Punjab University College of Pharmacy Faculty of Pharmacy
University of the Punjab, Lahore

Course Outline

Programme	Pharm.D 1st Semester	**Course Code**	PHARM-105 (Theory), PHARM-106 (Lab)	**Credit Hours**	2+1
Course Title	Biochemistry-I				

Course Introduction

The course includes an introduction to biochemistry, focusing on the importance of biochemical reactions in maintaining life. It also covers carbohydrates, their structure, classification, functions, and metabolism, explaining how they serve as major energy sources. In addition, students study lipids, including their structure, types, and biological roles in energy storage and cell membranes. The course further discusses vitamins, including both water-soluble vitamins (B-complex and vitamin C) and fat-soluble vitamins (A, D, E, and K), highlighting their biochemical functions, dietary sources, and deficiency effects. Overall, this course provides basic knowledge of essential biomolecules and metabolic processes that form the foundation for further studies in biochemistry and related life sciences.

Learning Outcomes

On the completion of the course, the students will:

1. Analyze the scope and importance of pharmaceutical biochemistry and explain its role in drug action, disease mechanisms, and clinical decision-making in pharmacy practice.
2. Classify and interpret the structure, isomerism, and properties of carbohydrates, and analyze major carbohydrate metabolic pathways (glycolysis, PPP, TCA cycle, etc.), evaluating their dysregulation in metabolic disorders.
3. Explain and analyze bioenergetic principles, including ATP generation, electron transport chain, and oxidative phosphorylation, and evaluate the biochemical impact of mitochondrial dysfunction and reactive oxygen species in health and pharmaceutical contexts.
4. Classify and analyze lipids, their digestion, metabolism, and biosynthesis, and evaluate the relationship between lipid metabolic disorders and their pharmaceutical significance.
5. Classify and explain vitamins based on structure and function, and analyze their roles in metabolism, deficiencies, toxicities, and drug–vitamin interactions in clinical and pharmaceutical practice.
6. Classify and explain hormones and their biochemical roles, and analyze their clinical and pharmaceutical applications in disease diagnosis and therapy.

Course Content (Theory)		Assignments/Readings
Week 1	**Unit I: Basic concepts** Introduction to Biochemistry	Berg, J. M., Tymoczko, J. L., & Gatto, G. J. (2019). Stryer's biochemistry (8th ed.). W. H. Freeman and Company.
	Types of biochemical reactions	
	Chemical reactions pharmaceutical importance	
	Concept of anabolism and catabolism	

Week 2	Role of pharmaceutical chemistry in pharmacy and medicine	Tortora, G. J., & Derrickson, B. H. (2020). Principles of anatomy and physiology (15th ed.). Wiley Lippincott Williams & Wilkins. (2020). Lippincott's illustrated reviews: Biochemistry. Lippincott Williams & Wilkins.
	Role of biochemistry in pharmacy and medicine	
Week 3	Carbohydrates introduction	
	Classification of carbohydrates	
	Physical properties and chemical reactions of carbohydrates	
Week 4	Biological importance of carbohydrates	
	Pharmaceutical importance of carbohydrates	
	Pharmaceutical importance of carbohydrates	
Week 5	Metabolism of Carbohydrates	
	Types of metabolic pathways	
	Metabolic pathways of carbohydrates	
Week 6	Metabolic pathway of carbohydrates	
	Metabolic pathway of carbohydrates	Lippincott Williams & Wilkins. (2020). Lippincott's illustrated reviews: Biochemistry. Lippincott Williams & Wilkins.
	Metabolic pathway of carbohydrates	
Week 7	Lipids introduction	
	Classification of lipids	
	Physical properties and chemical reactions of lipids	
Week 8	Biological importance of lipids	
	Pharmaceutical importance of lipids	
	Pharmaceutical importance of lipids	
Week 9	Metabolism of lipids	
	Types of metabolic pathways	
	Metabolic pathways of lipids	
Week 10	Metabolic pathways of lipids	
	Metabolic pathways of lipids	
	Metabolic pathways of lipids	
Week 11	Introduction to Vitamins	
	Classification of vitamins	
	Chemical classification of vitamins	Abraham, D. J. (2017). *Burger's medicinal chemistry and drug discovery* (8th ed.). Wiley. Devlin, T. M. (2016). Textbook of biochemistry with clinical correlations (8th ed.). Wiley-Liss.
Week 12	Water soluble vitamins introduction	
	Vitamin A	
	Vitamin D	
Week 13	Vitamin E	
	Vitamin K	
	Vitamins Comparison	
	Fat soluble vitamins introduction	

