هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title	**Introduction in Biochemistry**
Course Code:	**CHM 1371**
Program:	**Bachelor of Science in Chemical Laboratories**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	**2024- -1**
Last Revision Date:	**15 September 2024**

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 3 (2, 3, 0)					
3 (2 Lectures, 3 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 5/ Third year					
4. Course general Description:					
This course is an introduction to the basic principles of biochemistry, the chemistry of living organisms, providing the necessary knowledge and background that a chemist should have about all chemical reactions occur in a living cell. The course introduces the student to the biomolecules (including protein, carbohydrate, lipid, DNA and RNA) function, structure, synthesis, and their metabolism..					
5. Pre-requirements for this course (if any)**:**					
General Biology BIO 1101, Organic Chemistry CHM 1225					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The students should be able to: ✓ Know basic cellular structure. ✓ Know the main role of water, PH, buffers in biological systems. ✓ Recognize the biomolecules and the difference between them with knowing their role. ✓ Learn the properties, structures, and functions of the biomolecules. ✓ Study in details the chemistry of macromolecules (protein, carbohydrate, lipid, and DNA and RNA), and the micromolecules (amino acids, fatty acids, mono- and di-saccharide, and nucleic acids, which are the building blocks of the macromolecules. ✓ Explaining all the pathways that occur in a living organism and the metabolism (anabolism and catabolism). ✓ Be familiar with basic biochemistry techniques and experiments.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**75**	**100%**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**45**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		75

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To define the fundamentals of biochemistry**	**K1, K3**	• Lectures supported laboratory experiments, • Homework and assignments, • Group discussion.	**Direct:** • Quizzes, • Lab reports, • Class questioning, • Exams (midterms and finals)
1.2	**To State biochemistry terminology**	**K1**	• Lectures supported laboratory experiment • Homework and assignments • Group discussion.	**Direct:** • Quizzes, lab reports, • Class questioning, • Exams (midterms and finals)
1.3	**To outline the biological molecules and the difference between them**	**KI**	• Lectures supported laboratory experiments, • Homework and assignments,	**Direct**: • Quizzes, • Lab reports, • Class questioning,

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
				• Exams (midterms and finals)
1.4	**To list the chemistry inside living organisms**	**K1,K4**		**Direct:** • Quizzes, lab reports, • Class questioning, • Exams (midterms and fnals)
2.0	**Skills**			
2.1	**To summarize the differences of biomolecules**	**S3**	• Lectures • Homework and assignments • Group discussion.	**Direct:** • Quizzes, • Lab reports, • Oral Discussion • Class questioning, • Exams (midterms and finals)
2.2	**To explain the most important techniques in biochemistry laboratory**	**S1, S4**	• Lectures • Homework and assignments • Laboratory performance • Group discussion.	**Direct:** • Quizzes, • Lab reports, • Oral Discussion • Class questioning, • Exams (midterms and finals)
2.3	**To use the biochemistry field with other chemistry field (e.g., Organic, and inorganic chemistry)**	**S1, S4**	• Lectures • Homework and assignments • Group discussion.	**Direct:** • Quizzes, • Lab reports, • Class questioning, • Exams (midterms and finals)

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	To appraise a moral value toward acquiring knowledge and dealing with others	V2	• Group discussion and assignments • homework	Oral tests Assignments homework marks
3.2	Show personal values and attributes such as honesty, empathy and respect for others	V1, V2	• Teamwork and class discussions	Direct • lab reports Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to biochemistry: What is biochemistry? Procaryotic and eucaryotic cells, cell structures, water, PH, buffer, ionic equilibrium	4
2.	Protein: Amino acids, structure of protein, globular and fibrous protein, enzymes	4
3.	Bioenergetics: Role of ATP, biological oxidation, respiratory chain, and oxidative phosphorylation	4
4.	Carbohydrates and the metabolism of carbohydrates: Introduction to carbohydrates, glycolysis, TCA cycle, gluconeogenesis, glycogen metabolism, pentose phosphate pathway, glycosaminoglycans and glycoproteins	6
5.	Lipid and the metabolism of lipids: Introduction to lipid, fatty acid, and triacylglycerol metabolism, complex lipid metabolism, lipid transport and storage, cholesterol and steroid metabolism	4
6.	Nucleic acid: Nucleotides, DNA structure, replication, and organization, RNA structure, synthesis, and translation, protein synthesis, and genetic code	4
7.	Revision	4
	Total	30

