a3-	Describe the classes of amino acids & their structures, functions, and the effective biological compounds produced from them.
		a4-	Explain types of protein classifications, structures, function and denaturation & re-naturation processes and their relation-ship in health and diseases .
		a5-	Define the types, structures& classification, of different types of enzymes, and their isozymes, illustrating their function in the diagnosis of diseases.
		a6-	Describe the sources, types, structures, classification, & functions, of vitamins, and their derivative compounds, illustrating their function and deficiency diseases resulted or hypervitaminosis.
		a7-	Discuss the types, structures, properties of nucleic acids (DNA & RNA), and mechanisms of flow of genetic information, and protein synthesis, (the replications, transcriptions, and translations processes).

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment of Learning Outcomes of Knowledge and Understanding to Teaching and Assessment Methods:

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Course Intended Learning Outcomes (CILOs) in Knowledge and Understanding		Teaching strategies/methods to be used	Methods of assessment
completing this course, students will be able to:			▪
a1-	Define the types, structures, classification, physical, chemical properties, & functions, of different types of carbohydrates, and their derivative compounds resulted, illustrating the relationship between their structure and function.	<ul style="list-style-type: none"> ▪ Lecture methods ▪ Brain storming. ▪ Discussion during lectures. ▪ Periodical Exam. ▪ Quizzes. ▪ Oral evaluation. ▪ Homework. 	
a2-	Define the types, structures, classification, physical, chemical properties, & functions, of different types of lipids and the relationship between their structure and function.		
a3-	Describe the classes of amino acids & their structures, functions, and the effective biological compounds produced from them.		
a4-	Explain types of protein classifications, structures, function and denaturation & renaturation processes, and their relation-ship in health and diseases .		
a5-	Define the types, structures& classification, of different types of enzymes, and their isozymes, illustrating their function in the diagnosis of diseases.		
a6-	Describe the sources, types, structures, classification, & functions, of vitamins, and their derivative compounds, illustrating their		
	function and deficiency diseases resulted or hypervitaminosis.		
a7-	Discuss the types, structures, properties of nucleic acids (DNA & RNA), and mechanisms of flow of genetic information, and protein synthesis, (the replications, transcriptions, and translations processes).		

(B) Intellectual Skills:

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Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Intellectual skills			
Program Intended Learning Outcomes (Sub-PILOs) in Intellectual skills		Course Intended Learning Outcomes (CILOs) of Intellectual Skills	
After completing this program, students will be able to:		After completing this course, students will be able to:	
B1-	Consolidate the chemical, biochemical and physiological principles to construct the pharmacophores of the structure and their effect on the stability, pharmacokinetic and pharmacodynamic profiles of the drug.	b1-	Point-out the different types of biological molecules, e.g. (sugars, amino acids, proteins & fatty acids), and differentiate between the essential, and the non-essential ones.
		b2-	Summarize and categorize of some enzymes & isoenzymes reactions, with their clinical & diagnostic significance.
		b3-	Interpret symptoms, signs and biochemical lab. findings (deficiency diseases), of some macro and trace elements, as some plasma proteins, enzymes, vitamins, and minerals as (Ca ⁺⁺ , Na ⁺ , K ⁺ , Iron, etc.).
		b4-	Consolidate & illustrating the different types of mutations, to construct the normal and abnormal (mutant) samples, as sickle cell anemia.
		b5-	Identify of many genetic diseases due to deficiency of certain biological molecules.
Teaching And Assessment Methods For Achieving Learning Outcomes:			
Alignment of Learning Outcomes of Intellectual Skills to Teaching Methods and Assessment Methods:			
Course Intended Learning Outcomes (CILOs) in Intellectual Skills.		Teaching strategies/methods to be used	Methods of assessment
After completing this course, students will be able to:		<ul style="list-style-type: none"> ▪ Lecture lectures ▪ Problem solving ▪ Brain storming.	<ul style="list-style-type: none"> ▪ Oral evaluations. ▪ Observation ▪ Drop quizzes.
b1-	Point-out the different types of biological molecules, e.g. (sugars, amino acids, proteins & fatty acids), and differentiate between the essential, and the non-essential ones.		
b2-	Summarize and categorize of some enzymes & isoenzymes reactions, with their clinical & diagnostic significance.		



