Course Specification
(Bachelor)

Course Title:	Principles of Biochemistry
Course Code:	439 CHEM-3
Program:	Bachelor of Science in Chemistry
Department:	Physical Sciences
College:	College of Science
Institution:	Jazan University (JU)
Version:	TP 153-2024
Last Revision Date:	06/5/2002

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3h)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: (Level 8, Year 4)

4. Course general Description:

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre- requisite*
		Lec.	*Prac.*				
Principles of Biochemistry	*CHEM 439*	*2*	*1*	*3*	*4*	*8*	*232CHEM3*

This course aims to provide students basic principles and definition of biochemistry, structure, functions and a general idea of metabolic reactions, biological functions of proteins, amino acids, enzymes and Nucleic acids. Carbohydrates studies and their function and Glucose oxidation to get energy. Lipids and their biological importance

Course objectives: They are to identify the following.

- The importance of biochemistry in our life.
- Biological fluids and metabolic reactions (catabolic and anabolic)
- Nucleic acids, its structure, and functions (DNA and RNA).
- Enzyme's classification, regulation, factors affecting enzyme action.

A-Theoretical contents

General introduction to the study of biomolecules – biological fluids - metabolic reactions (catabolic and anabolic) – production of bioenergetics – structure and function of macro bio-molecules, including proteins, amino acids, enzymes and carbohydrates (monosaccharides , disaccharides and polysaccharides) – Biological oxidation of glucose to obtain energy - lipids – classification and biological importance – structure and function of lipids - Fatty acids – beta oxidation of fatty acids to obtain energy – nucleic acids; structure and function - DNA and RNA, structure and function

B-Practical contents

Selected experiments related to Biochemistry analysis

5. Pre-requirements for this course (if any)**:**

232CHEM3

6. Co-requisites for this course (if any)**:**

None

7. Course Main Objective(s):
This course aims to provide students basic principles and definition of biochemistry, structure, functions and a general idea of metabolic reactions, biological functions of proteins, amino acids, enzymes and Nucleic acids. Carbohydrates studies and their function and Glucose oxidation to get energy. Lipids and their biological importance.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**; (Upon completion of the course, student will be able to)			
1.1	Demonstrate knowledge and an understanding of fundamental biochemistry principles, including bimolecular structure and metabolic pathways. (P)	K (1.1)	***lecture/ discussion***	***Objective question***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			Seminars/presentation	
1.2	Explain the essential facts in biochemistry and correlate between the metabolic disorders and diagnosis of diseases. (P)	K (1.2)	***lecture / discussion / Seminars /Individual presentation***	***Essay question***
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	Solve problems in biochemistry, differentiate between metabolic pathways and the energy production level from different biomolecules, and evaluate the level of different biological metabolites in biological fluids. (P)	S (2.1)	***lecture / discussion / Seminars /Individual presentation***	***Solving Problems & Essay question***
2.2	Design, carry out, and record the results of biochemical experiments using classical techniques and modern instruments, then analyze those results to draw reasonable, accurate conclusions and write reports. (P)	S (2.2)	***Lab work, group work***	***Objective question, Essay question,*** ***lab report rubric***
2.3	Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the proper procedures and regulations for safe handling when using chemicals. (P)	S (2.3)	***lab demonstrations / hands-on student learning activities***	***Safety exam***
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	Working as a group leader in cooperation with other colleagues. (P)	V (3.1)	***lab demonstrations / whole group and small group discussion***	***Practical group work Rubric***

C. Course Content

No	List of Topics	Contact Hours
1.	An introduction to biochemistry and water structure, hydrogen bonds, ionization, pH and buffer solutions.	3
2.	Carbohydrates, classification, Nomenclature of monosaccharides and their derivatives, isomerism and mutarotation.	2
3.	Reactions of monosaccharides, structures and functions of disaccharides and poly saccharides.	4
4.	Amino acids chemistry, classification and reactions.	3
5.	Peptide formation, protein functions, classification, separation, solubility, and color reactions.	3
6.	Enzyme's nomenclature, classification, mechanism, inhibitions and their types.	3
7.	Lipid's identification and classification. Triglycerides functions. Compound lipids (Conjugated and derived) and fatty acids Classification	3
8.	Chemical properties of fatty acids, rancidity, nucleic acid classification and structure.	2
9.	Types of nucleic acids, DNA Transcription, RNA translation and protein synthesis.	2
10.	Metabolism, Glycolysis and Kreb's cycle.	2
11.	Gluconeogenesis, phosphate pentose shunt and glycogenolysis.	1
12.	Beta Oxidation and digestion of proteins.	1
13.	Protein metabolism and urea cycle.	1
14.	Lab Experiments	30
	Total	**60**

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Homework assignment*		*3-8*	*3%*
2.	*Lecture Quizzes*		*4-8*	*2%*
3.	*Mid-term exam*		*9-11*	*15%*
4.	*Practical* work	*LAB Sheet*	*15*	*5%*
5.		*Quiz in Safety*	15	*4%*
6.		*Final practical exam*	*15*	*5%*
7.		*Lab report*	*2-15*	*10%*
8.		*Group work evaluation*	*2-15*	*6%*
9.	*Final Exam*		*16-17*	*50%*
	Total			*100 %*

