

REFERENCES

- Nelson D. L., Cox M. M. (2021) Lehninger Principles of Biochemistry, (8th ed.) W.H. Freeman & Co Ltd.
- Biochemistry (2004) by Donald Voet, Judith G. Voet Publisher: John Wiley & Sons Inc ISBN: 047119350X ISBN-13: 9780471193500, 978-0471193500.
- Biochemistry by Lubert Stryer, 4th Edition, W.H Freeman and Company ISBN 0-7167-2009-4.2.
- J L Jain, Sunjay Jain, Nitin Jain, Fundamentals of Biochemistry Paperback – 1 January 2016; ISBN : 9788121924535
- Jonathan B. Losos, Peter H. Raven, Susan R. Singer, Kenneth A. Mason, Biology, 2022, ISBN 9781260169614
- Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing House, New Delhi, ISBN 81-7319-302-9.
- Experimental Biochemistry: A Student Companion, Beedu Sasidhar Rao & Vijay Despande(ed). I.K International Pvt. LTD, NewDelhi. ISBN 81-88237-41-8.



University of Kerala

Discipline	BIOCHEMISTRY				
Course Code	UK1DSCBCH101				
Course Title	FOUNDATIONS OF BIOCHEMISTRY				
Type of Course	DSC2				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Basic knowledge in biology and chemistry				

Course Summary	Students will be able to investigate the chemical reactions and molecular interactions that take place within living things after completing the course. It looks at the minute aspects of the molecules that comprise life, particularly nucleic acids. Additionally, they will be able to comprehend and interpret good laboratory practice (GLP) and advance their knowledge and abilities in the areas of documenting, putting into practice, and maintaining a technical and quality management system for laboratories that is based on GLP.
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Detailed Syllabus:

Module	Unit	Content	Hrs
I	FUNDAMENTAL UNITS OF LIFE		15
	1	Definition of Biochemistry and how it explores the molecular logic of life.	
	2	Cell as the structural and functional unit of living organisms,	
	3	Differences between prokaryotic and eukaryotic cell	
	4	Outline of the different prokaryotic and eukaryotic cells' organelles	
II	CHEMICAL BONDS & FOUNDATIONS OF LIFE		15
	5	Definition & Types of molecular bonds	
	6	Bonds common in biomolecules- Characteristics of ester, hydrogen, ionic, van der Waals, and covalent bonds	
	7	Water's special qualities, its use as a universal solvent, Water's chemical composition	
	8	Bronsted theory of acids and bases, pH and pOH principles, computations based on pH and pOH, and the	
	9	Elements in various combinations comprise all matter on Earth, including living things (carbon, hydrogen, nitrogen, oxygen, sulfur, and phosphorus).	
III	GENETIC FOUNDATION		15
	10	Definition of genetic material, the central dogma	
	11	Properties, Types (DNA & RNA)	
	12	General introduction without structure	
	13	Classical experiments to prove DNA as genetic material (Griffith's Experiment, Meselson-Stahl experiment, Hershey Chase Blender experiment.	
	14	Examples of microorganism containing DNA & RNA as genetic material	
IV	INTRODUCTION TO LABORATORY AND LAB EQUIPMENT		15
	15	Awareness of good laboratory practices.	
	16	Familiarization with glassware and equipment used in biochemistry student's laboratory, (study the functions of light microscope)	
	17	Use of balances-common, analytical, and electronic balances- Preparation of standard solutions	
V	GENERAL LABORATORY PRACTICES		15
	18	General lab safety rules	

	19	Laboratory safety and management of hazards in the laboratory.	
	20	Laboratory visit to a recognized institute	
	PRACTICALS		30
	21	Introduction to Lab Safety • Awareness of good laboratory practice • General lab safety rules • Laboratory safety and management of hazards in the laboratory • Familiarization with glassware/equipment (light microscope, pH, electronic balance, distillation unit, thermostatic & boiling water bath)	
	22	ACTIVITIES Activities • Logbook/register maintenance • Labeling of chemicals/glasswares • Preparing SOP of equipments • Preparation of solutions (percentage, normal, molar solutions) • Preparation of dilute solutions from stock solutions • Determination of pH • Laboratory visit to a recognized institute *Lab records to be maintained	

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Describe cell organelles and describe their structure and function.	U	1,2
CO-2	Describe the basic chemical and biological foundations that lead to origin of life on Earth	R, U	1,2
CO-3	Identify the genetic and evolutionary foundations of Biochemistry	U,	3
CO-4	Know appropriate methods in the laboratory	Ap	3
CO-5	Develop the knowledge necessary to conduct accurate and secure laboratory experiments.	U, Ap	4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Fundamentals of Biochemistry

