



Course Specification

I. Course Identification and General Information:						
1	Course Title:	Pharmaceutical Biochemistry (II)				
2	Course Number & Code:	Ph752				
3	Credit hours:	C.H				Total
		Theoretical	Practical	Training	Seminar	
		2	2	-	-	3
4	Study level/ semester at which this course is offered:	1 st semester of 3 rd Level.				
5	Pre –requisite (if any):	General Pharmaceutical Chemistry, Pharmaceutical Organic Chemistry & Pharmaceutical Analytical Chemistry				
6	Co –requisite (if any):	Physiology & Pathology				
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. Proff. Badria A. Shamsan				
11	Date of approval:					

II. Course description:

The course is designed to provide the student with an appropriate exposure to the medical biochemistry discipline, which will assist students in understanding biochemical events at the cellular level to the physiological process occurring in human body, and explain the biochemical alteration in health and disease. Also to enable the students to be oriented with concepts of molecular biology, and how this field gave them a new perspective and new technology used in the diagnosis, treatment and new drugs design.



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

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ا.د. القاسم محمد عباس

عميدة مركز التطوير وضمان الجودة
ا.م.د. هدى العماد

عميد الكلية
د.خالد الشوبية

رئيس القسم

نائب العميد لشؤون الجودة
ا.د. محمود البريهي

الموصف
ا.د.م.بدرية شمسان



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

1. Describe carbohydrates, proteins & amino acids digestion, absorption & transportation.
2. Explore the general digestion, absorption & transported processes, synthesis, metabolism and fate of dietary lipids and cholesterol.
3. Describe (fatty acid oxidation & synthesis), (triglyceride, phospholipid, & lipoproteins metabolism)
4. Illustrate the need for energy in the human body, and list the phases of energy transformation, and be familiar with the different bioenergetics terms
5. Define the metabolic pathways as (glycolysis & gluconeogenesis, glycogenesis, glycogenolysis, uronic acid pathway & pentose phosphate pathway, (reactions, regulation, & significance), illustrating the integration process inside the human body.
6. Describe protein and amino acids metabolism: (deamination & transamination reactions, urea formation), regulation, significance & disorders.
7. Explain the effect of (cation & anion) as: Ca^{2+} , Na^+ , K^+ , and HCO_3^- , Cl^- , etc..., their roles in maintenance of gastric pH & blood pH, in health and disease state. (reaction, regulation, significance & disorders).
8. Discuss blood glucose, lipids (cholesterol & lipoproteins), proteins, amino acids levels & their regulations, biological importance, and usefulness in diagnostic values.
9. Differentiate between various biomolecules metabolic pathways.
10. Calculate energy (produced & requirements) for different pathways, (anabolic & catabolic reactions) in health and diseases.
11. Interpret symptoms, signs, and biochemical laboratory findings of some macro & trace elements (deficiency disease).
12. Summarize the clinical significance and some enzymes reactions & kinetics.
13. Point-out the application of molecular biology in basic & clinical sciences.
14. Interpret some plasma proteins electrophoresis.
15. Perform chemical tests (analysis) to study the properties of carbohydrate, lipids & proteins).
16. Estimate glucose in the blood & urine.
17. Estimation of lipid profile as (cholesterol, triglyceride, LDL & HDL).
18. Estimate total proteins, bilirubin, albumin, urea, creatinine, certain enzymes & hormones.
19. Apply different methods for separation processes & expression of concentration and calculation of the dilution, & pH of solutions.
20. Deal with information technology & electronic forms.
21. Collaborate with colleagues in team work inside the lab & as well as solving problems
22. Implement writing and presentation skills through creation of research proposal group discussions & oral presentations.
23. Manage time effectively.



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.**

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-	Describe carbohydrates, proteins & amino acids digestion, absorption & transportation.
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-	Explore the general digestion, absorption & transported processes, synthesis, metabolism and fate of dietary lipids and cholesterol.
		a3-	Describe (fatty acid oxidation & synthesis), (triglyceride, phospholipid, & lipoproteins metabolism).
		a4-	Illustrate the need for energy in the human body, and list the phases of energy transformation, and be familiar with the different bioenergetics terms.
		a5-	Define the metabolic pathways as (glycolysis & gluconeogenesis, glycogenesis, glycogenolysis, uronic acid pathway & pentose phosphate pathway, (reactions, regulation, & significance), illustrating the integration process inside the human body.
		a6-	Describe protein and amino acids metabolism: (deamination & transamination reactions, urea formation), regulation, significance & disorders.