b3-	Interpret symptoms, signs and biochemical lab. findings (deficiency diseases), of some macro and trace elements, as some plasma proteins, enzymes, vitamins, and minerals as (Ca ⁺⁺ , Na ⁺ , K ⁺ , Iron, ... etc.).	
b4-	Consolidate the replications, transcriptions, and translations processes, illustrating the different types of mutations, to construct the normal and abnormal (mutant) samples, as sickle cell anemia.	
b5-	Identify of many genetic diseases due to deficiency of certain biological molecules.	

(C) Professional and Practical Skills:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Professional and Practical Skills**

Program Intended Learning Outcomes (Sub-PILOs) in Professional and Practical Skills		Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills	
After completing this program, students will be able to:		After completing this course, students will be able to:	
C1-	Operate different pharmaceutical equipments and instruments and use emerging technologies in design, synthesis, pre-formulation, formulation,	c1-	Identify the physical & chemical properties of carbohydrates and to differentiate between the reducing substances present in urine in

	packaging, storage and analysis of pharmaceutical products according to GLP, GSP and cGMP guidelines.		health & disease.
C2-	Handle and dispose chemicals and pharmaceutical preparations including radio-pharmaceuticals safely and effectively.	c2-	Identify the physical & chemical properties of different types of amino acids and proteins, using different methods (electrophoresis, chromatography, ppt. methods etc....).
C5-	Conduct research studies and utilize the results in different pharmaceutical fields.	c3-	Perform the physical and chemical tests to study the properties of lipids, fatty acids, triglycerides, cholesterol and lipoproteins.
		c4-	Practice the qualitative determinations of macromolecules and write a small report to discuss the result or the method.



		c5-	Dialogue and discuss medical conditions of patients depending on biochemical lab investigations.
Teaching And Assessment Methods For Achieving Learning Outcomes:			
Alignment of Learning Outcomes of Professional and Practical Skills to Teaching and Assessment Methods:			
Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills		Teaching strategies/methods to be used	Methods of assessment
After completing this course, students will be able to:		<ul style="list-style-type: none"> ▪ Lecture methods. ▪ Practical session. ▪ Brain storming. ▪ Group discussion. 	<ul style="list-style-type: none"> ▪ Practical works. ▪ Observation. ▪ Oral evaluation. ▪ Reports. ▪ Quizzes.
c1-	Identify the physical & chemical properties of carbohydrates and to differentiate between the reducing substances present in urine in health & disease.		
c2-	Identify the physical & chemical properties of different types of amino acids and proteins, using different methods (electrophoresis, chromatography, ppt. methods etc.).		
c3-	Perform the physical and chemical tests to study the properties of lipids, fatty acids, triglycerides, cholesterol, and lipoproteins.		
c4-	Practice the qualitative determinations of macromolecules and write a small report to discuss the result or the method.		
c5-	Dialogue and discuss medical conditions of patients depending on biochemical lab investigations.		

(D) General / Transferable Skills:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **General and Transferable skills**

Program Intended Learning Outcomes (PILOs) in General / Transferable skills		Course Intended Learning Outcomes (CILOs) in General / Transferable skills	
After completing this program, students will be able to:		After completing this course, students will be able to:	
D2-	Employ proper documentation and filing systems in different pharmaceutical fields	d1-	Deal & cooperative with information technology, and utilize the resources of biomedical information including the available electronic facilities to update knowledge and solve emerging problems.

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D3-	Develop financial, market management, writing, presentation and time management skills as well as creativity, critical thinking, problem solving and decision making abilities.	d2-	Adopt the principles of lifelong and communicate effectively with a group in lab. or during preparation of seminars.
D5-	Apply information and communication technology and working effectively in a team.	d3-	Work independently, or collaboratively as a medical teamwork member, during certain community crisis.
		d4-	Write reports or proposals.

