ADVANCE CHEMISTRY- VII (BIO-CHEMISTRY)

CREDIT HOURS: 3

Course Objectives: Students will gain knowledge about fundamental concepts of biochemistry as well as be able to learn about the structures, properties and functions of amino acids, proteins, carbohydrates, lipids and nucleic acids.

1. **Introductory Biochemistry:**
   Scope of Biochemistry. The molecular logic of life. Structure and Functions of Cells. Cell wall Composition. A brief description on the isolation of cellular components.

2. **Water:**
   Weak interactions in aqueous system. Ionization of water. Weak acids and weak bases. pH and buffer systems. Different buffering agents. Importance of buffers in biological systems.

3. **Carbohydrates:**
   Nature, Structure and Classification of Carbohydrates. Aldoses and Ketoses Cyclic structure of monosaccarides, Hawarth configurations D and L configuration of monosaccharides, Optical isomerism and Mutarotation in glucose. Formation of Glycosidic bonds. Reducing and non reducing sugars. Important monosaccharide and their derivatives. Invert sugars. Biological significance of Glucose. Structures and functions of common Disaccharides and Polysaccharides: Succrose, Lactose, Maltose Amylose and Amylopectins. , Cellulose, Chitin Glycogen, Starch and Dextran. Derived carbohydrates and hexose derivatives present in microorganisms. Sensory properties of monosaccharides. Proteoglycan and glycoproteins: their Structure and function.

4. **Nucleic acids:**
   Purines, Pyrimidines and nucleotides. Structure and functions of DNA, different type of RNA. Nucleic acid hydrolysis. Determination of Primary structure of Nucleic acids. Chemical synthesis of oligonucleotides.

5. **LIPIDS:**
   Lipid Classification, Structures and functions. Chemical Properties of triglycerides. Phospholipids. Sterol/steroids. Lipid with specific biological activities. Prostaglandins: Structure and function. Properties of lipid aggregates: Micelles and Bilayers. Biological membranes. Membrane proteins, Membrane structure and Assembly. Fluid Mosaic model. The erythrocyte membrane. .

6. **PROTEINS:**
   Amino acids: their Structure, Chiral Center, and stereoisomerism. Classification of amino acids. Acid base properties, their titration curve and its importance. . Amino acid sequence. Peptides and their biological importance. Proteins: classification, Covalent structure and biological significance including Primary. Secondary, Tertiary and Quaternary structure of proteins, as Keratins, Collagens and elastin. Conformation and function of globular proteins with special reference to structure and function of Hemoglobin and Myoglobin. Biological significance of Proteins.

7. **ENZYMES:**
   Chemical nature, nomenclature and classification of enzymes. Cofactors and Coenzymes. Concepts of Active site. Substrate specificity. Affect of different factors on enzyme activity. Kinetics of single substrate reactions. Quantitative assay of enzymatic activity. Enzyme inhibition: Competitive, non-competitive and irreversible inhibition. Regulatory enzymes, allosteric enzymes, Multienzyme system, Zymogons, isoenzyme. Immobilized enzymes.

8. **NUTRITION:**
Introduction to the science of nutrition: Nutrients and their functions Biological evaluation of proteins, carbohydrates and lipids. Sources and forms of Energy. Energy value of foods. Energy requirements under different living and physiological conditions. Direct and indirect Calorimetry. Basal metabolic Rate, Respiratory quotient and their measurements. Assessment of nutritional status in Pakistan. Thermogenic effects of food.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

RECOMMENDED BOOKS:

1. Principles of Biochemistry by Lehninger AL, Nelson DL and Cox MN, 2000 Pub: worth Publishers
2. Biochemistry by Lubert Stryer 2006 Pub: Freeman and Company
3. Biochemistry by Voet, and Pratt, 2004, John wiley and sons Inc.
4. Lippincott's Biochemistry by Champe.P C; Harvey. R. A and Ferrier. D. R. 3rd ed., 2004 Pub: J. b. Lippincott Company
5. Harpers Biochemistry, 27th ed. 2006 Pub: McGraw Hill Inc.

ADVANCE CHEMISTRY LAB- VII (BIO-CHEMISTRY)

CREDIT HOURS: 1

1. **Carbohydrates:**
   Qualitative tests for Carbohydrates. Distinction between pentoses and hexoses, aldoses and Ketoses, reducing and non reducing sugars mono and polysaccharides. Chromatography of sugars. Preparation of glycogen from liver. Acid and enzymic hydrolysis of glycogen.

2. **Nucleic Acids:**
   Isolation of RNA from beef liver. Isolation of DNA from Calf Spleen. UV absorption of nucleic acids.

3. **Lipids:**
   Qualitative tests for lipids including fatty acids, sterols and phospholipids. Lipids separation from Calf brain tissue. Acid value, Saponification Value and Iodine Value of fats. Extraction and TLC of Wheat Lipids.

4. **Amino Acids and Proteins:**
   Qualitative tests of amino acids, determination of isoelectric Point. Isolation and solubilization of proteins from plant and animal origin.Hydrolysis of proteins. Estimation of proteins by Kjeldahl method. Isolation of enzyme amylase, a study on its properties and catalytic activity.

Evaluation Criteria

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Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

RECOMMENDED BOOKS:

1 Practical Clinical Biochemistry by Varley. Pub: CBS publishersAn
2 Introduction to Practical Biochemistry By D. T. Plummer Pub: McGraw Hill