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		a7-	Explain the effect of (cation & anion) as: Ca^{2+} , Na^+ , K^+ , and HCO_3^- , Cl^- , etc..., their roles in maintenance of gastric pH & blood pH, in health and disease state. (reaction, regulation, significance & disorders).
		a8-	Discuss blood glucose, lipids (cholesterol & lipoproteins), proteins, amino acids levels & their regulations, biological importance, and usefulness in diagnostic values.
Teaching And Assessment Methods For Achieving Learning Outcomes:		Understanding to Teaching and Assessment Methods:	
Alignment of Learning Outcomes of Knowledge and Course Intended Learning Outcomes (CILOs) in		Teaching	Assessment Methods: Methods of assessment
Knowledge and Understanding		strategies/methods to be used	
<p>completing this course, students will be able to:</p> <p>a1- Describe carbohydrates, proteins & amino acids digestion, absorption & transportation.</p> <p>a2- Explore the general digestion, absorption & transported processes, synthesis, metabolism and fate of dietary lipids and cholesterol.</p> <p>a3- Describe (fatty acid oxidation & synthesis), (triglyceride, phospholipid, & lipoproteins metabolism).</p> <p>a4- Illustrate the need for energy in the human body, and list the phases of energy transformation, and be familiar with the different bioenergetics terms.</p> <p>a5- Define the metabolic pathways as (glycolysis & gluconeogenesis, glycogenesis, glycogenolysis, uronic acid pathway & pentose phosphate pathway, (reactions, regulation, & significance), illustrating the integration process inside the human body. a6- Describe protein and amino acids metabolism: (deamination & transamination reactions, urea formation), regulation, significance & disorders.</p> <p>a7- Explain the effect of (cation & anion) as: Ca^{2+}, Na^+, K^+, and HCO_3^-, Cl^-, etc..., their roles in</p>		<p>maintenance of gastric pH & blood pH, in health and disease state. (reaction, regulation, significance & disorders).</p> <ul style="list-style-type: none"> ▪ Brain storming ▪ Lecture ▪ Oral evaluation. ▪ Written Exam ▪ Practical <p style="text-align: center;">competence assessment & practical Exam.</p>	
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			الموصف إ.م.يدرية شمسان



a8-	Discuss blood glucose, lipids (cholesterol & lipoproteins), proteins, amino acids levels & their regulations, biological importance, and usefulness in diagnostic values.		
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(B) Intellectual Skills:

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-	Differentiate between various biomolecules metabolic pathways.	
	b2-	Calculate energy (produced & requirements) for different pathways, (anabolic & catabolic reactions) in health and diseases.	
	b3-	Interpret symptoms, signs, and biochemical laboratory findings of some macro & trace elements (deficiency disease).	
	b4-	Summarize the clinical significance and some enzymes reactions & kinetics.	
	b5-	Point-out the application of molecular biology in basic & clinical sciences.	
	b6-	Interpret some plasma proteins electrophoresis.	

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:			
b1-	Differentiate between various biomolecules metabolic pathways.	<ul style="list-style-type: none"> ▪ Brain Storming ▪ Lectures ▪ Discussions 	<ul style="list-style-type: none"> ▪ Written Exam ▪ Practical competence assessment & Report ▪ practical Exam. ▪ Oral evaluation
b2-	Calculate energy (produced & requirements) for different pathways, (anabolic & catabolic reactions) in health and diseases.		
b3-	Interpret symptoms, signs, and biochemical laboratory findings of some macro & trace elements (deficiency disease).		
b4-	Summarize the clinical significance and some enzymes reactions & kinetics.		
b5-	Point-out the application of molecular biology in basic & clinical sciences.		
b6-	Interpret some plasma proteins electrophoresis.		

(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, packaging, storage and analysis of pharmaceutical products according to GLP, GSP and cGMP guidelines.	c1-	Perform chemical tests (analysis) to study the properties of carbohydrate, lipids & proteins).