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment of Learning Outcomes of General and Transferable skills to Teaching and Assessment Methods:

Course Intended Learning Outcomes (CILOs) in General and Transferable Skills		Teaching strategies/methods to be used	Methods of assessment
After completing this course, students will be able to:			
d1-	Deal & cooperative with information technology, and utilize the resources of biomedical information including the available electronic facilities to update knowledge and solve emerging problems.	<ul style="list-style-type: none"> ▪ Group work. ▪ Practical session. ▪ Oral presentations. ▪ Research proposal. 	<ul style="list-style-type: none"> ▪ Observation. ▪ Homework. ▪ Reports.
d2-	Adopt the principles of lifelong and communicate effectively with a group in lab. or during preparation of seminars.		
d3-	Work independently, or collaboratively as a medical teamwork member, during certain community crisis.		
d4-	Write reports or proposals.		

IV. Course Content:

1 – Course Topics/Items:

a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Number of weeks	Contact hours
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1	Carbohydrate Chemistry, Classification, types & their biological importance.	a1, b1, c1, c4, c5, d1, d3.	- Monosaccharides, - Disaccharides, - Oligosaccharides. - Polysaccharides, Physical & chemical properties, their functions & resulted diseases.	2	4
2	Lipid Chemistry, Types, their biological importance.	a2, b1, c3, c4, c5, d1	- Triglycerides. - Phospholipids & lipoprot- -eins, their chemical , physical properties & types, with their clinical importance - Cholesterol, advantage, disadvantage & resulted diseases as (Atherosclerosis).	3	6
3	Amino Acids & proteins Chemistry.	a3, a4, b1, b3, c2, c4, c5, d1	-Classifications, Physical, chemical properties & their biological importance.	2	4
4	Midterm exam			1	2
5	Heamoglobin	a7, b3, b4, b5, c2, c5, d1	-Structures, Types, Function & resulted disorders.	1	2
6	Enzymes	a4, a5, b2, b3, b5, c2, c4, c5, d1	-Classifications, Function, Mod of actions, Factors affecting their activities & their clinical applications in diagnostic aspect.	2	4
7	Vitamins	a2, a6, b3, c5, d1	-Classifications, derivatives, sources, daily requirements, functions, deficiency diseases and toxicity.	2	4
8	Nucleic Acids Chemistry , DNA replication & Protein Synthesis.	a7, b4, b5, c4, c5, d1	- Types, Structures, Functions. -Replication -Trascription -Translation (Protein synthesis) -PCR & c-DNA.	2	4
9	Final exam			1	2



Number of Weeks /and Units Per Semester	16	32
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b- Practical Aspect:				
Order	Training Tasks	CILOs (symbols)	Number of weeks	Contact hours
1	Identification of Carbohydrates, lipids & proteins.	a1, a2, a3, a4, b1, b3, c1, c2, c3, c4, c5, d1	4	8
2	Chromatographical analysis for amino acids.	c2, c3, c5	2	4
3	Osazone tests to differentiate between urine sugars.	c1	1	2
4	Mid term exam	c1-5	1	2
5	Precipitate of different proteins by different methods.	a4, c2, c4	3	6
6	Differentiate between types of proteins (Albumin, Benz-Jones protein), for diagnostic purpose.	a4, c2, c4, c5	3	6
7	Review	c1-5	1	2
8	Final exam	c1-5	1	2
Number of Weeks /and Units Per Semester			16	32

V. Teaching strategies of the course:

- Lectures
- Discussion sessions ▪ Lab sessions.
- Assignment and reports.
- Self – learning.
- Practical session.
- Brain storming.

-Assessment Methods:

- Mid term written exam to assess Knowledge and understanding skills and Intellectual skills. ▪ Final written exam to assess Knowledge and understanding skills and Intellectual skills.
- Observation.
- Oral evaluation.
- Reports.
- Quizzes.