Week 14	B-complex vitamins	
	Non-B complex vitamins	
Week 15	Bioenergetics introduction	Lippincott Williams & Wilkins. (2020). Lippincott's illustrated reviews: Biochemistry. Lippincott Williams & Wilkins.
	Energy production	
	Energy calculation	
Week 16	Electron transport chain	
	Energy calculation of metabolic pathways	
	Energy calculation of metabolic pathways	

Textbooks and Reading Material

Main source: Berg, J. M., Tymoczko, J. L., & Gatto, G. J. (2019). Stryer's biochemistry (8th ed.). W. H. Freeman and Company.

Other sources: Akash, M. S. H., & Rehman, K. (2025). Biochemical aspects of metabolic disorders. Elsevier Academic Press.

Nelson, D. L., & Cox, M. M. (2017). Lehninger principles of biochemistry (7th ed.). W. H. Freeman and Company.

Abraham, D. J. (2017). *Burger's medicinal chemistry and drug discovery* (8th ed.). Wiley.

Devlin, T. M. (2016). Textbook of biochemistry with clinical correlations (8th ed.). Wiley-Liss.

Gout, A. M. (2019). Biochemistry for the pharmaceutical sciences (4th ed.). Wiley.

Berg, J. M., & Stryer, L. (2020). Biochemistry (9th ed.). W. H. Freeman and Company

Hodges, R. S. (2019). Biochemistry: A short course (3rd ed.). Wiley.

Tortora, G. J., & Derrickson, B. H. (2020). Principles of anatomy and physiology (15th ed.). Wiley

Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). Molecular biology of the cell (6th ed.). Garland Science.

Lippincott Williams & Wilkins. (2020). Lippincott's illustrated reviews: Biochemistry. Lippincott Williams & Wilkins.

Rodwell, V. W., Bender, D. A., Botham, K. M., Kennelly, P. J., & Weil, P. A. (2017). Harper's illustrated biochemistry (31st ed.). McGraw-Hill Education.

Course content (Practical/lab)		
1	Good laboratory practice for the biochemistry lab (Protocol for Chemical Handling of flammable, non-flammable, and acids)	
2	Introduction to biochemistry lab apparatus and instruments.	
3	**QUALITATIVE TESTS FOR IDENTIFICATION OF BIOMOLECULES CARBOHYDRATES**	
	1	Starch
	2	Dextrin
	3	Glucose
	4	Fructose
	5	Lactose
	6	Maltose
4	**QUALITATIVE TESTS FOR IDENTIFICATION OF BIOMOLECULES PROTEINS**	
	7	Proteins
	8	Tryptophan
	9	Arginine
	10	Cysteine
	11	Albumin
	12	Gelatin

Assignments: Types and Number with Calendar

Assignment/presentation (20 marks)			**Class quiz (30 marks)**	
No.	**Week**	**Deadline for submission**	**No.**	**Week**
Assignment 1 (Pre-mid)	Week 3	Within the timeline assigned by the teacher	Quiz 1 (pre-mid)	Week 4
			Quiz 2 (pre-mid)	Week 7
Assignment 2 (Post-mid)	Week 11		Quiz 3 (post-mid)	Week 10
			Quiz 4 (post-mid)	Week 14