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C2-	Handle and dispose chemicals and pharmaceutical preparations including radio-pharmaceuticals safely and effectively.	c2-	Estimate glucose in the blood & urine.
C5-	Conduct research studies and utilize the results in different pharmaceutical fields.	c3-	Estimation of lipid profile as (cholesterol, triglyceride, LDL & HDL).
		c4-	Estimate of , total proteins, bilirubin, albumin, urea , creatinine, certain enzymes & hormones.
		c5-	Apply different methods for separation processes & expression of concentration and calculation of the dilution, & pH of solutions.

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"> ▪ Practical Lectures ▪ Group discussions 	<ul style="list-style-type: none"> ▪ Observations. ▪ Oral evaluation ▪ Drop quizzes. ▪ Reports
c1-	Perform chemical tests (analysis) to study the properties of carbohydrate, lipids & proteins).		
c2-	Estimate glucose in the blood & urine.		
c3-	Estimation of lipid profile as (cholesterol, triglyceride, LDL & HDL).		
c4-	Estimate of , total proteins, albumin, bilirubin, urea , creatinine, certain enzymes & hormones.		
c5-	Apply different methods for separation processes & expression of concentration and calculation of the dilution, & pH of solutions.		



(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 with information technology & electronic forms.
D3-	Develop financial, market management, writing, presentation and time management skills as well as creativity, critical thinking, problem solving and decision making abilities.	d2	Collaborate with colleagues in team work inside the lab & as well as solving problems
D5-	Apply information and communication technology and working effectively in a team.	d3-	Implement writing and presentation skills through creation of research proposal group discussions & oral presentations.
		d4-	Manage time effectively.

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:		<ul style="list-style-type: none"> ▪ Group work. ▪ Practical session. ▪ Oral presentations. ▪ Research proposal. 	<ul style="list-style-type: none"> ▪ Observation. ▪ Homework. ▪ Reports.
d1-	Deal with information technology & electronic forms.		
d2-	Collaborate with colleagues in team work inside the lab & as well as solving problems		
d3-	Implement writing and presentation skills through creation of research proposal group discussions & oral presentations.		



d4-	Manage time effectively.	
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IV. Course Content:					
1 – Course Topics/Items:					
a – Theoretical Aspect					
Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Number of weeks	Contact hours
1	Carbohydrate digestion & metabolism:	a1, a4, a5, a8, b1, b2, b3, b4, c1, c2, d2, d3	-Glycolysis -Gluconeogenesis -Glycogenesis -Glycogenolysis -Glucouronic pathway -Pentose Phosphate Pathway -Mono saccharides interconvert able -Resulted of metabolic diseases (diabetes mellitus, ...etc,)	4	8
2	Dietary lipid digestion & absorption.	a2, d2, d3	metabolism of	1	2
			lipoproteins, (Chylomicron, Low Density Lipoprotein, High Density Lipoprotein, & the resulted metabolic diseases.		

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3	Fatty acids & triglycerides metabolism (synthesis & oxidation "degradation")	a2, a3, a8, b1, b2, b3, b4, c1, c3, d3, d2	-β-Oxidation of fatty acids & energy production. -Fatty acid synthesis & elongations.	3	6
4	Midterm exam			1	2
5	Complex lipid metabolism	a2, a3, a8, b1, b3, b4, c1, c3, d2, d3	-Phospholipids, -Glycolipids, Cerebroside and Ganglioside degradations.	1	2
6	Cholesterol metabolism	a2, a8, b1, b3, c3, d2, d3	-Cholesterol synthesis & degradation -Accumulation (atherosclerosis), -Cholesterol Ester,	1	2
7	Protein digestion & absorption mechanisms.	a1, a6, a8, b1, b3, b5, b6, c4, c5, d2, d3	- Gastric juice composition. - Formation of Hcl & HCO ₃ ⁻ . -Simple diffusion -Active transport -Carrier transport	1	2
8	Amino acids metabolism (degradation & synthesis)	a1, a5, a6, a8, b1, b2, b3, c5, d2, d3	-Transamination & deamination reactions. - Shuttles to transfer the reducing agents produced. - Ammonia production, its fates. -Urea cycle.	2	4
9	Conversion of amino acids to specializes products.	a8, b1, b3, c4, d2, d3	-Special products from different amino acids & their biological importance.	1	2
10	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	-Define the principles of lab. safety & how to deal with the equipments and glass ware.	c1- c5, d1, d2	1	2
2	Differentiate between serum & plasma. Assay of bilirubin (direct & indirect).	c4, d2, d3	1	2
3	Assay of blood glucose. GGT-test.	a8, c2, d2, d4	2	4
4	Assay of blood triglyceride & cholesterol	a2, a8, c3, d2, d3	1	2
5	Assay of LDL & HDL	a1, a2, a3, a8, c3, d2, d4	1	2
6	Practical Mid-Term Exam	b1-b4, c1-c3, d2, d4	1	2
7	Assay of blood total proteins & Albumin	b3, b6, c1, c4, c5, d2, d4	1	2
8	Assay of LDH, GPT, GOT, Amylase, Lipase enzymes.	b3, b4, c4, d2, d4	2	4
9	Urine analysis: - using urine-strip to test all biochemical parametres as: glucose, proteins, sp.gravity,etc.(normal & abnormal urine samples).	c2, d2, d4	1	2
10	-Isolations of amino acid in urine sample by chromatography.	c5, d2, d4	2	4
11	Review	c1-5	1	2
12	Practical Final Exam	b1, b3, b4, b6, c1-c5, d1-d4	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-a8, b1-b6
2	Assignments	4-12	10	7%	c1- c5
3	Attendance, reports and mid practical exam	ALL	30	20%	c1-c5
4	Mid-semester exam	9	30	20%	a1-a8, b1-b6, c1-c5, d1-d3
5	Final theoretical Exam	16	50	33%	a1-a8, b1-b6, c1-c5, d1-d4
6	Final practical Exam	13-14	20	13%	c1-c5