VI. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
1	Participation and quizzes	1-12	10	7%	a1- a7, b1 – b5, c1 – c5, d1
2	Assignments	4-12	10	7%	c1-c5, d1- d4
3	Attendance, reports and mid practical exam	ALL	30	20%	c1-c5
4	Mid-semester exam	8	30	20%	a1- a4, b1-b5, c1-c5, d1-d4
5	Final Exam (theoretical)	16	50	33%	a1- a7, b1-b5, c1-c5, d1-d4
6	Final Practical Exam	13-14	20	13%	a1- a4, b1-b5, c1-c5, d1-d4
Total			150	10%	

VII. Students' Support:

Office Hours/week	Other Procedures (if any)
- 2 hr./ week	By social media (Face-book) or Whatsapp.

VIII. Learning Resource (MLA style or APA style)S:

1- Required Textbook(s) (maximum two)

- Murray RK, Granner DK, Mayes PA, Rodwell VW, (2003), Harper's Illustrated Biochemistry, 26th edition, McGraw-Hill companies New York.
- Champe PC, Harvey RA. Ferrier DR, (2007), Lippincott's Reviews of Biochemistry, 3rd edition Lippincott William & Wilkins London,.
- David L. Nelson and Michael M, (2012), Lehninger Principles of Biochemistry, Cox. 6th edition, W.H. Freeman.

2- Recommended Readings and Reference Materials

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	<ul style="list-style-type: none"> • Pankaja Naik, 2010, Biochemistry, 3rd Edition. • Stryer B. L, 2011. Biochemistry 2nd edition, (Short course).
3- Essential References	
	<ul style="list-style-type: none"> □ Devlin T. M, (2010), Textbook of Biochemistry with Clinical Correlations, 7th edition, New York,
4- Electronic Materials and Web Sites etc.	
	<ul style="list-style-type: none"> • <u>Periodical Book Website</u> • http://www.kumc.edu/biochemistry/resource.htm • http://www.medlib.iupui.edu/ref/biochem.htm
5- Other Learning Material:	
	<ul style="list-style-type: none"> □ Hand out (if possible) prepare by the lecturer.

X. Course Policies:	
1	Class Attendance: <ul style="list-style-type: none"> ▪ Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.
2	Tardiness: <ul style="list-style-type: none"> - Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.
3	Exam Attendance/Punctuality: <ul style="list-style-type: none"> ▪ Exam attendance is obligatory unless being excused by the department and faculty. ▪ Absence from assignments or exams will be dealt with according to the general policy of the university.
4	Assignments & Projects: <ul style="list-style-type: none"> ▪ Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ▪ Projects: Not applicable.
5	Cheating: <ul style="list-style-type: none"> ▪ Punishment of cheating will be according to the general policy of the university in this respect.
6	Plagiarism: <ul style="list-style-type: none"> ▪ Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.
7	Other policies: <ul style="list-style-type: none"> ▪ General policies of the Students' Affairs of the University and the Quality Assurance Unit.



Course Plan of Pharmaceutical Biochemistry (I)

I. - Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Assoc. Proff. / Badria A. Shamsan	Office Hours					
Location & Telephone No.	775010533	SAT	SUN	MON	TUE	WED	THU
E-mail	Biobadria@hotmail.com				10-12		

II. Course Identification and General Information:					
1-	Course Title:	Pharmaceutical Biochemistry (I)			
2-	Course Number & Code:	Ph741			
3-	Credit hours:	C.H			Total
		Th.	Seminar	Pr.	
		2	-	2	3
4-	Study level/year at which this course is offered:	2 nd semester of 2 nd Level			
5-	Pre –requisite (if any):	General Pharmaceutical Chemistry, Pharmaceutical Organic Chemistry & Pharmaceutical Analytical Chemistry			
6-	Co –requisite (if any):	Physiology II			
7-	Program (s) in which the course is offered	Bachelor of pharmacy			
8-	Language of teaching the course:	English			
9-	System of Study:	Semesters			

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10-	Mode of delivery:	Regular
11-	Location of teaching the course:	Faculty of Pharmacy- Sana`a university

III. Course description:

The course is designed to provide candidate with good knowledge about structure and function of carbohydrates, lipids and proteins. It also provides candidate with a basic knowledge in modern biochemistry and molecular biology necessary for an understanding of the life sciences at the molecular level, in addition to help students to become familiar with the biochemical knowledge and skills necessary to understand other related subjects.

