School of Chemistry
Faculty of Science
University of the Punjab, Lahore
Course Outline

BS Chemistry Semester-V					
Programme	**BS Chemistry**	**Course Code**	**Chem-376**	**Credit Hours**	**2**
Course Title	**Carbohydrate**		**Course Type**	**Major (Elective)**	

Course Introduction

This course needs to demonstrate the in-depth knowledge on occurrence, classification, chemical structure, physical properties, biological importance and metabolism of different types of carbohydrates.

Introduction, occurrence and importance of Carbohydrates in biosphere and life processes. Detail Classification of carbohydrates and their biological significance. Structures, chemical and physical properties of monosaccharides, oligo saccharides and polysaccharides. Homo-polysaccharides and Hetro-polysaccharides with special emphasis on Glycosaminoglycans. Haworth configuration, D and L configuration of monosaccharides. Optical isomerism and mutarotation in glucose, Invert sugar. A brief discussion of digestion, absorption, and transport of Carbohydrates. Description about the Metabolism, biological importance and ATP production of carbohydrates; glycolysis, citric acid Cycle, HMP pathway, uronic acid pathway. Gluconeogenesis, glycogenesis, glycogenolysis, electron transport chain, oxidative phosphorylation and uncoupler agents involved in oxidative phosphorylation.

Learning Outcomes

1- This course will help students to understand major types of carbohydrates and their function in the human body.
2- Students will be able to learn metabolism and metabolic pathways of carbohydrates and their use in life.
3- It will also help in understanding of ATP production in cell, normal level of blood sugar and its regulation.

	Course Content	**Assignments/Readings**
Week 1	General lecture about carbohydrates	-
	Occurrence and importance of Carbohydrates in biosphere and life processes	Class base learning/test
Week 2	Detail Classification of carbohydrates and their biological significance	Class base learning/test
	Structures, chemical and physical properties of monosaccharides, oligo saccharides and polysaccharides	Class base learning/test
Week 3	Homo-polysaccharides and Hetro-polysaccharides with special emphasis on Glycosaminoglycans	Class base learning/test
	Haworth configuration, D and L configuration of monosaccharides	Class base learning/test
Week 4	Optical isomerism and mutarotation in glucose, Invert sugar	Class base learning/test

	Class discussion	-
Week 5	A brief discussion of digestion, absorption, and transport of Carbohydrates	Class base learning/test
	Description about the Metabolism, biological importance and ATP production of carbohydrates	Class base learning/test
Week 6	Glycolysis	Class base learning/test
	Class Discussion	-
Week 7	Citric acid Cycle	Class base learning/test
	Detail about the HMP pathway	Class base learning/test
Week 8	Class Discussion	-
	Quiz (Give marks, if necessary, from assignment)	-
Week 9	Mid Term Exams	-
Week 10	Uronic acid pathway	Class base learning/test
	Class Discussion	-
Week 11	Gluconeogenesis pathway	Class base learning/test
	Glycogenesis pathway	Class base learning/test
Week 12	Glycogenolysis	Class base learning/test
	Discussion on the Assigned topic for assignment	-
Week 13	Electron transport chain	Class base learning/test
	Oxidative phosphorylation	Class base learning/test
Week 14	Uncoupler agents involved in oxidative phosphorylation	Class base learning/test
Week 15	Class discussion	-
	Quiz (Give marks, if necessary, from assignment)	-
Week 16	Submission of assignments. If required then discussion the whole chapter for final term exams preparation	-

Reading Material

1- Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2020). *Principles of biochemistry* (8th ed.). W. H. Freeman and Company.
2- Stryer, L. (2021). *Biochemistry* (9th ed.). W. H. Freeman and Company.
3- Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., & Rodwell, V. W. (2018). *Harper's biochemistry* (32nd ed.). McGraw-Hill Education.
4- Champ, C., Harvey, R. A., & Ferrie, D. R. (2021). *Lippincott's biochemistry* (6th ed.). Wolters Kluwer.

Teaching Learning Strategies

- Lecturing using white/black board/Multimedia
- Written Assignments/Quiz/Task/Presentation
- Discussion about practical
- Checking the results and discussion

Assignments: Types and Number with Calendar

Assignment, Quiz, Task, Presentation etc.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

BS Chemistry Semester-V					
Programme	**BS Chemistry**	**Course Code**	**Chem-377**	**Credit Hours**	**1**
Course Title	**Carbohydrate-Lab**		**Course Type**	**Major (Elective)**	

Course Introduction

This course is require to impart practical knowledge of different methods for qualitative and quantitative analysis of carbohydrates

Qualitative and Quantitative tests of various Carbohydrates; Distinction between pentoses and hexoses, aldoses and Ketoses, reducing and non-reducing sugars, mono and polysaccharides. Qualitative tests for polysaccharides; starch, glycogen and cellulose. Extraction of starch from plant source and its confirmatory tests. Determination of sugar level in blood and urine. Estimation of glucose in urine.

Learning Outcomes

1- This course will provide practical knowledge and grounds for distinction between various carbohydrates.
2- In addition, it will help students to apply these practical methods on sugar level determination of human's blood and urine.
3- These practical will given practical understanding about the carbohydrates

	Course Content	**Assignments/Readings**
Week 1	Role of carbohydrates in the life and which kind of test are being in use to determine the different types of carbohydrates	Class base learning/test
Week 2	Qualitative test; Distinction between pentoses and hexoses	Class base learning/test
Week 3	Qualitative test; Distinction between aldoses and Ketoses	Class base learning/test
Week 4	Qualitative test; Distinction between reducing and non-reducing sugars	Class base learning/test
Week 5	Qualitative test; Distinction between mono and polysaccharides	Class base learning/test
Week 6	Qualitative tests for polysaccharides; starch, glycogen	Class base learning/test
Week 7	Discussion the practical and if need then repeat it	-
Week 8	Midterm Exams	-
Week 9	Qualitative tests for polysaccharides; cellulose	Class base learning/test
Week 10	Extraction of starch from plant source	Class base learning/test
Week 11	Confirmatory tests of starch extracted from plant sources	Class base learning/test
Week 12	Determination of sugar level in blood	Class base learning/test
Week 13	Determination of sugar level in urine	Class base learning/test

Week 14	Estimation of glucose in urine	Class base learning/test
Week 15	Discussion all practical if need then repeat	-
Week 16	Final Term	-

Reading Material

1. Varley, H., Gowenlock, A. H., & Bell, P. G. (2022). *Practical clinical biochemistry* (8th ed.). CBS Publishers & Distributors.
2. Plummer, D. T. (2008). *An introduction to practical biochemistry* (3rd ed.). McGraw-Hill Education.
3. Gowenlock, A. H. (2009). *Varley's practical clinical biochemistry* (6th ed.). Arnold.
4. Williams, B. L., & Wilson, K. (2006). *Principles and techniques of practical biochemistry* (3rd ed.). Cambridge University Press.
5. Online literature as per direction of teacher

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