	Total	150	10%	
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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

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

3- Essential References

- 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"> • Periodical Book Website • http://www.kumc.edu/biochemistry/resource.htm • http://www.medlib.iupui.edu/ref/biochem.htm
5- Other Learning Material:	
	□ 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 (II)

I. - Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Badria A. Shamsan Al-Nedhari	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 (II)				
2-	Course Number & Code:	Ph 752				
3-	Credit hours:	C.H			Total	
		Th.	Seminar	Pr.		F. Tr.
		2	-	2	-	3
4-	Study level/year at which this course is offered:	1 st semester of 3 rd Level.				
5-	Pre –requisite (if any):	General Pharmaceutical Chemistry, Pharmaceutical Organic Chemistry & Pharmaceutical Analytical Chemistry				
6-	Co –requisite (if any):	Physiology & Pathology				
7-	Program (s) in which the course is offered	Bachelor degree of Pharmacy				

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8-	Language of teaching the course:	English
9-	System of Study:	Semesters
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 the student with an appropriate exposure to the medical biochemistry discipline, which will assist students in understanding biochemical events at the cellular level to the physiological process occurring in human body, and explain the biochemical alteration in health and disease. Also to enable the students to be oriented with concepts of molecular biology, and how this field gave them a new perspective and new technology used in the diagnosis, treatment and new drugs design.

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

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

1. Describe carbohydrates, proteins & amino acids digestion, absorption & transportation.
2. Explore the general digestion, absorption & transported processes, synthesis, metabolism and fate of dietary lipids and cholesterol.
3. Describe (fatty acid oxidation & synthesis), (triglyceride, phospholipid, & lipoproteins metabolism)
4. Illustrate the need for energy in the human body, and list the phases of energy transformation, and be familiar with the different bioenergetics terms
5. Define the metabolic pathways as (glycolysis & gluconeogenesis, glycogenesis, glycogenolysis, uronic acid pathway & pentose phosphate pathway, (reactions, regulation, & significance), illustrating the integration process inside the human body.
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7. Explain the effect of (cation & anion) as: Ca^{2+} , Na^+ , K^+ , and HCO_3^- , Cl^- , etc..., their roles in maintenance of gastric pH & blood pH, in health and disease state. (reaction, regulation, significance & disorders).
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12. Summarize the clinical significance and some enzymes reactions & kinetics.
13. Point-out the application of molecular biology in basic & clinical sciences.
14. Interpret some plasma proteins electrophoresis.
15. Perform chemical tests (analysis) to study the properties of carbohydrate, lipids & proteins).
16. Estimate glucose in the blood & urine.
17. Estimation of lipid profile as (cholesterol, triglyceride, LDL & HDL).
18. Estimate total proteins, bilirubin, albumin, urea, creatinine, certain enzymes & hormones.
19. Apply different methods for separation processes & expression of concentration and calculation of the dilution, & pH of solutions.
20. Deal with information technology & electronic forms.
21. Collaborate with colleagues in team work inside the lab & as well as solving problems
22. Implement writing and presentation skills through creation of research proposal group discussions & oral presentations.
23. Manage time effectively.