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	**Leininger, principals of biochemistry (sixth edition) by David L. Nelson Michafi M. Cox. W. H. FREEMAN AND COMPANY. New York. 2013**
Supportive References	**اسس الكيمياء الحيوية. الدكتور عبد المنعم الاعسر، المجلد الاول، المكتبة الاكاديمية 2011**
Electronic Materials	**Some course contents and materials are posted on Black board sites**
Other Learning Materials	**• www.wikipedia.org/ •http://www.wpi.edu/Academics/Depts/Chemistry/Courses/General http://med-mu.com/wp-content/uploads/2018/06/DM-Vasudevan-Textbook-of-Biochemistry-For-Medical-Students-6th-Edition.pdf**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	Colorimetric devices, Bunsen burner, microscopes, reagent bottles, beakers, Buchner funnel, Test tube and many more. Scientific videos

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of Students' assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024

H. Attachments

1- Practical Work

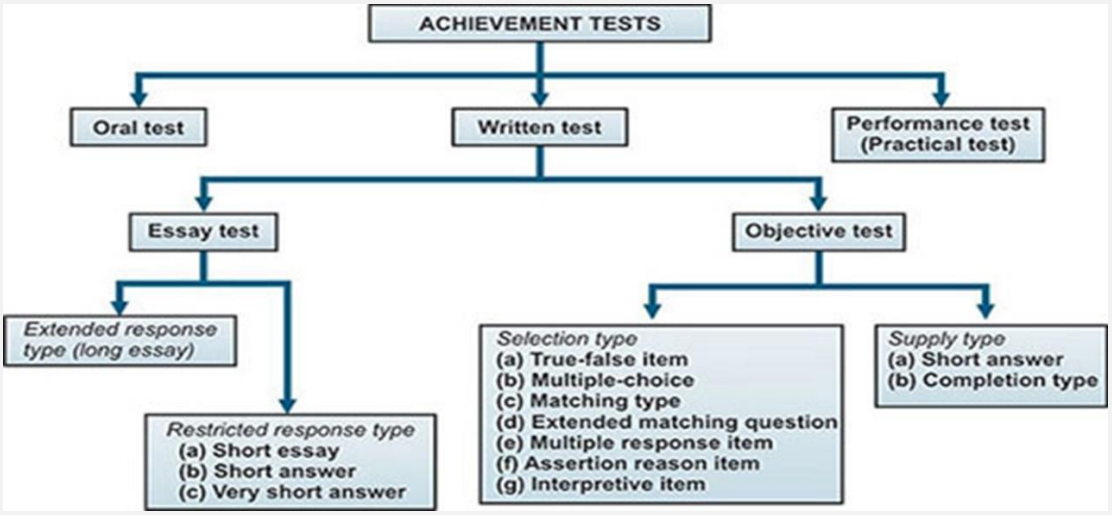
Week	EXP, titles	Chemicals and tools	Remarks
1	Course Introduction include: -Safety during handling with Chemicals and biological samples. Preparation of buffer solution.	Safety tools, and Devices	None
2-3	Carbohydrate detection	Molisch's, Barfoed. Reducing tests, Fehling's, Benedict's, Ammoniacal silver nitrate, Rapid furfural, furfural, Osazone formation and Iodine test	None
4-5	Estimation of the content of reducing sugars using Fehling's and Benedict's test	Fehling's and Benedict's reagent; copper (II) sulfate, potassium sodium tartrate, Potassium hydroxide	None
6	Estimation of glucose in serum by phenol-sulphuric acid method	Spectrophotometer, ethanol Phenol, Sulfuric acid, Water bath, Tubes with covers, filter paper, Cones	None
7	General tests for proteins	Ninhydrin reagent, copper sulfate in a strong base, sodium hydroxide solution, water bath	None
8	Solubility and Precipitation of protein	heavy metals (e.g., Hg2+, Pb2+, Cu2+), Alkaloidal reagents (e.g., tannate & trichloro acetate), by denaturation (heat coagulation test, strong acids, strong base)	None
9	Color reactions of proteins, Biuret test, Millon's test and Reduced sulfur test, Hopkins-Colé test	copper sulfate, sodium hydroxide, Millon's reagent, Hopkins-Colé reagent, H2SO4	None
10-11	Estimation of amino acid	-Using Ninhydrin - titration with potassium hydroxide in the presence of formaldehyde	None
12	Properties of fats and oils	Melting point, Crystallization, Viscosity, Density, Solubility, Refractive index, The Saponification number, iodine number, Rancidity	None
13	Estimation of triglyceride	4-chlorophenol, Magnesium aspartate, Sodium Azide	None
14	Determination of Iodine number	Fats, Pyridine sulphate dibromide, glacial acetic acid, potassium iodide, thiosulphate, and chloroform	Non
15	Practical Exam		

2- Blue Print

Course Name	Principle of Biochemistry
Course Code	439Chem -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	10	18	42	20	4	--	6	--

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (10 M)	Quiz	Objective question	5	5	1
			Mid term	Objective question	4	2	2
			Final Exam	Objective question	14	7	7
	K2	1.2 (18 M)	Quiz	Essay question	2	2	1
			Mid term	Essay question	2	4	4
			Final Exam	Essay question	4	13	13
Skills	S1	2.1 (42 M)	H. W	Essay question	6	3	3
			Mid term	Essay question	4	9	9
			Final Exam	Essay question	6	30	30
	S2	2.2 (20 M)	Practical Sheet	Objective question	10	5	5
			Lab Report	10 experiments	10	10	10
			Final Lab Exam	1 task experiment	1	5	5
	S3	2.3 (4 M)	Safety EXAM	Objective question	8	4	4
Value	V1	3.1 (6 M)	Continuous assessment	Group evaluation rubric	--	6	6
Total						100	100 %


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type