IV. Intended learning outcomes (ILOs) of the course:

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At the end of this course the students should be able to:

22. Define the types, structures, classification, physical, chemical properties, & functions, of different types of carbohydrates, and their derivative compounds resulted, illustrating the relationship between their structure and function.
23. Define the types, structures, classification, physical, chemical properties, & functions, of different types biological molecules of lipids and the relationship between their structure and function.
24. Describe the classes of amino acids & their structures, functions, and the effective biological compounds produced from them.
25. Explain types of protein classifications, structures, function and denaturation & re-naturation processes and their relation-ship in health and diseases .
26. Define the types, structures& classification, of different types of enzymes, and their isozymes, illustrating their function in the diagnosis of diseases.
27. Describe the sources, types, structures, classification, & functions, of vitamins, and their derivative compounds, illustrating their function and deficiency diseases resulted or hypervitaminosis.
28. Discuss the types, structures, properties of nucleic acids (DNA & RNA), and mechanisms of flow of genetic information, and protein synthesis, (the replications, transcriptions, and translations processes).
29. Point-out the different types of biological molecules, e.g. (sugars, amino acids, proteins & fatty acids), and differentiate between the essential, and the non-essential ones.
30. Summarize and categorize some enzymes & isoenzymes reactions, with their clinical & diagnostic significance.
31. Interpret symptoms, signs and biochemical lab. findings (deficiency diseases), of some macro and trace elements, as some plasma proteins, enzymes, vitamins, and minerals as (Ca^{++} , Na^+ , K^+ , Iron, etc.)
32. Consolidate & illustrating the different types of mutations, to construct the normal and abnormal (mutant) samples, as sickle cell anemia
33. Identify of many genetic diseases due to deficiency of certain biological molecules.
34. Identify the physical & chemical properties of carbohydrates and to differentiate between the reducing substances present in urine in health & disease.
35. Identify the physical & chemical properties of different types of amino acids and proteins, using different methods (electrophoresis, chromatography, ppt. methods etc.).
36. Perform the physical and chemical tests to study the properties of lipids, fatty acids, triglycerides, cholesterol, and lipoproteins
37. Practice the qualitative determinations of macromolecules and write a small report to discuss the result or themethod.
38. Dialogue and discuss medical conditions of patients depending on biochemical lab investigations.
39. Deal & cooperative with information technology, and utilize the resources of biomedical information including the available electronic facilities to update knowledge and solve emerging problems.
40. Adopt the principles of lifelong and communicate effectively with a group in lab. or during preparation of seminars.
41. Work independently, or collaboratively as a medical teamwork member, during certain community crisis.
42. Write reports or proposals.

V. Course Content:

1 – Course Topics/Items:

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a – Theoretical Aspect					
Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Week Due	Contact hours
1	Carbohydrate Chemistry, Classification, types & their biological importance.	a1, b1, c1, c4, c5, d1, d3.	- Monosaccharides, - Disaccharides, - Oligosaccharides. - Polysaccharides, Physical & chemical properties, their functions & resulted diseases.	1,2	4
2	Lipid Chemistry, Types, their biological importance.	a2, b1, c3, c4, c5, d1	- Triglycerides. - Phospholipids & lipoprot- -eins, their chemical , physical properties & types, with their clinical importance - Cholesterol, advantage, disadvantage & resulted diseases as (Atherosclerosis).	3-5	6
3	Amino Acids & proteins Chemistry.	a3, a4, b1, b3, c2, c4, c5, d1	-Classifications, Physical, chemical properties & their biological importance.	6,7	4
4	Midterm exam			8	2
5	Heamoglobin	a7, b3, b4, b5, c2, c5, d1	-Structures, Types, Function & resulted disorders.	9	2
6	Enzymes	a4, a5, b2, b3, b5, c2, c4, c5, d1	-Classifications, Function, Mod of actions, Factors affecting their activities & their clinical applications in diagnostic aspect.	10,11	4
7	Vitamins	a2, a6, b3, c5, d1	-Classifications, derivatives, sources, daily requirements, functions, deficiency diseases and toxicity.	12,13	4