V. Course Content:

1 – Course Topics/Items:

a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Week Due	Contact hours
1	Carbohydrate digestion & metabolism:	a1, a4, a5, a8, b1, b2, b3, b4, c1, c2, d2, d3	-Glycolysis -Gluconeogenesis -Glycogenesis -Glycogenolysis -Glucouronic pathway -Pentose Phosphate Pathway -Mono saccharides interconvert able -Resulted of metabolic diseases (diabetes mellitus, ...etc.)	1-4	8
2	Dietary lipid digestion & absorption.	a2, d2, d3	- metabolism of lipoproteins, (Chylomicron, Low Density Lipoprotein, High Density Lipoprotein, & the resulted metabolic diseases.	5	2
3	Fatty acids & triglycerides metabolism (synthesis & oxidation "degradation")	a2, a3, a8, b1, b2, b3, b4, c1, c3, d3, d2	-β-Oxidation of fatty acids & energy production. -Fatty acid synthesis & elongations.	6-8	6
4	Midterm exam			9	2



5	Complex lipid metabolism	a2, a3, a8, b1, b3, b4, c1, c3, d2, d3	-Phospholipids, -Glycolipids, Cerebroside and Ganglioside degradations.	10	2
6	Cholesterol metabolism	a2, a8, b1, b3, c3, d2, d3	-Cholesterol synthesis & degradation -Accumulation (atherosclerosis), -Cholesterol Ester,	11	2
7	Protein digestion & absorption mechanisms.	a1, a6, a8, b1, b3, b5, b6, c4, c5, d2, d3	- Gastric juice composition. - Formation of Hcl & HCO ₃ ⁻ . -Simple diffusion -Active transport -Carrier transport	12	2
8	Amino acids metabolism (degradation & synthesis)	a1, a5, a6, a8, b1, b2, b3, c5, d2, d3	-Transamination & deamination reactions. - Shuttles to transfer the reducing agents produced. - Ammonia production, its fates. -Urea cycle.	13,14	4
9	Conversion of amino acids to specializes products.	a8, b1, b3, c4, d2, d3	-Special products from different amino acids & their biological importance.	15	2
10	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
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ا.م.د. هدى العماد

عميد الكلية
د.خالد الشوية

رئيس القسم

نائب العميد لشؤون الجودة
ا.د. محمود البريهي

الموصف
ا.د.م.يدرية شمسان



1	-Define the principles of lab. safety & how to deal with the equipments and glass ware.	c1- c5, d1, d2	1	2
2	Differentiate between serum & plasma. Assay of bilirubin (direct & indirect).	c4, d2, d3	2	2
3	Assay of blood glucose. GGT-test.	a8, c2, d2, d4	3,4	4
4	Assay of blood triglyceride & cholesterol	a2, a8, c3, d2, d3	5	2
5	Assay of LDL & HDL	a1, a2, a3, a8, c3, d2, d4	6	2
6	Practical Mid-Term Exam	b1-b4, c1-c3, d2, d4	7	
7	Assay of blood total proteins & Albumin	b3, b6, c1, c4, c5, d2, d4	8	2
8	Assay of LDH, GPT, GOT, Amylase, Lipase enzymes.	b3, b4, c4, d2, d4	9,10	4
9	Urine analysis: - using urine-strip to test all biochemical parametres as: glucose, proteins, sp.gravity,etc.(normal & abnormal urine samples).	c2, d2, d4	11,12	2
10	-Isolations of amino acid in urine sample by chromatography.	c5, d2, d4	13,14	4
11	Review	c1-5	15	2
12	Practical Final Exam	b1, b3, b4, b6, c1-c5, d1-d4	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-a8, b1-b6
2	Assignments	4-12	10	7%	c1- c5
3	Attendance, reports and mid practical exam	ALL	30	20%	c1-c5
4	Mid-semester exam	9	30	20%	a1-a8, b1-b6, c1-c5, d1-d3
5	Final theoretical Exam	16	50	33%	a1-a8, b1-b6, c1-c5, d1-d4
6	Final practical Exam	13-14	20	13%	c1-c5
Total			150	10%	



VIII. Students' Support:

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

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: <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.