Laboratory Topics		
1	Biochemistry laboratory instructions: Lab guideline, safety, equipment, glassware, chemicals, how to write a scientific report	3
2	Buffer solutions: definition, preparing buffer solutions, calculating PH, buffer capacity	3
3	Amino acids: Solubility of amino acids, Ninhydrin test, Xanthoprotein test, millon test, Sakaguchi test, sulfur test	3
4	Protein: The Lowry, Bradford, BCA assays and/or Biuret assays	3
5	Protein: affecting of salt on protein, precipitation by acids, precipitation by high temperature, precipitation by salt and heavy metals	3
6	Protein: Enzyme assay	3
7,8	Carbohydrates: Molisch test, benedict's test, barfoed's test, bial's test, seliwanoff's test, hydrolysis of sucrose test, Iodine/potassium iodide test,	6
9,10	Lipid: Lipid solubility test, saponification test, testing the separation of soap from solution by salt, test formation insoluble fatty acids salt	6
11,12	Lipid: Copper acetate test, Burchard test, Acrolein test, unsaturated fatty acid test	6
13	DNA: DNA extraction and characterization	3
14, 15	Revision and Lab. Reports overview	6
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	6th/ 7th week	10 %
2.	Midterm 2	11th/ 12th week	10 %
3.	Quizzes, Home Works, class participation, and mini projects	During the semester	10 %
4. .	Laboratory	All the semester	30 %

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
5	Final Exam	16thweek	40 %
6.	Total	All weeks	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	**Lippincott's Illustrated Reviews Biochemistry**, 7th edition, by Pamela C. Champe, Richard A. Harvey, and Denise R. Ferrier.
Supportive References	**Harper's Illustrated Biochemistry**, 31st edition, international edition, by Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, and P. Anthony Weil.
Electronic Materials	1- **Oxford journal of Biochemistry. 0TUhttp://jb.oxfordjournals.org/U0T** **2- American journal of Biochemistry.** **3- 0TUhttp://www.sapub.org/journal/aimsandscope.aspx?journalid=1012U0T.** **4- www.biology.arizona.edu/default.htmlU0T** **5- http://mcb.harvard.edu/BioLinks.htmlU0T.** **0TU**
Other Learning Materials	• **Blackboard**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students.** • **In each laboratory, a list of safety and precautions are provided.** • **In each lab has proper ventilation, and well equipped with instruments.** • **In each lab, containers for solid waste, liquid waste, and crushed glasses.**

Items	Resources
	• **Each lab has a small pharmacy for first aid in case of an accident** • **In each lab, the rules, conditions, and safety mechanism as well list of Risk, Safety precautions according to Merck Catalogue are hanging in the labs**
Technology equipment (projector, smart board, software)	**The rooms are equipped with data show, Smart Board, WI-FI access.**
Other equipment (depending on the nature of the specialty)	• **Appropriate Glasswares for carrying the requested experiments (conical flasks, beakers, measuring cylinders)** • **Appropriate fine chemicals and solvents (distilled Water ammonium nitrate)** **Analytical balance (3 digits), Set gas laws with the glass jacket Data acquisition set for gas laws with glass jacket, PC, Windows® 95 or higher, calorimeter, thermometer, Filter papers , clamps, stands**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	**Program Leaders**	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	**Students**	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
	Course Responsible	**Direct:** Exams - Course e-Portfolio.

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	**Program Leaders**	**Indirect:** Second examiner checklist-Course report. **Indirect:** Exams.
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**3 (NO. 1/3)**
DATE	**5/3/1446- 8/09/2024**