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د.خالد الشويبة

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8	Nucleic Acids Chemistry , DNA replication & Protein Synthesis.	a7, b4, b5, c4, c5, d1	- Types, Structures, Functions. -Replication -Trascription -Translation (Protein synthesis) -PCR & c-DNA.	14,15	4
9	Final exam			16	2
Number of Weeks /and Units Per Semester				16	32

b- Practical Aspect:

Order	Training Tasks	CILOs (symbols)	Week Due	Contact hours
1	Identification of Carbohydrates, lipids & proteins.	a1, a2, a3, a4, b1, b3, c1, c2, c3, c4, c5, d1	1-4	8
2	Chromatographical analysis for amino acids.	c2, c3, c5	5,6	4
3	Osazone tests to differentiate between urine sugars.	c1	7	2
4	Mid term exam	c1-5	8	2
5	Precipitate of different proteins by different methods.	a4, c2, c4	9-11	6
6	Differentiate between types of proteins (Albumin, Benz-Jones protein), for diagnostic purpose.	a4, c2, c4, c5	12-14	6
7	Review	c1-5	15	2
8	Final exam	c1-5	16	2
Number of Weeks /and Units Per Semester			16	32

VI. Teaching strategies of the course:

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- Lectures
- Discussion sessions ▪ Lab sessions.
- Assignment and reports.
- Self – learning.
- Practical session.
- Brain storming.

-Assessment Methods:

- Mid term written exam to assess Knowledge and understanding skills and Intellectual skills. ▪ Final written exam to assess Knowledge and understanding skills and Intellectual skills.
- Observation.
- Oral evaluation.
- Reports.
- Quizzes.

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
1	Participation and quizzes	1-12	10	7%	a1- a7, b1 – b5, c1 – c5, d1
2	Assignments	4-12	10	7%	c1-c5, d1- d4
3	Attendance, reports and mid practical exam	ALL	30	20%	c1-c5
5	Mid-semester exam	8	30	20%	a1- a4, b1-b5, c1-c5, d1-d4
6	Final Exam (theoretical)	16	50	33%	a1- a7, b1-b5, c1-c5, d1-d4
7	Final Practical Exam	13-14	20	13%	a1- a4, b1-b5, c1-c5, d1-d4
Total			150	10%	

VIII. Students' Support:

Office Hours/week	Other Procedures (if any)
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- 2 hr./ week	By social media (Face-book) or Whatsapp.
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IX. Learning Resource (MLA style or APA style)S:

6- Required Textbook(s) (maximum two)

- Murray RK, Granner DK, Mayes PA, Rodwell VW, (2003), Harper's Illustrated Biochemistry: 26th edition, McGraw-Hill companies New York,.
- Champe PC, Harvey RA. Ferrier DR, (2007), Lippincott's Reviews of Biochemistry, 3rd edition Lippincott William & Wilkins London,.
- David L. Nelson and Michael M, (2012), Lehninger Principles of Biochemistry, Cox. 6th edition, W.H. Freeman.

7- Recommended Readings and Reference Materials

- Pankaja Naik , , 2010, Biochemistry, 3rd Edition.
- Stryer B. L, 2011. Biochemistry 2nd edition, (Short course).

8- Essential References

- Devlin T. M, (2010), Textbook of Biochemistry with Clinical Correlations, 7th edition, New York,

9- Electronic Materials and Web Sites etc.

- [Periodical Book Website](#)
- <http://www.kumc.edu/biochemistry/resource.htm>
- <http://www.medlib.iupui.edu/ref/biochem.htm>

10- Other Learning Material:

- Hand out (if possible) prepare by the lecturer.

XI. Course Policies:

1 Class Attendance:

- Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.



2	Tardiness: - Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.
3	Exam Attendance/Punctuality: ▪ Exam attendance is obligatory unless being excused by the department and faculty. ▪ Absence from assignments or exams will be dealt with according to the general policy of the university.
4	Assignments & Projects: ▪ Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ▪ Projects: Not applicable.
5	Cheating: ▪ Punishment of cheating will be according to the general policy of the university in this respect.
6	Plagiarism: ▪ Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.
7	Other policies: ▪ General policies of the Students' Affairs of the University and the Quality Assurance Unit.