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	1	1,2	U	F, C	LT	
2	2	1,2	R U	F, C	LT	
3	3	3	U	F, C	LT	
4	4	3	Ap	P	LT	P
5	5	4	U,Ap	F, C	LT	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	3	-	-	-	-		2				
CO 2	2	3	-	-	-	-		2				
CO 3	-	-	1	-	-	-	2					
CO 4	-	-	2	3	-	-	1	2				
CO 5	-	1	-	-	-	-						3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓

References

- Nelson D. L., Cox M. M. (2021) Lehninger Principles of Biochemistry, (8th ed.) W.H. Freeman & Co Ltd.
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University of Kerala

Discipline	BIOCHEMISTRY				
Course Code	UK1DSCBCH104				
Course Title	PHYSICAL ASPECTS OF BIOCHEMISTRY				
Type of Course	DSC 5				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Basic knowledge in biology and chemistry				
Course Summary	The course lays a foundation of basic biochemistry and outlines the concepts of water, buffer systems, colloids, basic separation methods and radiation biology.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	Colloids and solutions		10
	1	Classification and biological significance of colloids	
	2	Osmosis and diffusion (Definition and biological significance) Basics of Donnan Membrane Equilibrium	
	3	Isotonic, hypotonic, hypertonic and Iso-osmotic solutions, surface tension and viscosity	
	4	Structure and properties of water, Ionization of water, Concepts of acids and bases. pH & pOH	
II	5	Buffers, Henderson Hasselbalch equation, Buffers in biological system and its biomedical importance	
	Bio-organic chemistry		8
	6	Introduction to major biomolecules and classification	
	7	Major types of Covalent bonds in biomolecules: Disulphide bonds, Peptide Bonds, Glycosidic bonds, Phosphodiester bonds	
	8	Non covalent bonds and its biological significance: Hydrogen bond, Ionic bond, Hydrophobic bond, van der Waals forces)	
III	9	Common Functional groups in biomolecules and their significance, Isomerism in biomolecules	
	Biochemical Separation techniques		9
	10	Dialysis: Principle and procedure	

	11	Chromatography : Principle and procedure (Paper and TLC)	
	12	Electrophoresis: Principle and procedure (Agarose gel electrophoresis and SDS PAGE)	
	13	Centrifugation: Principle and applications of Differential and density gradient, Svedberg constant.	
IV	Colorimetry and spectrophotometry		9
	14	Beer Lambert's law, Molar extinction coefficient and absorption spectra.	
	15	Principle and instrumentation of Colorimetry and Spectrophotometry.	
	16	Applications of colorimetry and spectrophotometry in the field of biochemistry	
V	Basics of radiobiology		9
	17	Radioactive isotopes- half life, important stable isotopes used in biochemical research (^{32}P , ^{125}I , ^{131}I , ^{60}Co , ^{14}C , etc)	
	18	Classification of radiation damage , Effects of radiation in humans	
	19	Harmful effects of radiation, Stochastic and deterministic (non-stochastic) effects	
		Practical	30
	20	• Basic laboratory practices • Weighing in chemical balance • Preparation of solutions (Molar, Normal and Percentage solutions) • Dilution from stock solution • Preparation of Buffers and determination of pH. • Demonstration of paper chromatography • Verification of Beer Lambert's law and colorimetric estimation of concentration of unknown solution. • Lab/Institution Visit	

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Discuss the basics aspects and biological significance colloids and solutions	R, U	1
CO-2	Describe the concepts of important linkages in biomolecules	R, U	2
CO-3	Demonstrate and explain the basic techniques used in the field of biochemistry	R, U, Ap	3,4

CO-4	Explain the concepts of radiation biology	R, U	3,4
CO-5	Restate good laboratory practices, carry out safe laboratory experiments and prepare solutions & buffers.	R, U, Ap	3,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Physical Aspects of Biochemistry

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	1	1	R, U	F, C	LT	
2	2	2	R, U	F, C	LT	
3	3	3,4	R, U, Ap	F, C	LT	
4	4	3,4	R, U	F, C	LT	
5	5	3,4	R, U, Ap	F, C, P	LT	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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CO 1	2	-	-	-	-	-		2				
CO 2	3	-	-	-	-	-		2				
CO 3	-	-	2	3	-	-	2	2		2		3
CO 4	-	-	1	3	-	-	2	2		2		3
CO 5	-		2	3	-	-		2		3		3

Correlation Levels:

Level	Correlation
	Nil
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Assessment Rubrics:

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CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		