

Title of the paper_ Biomolecules

Unit – I: Biophysical Concepts

12 hours

Water as a biological solvent and its role in biological processes. Biological relevance of pH, PKa of functional groups in biopolymers such as proteins and nucleic acids. Importance of buffers in biological systems. Donnan membrane equilibrium. Significance of osmotic pressure in biological systems.

Unit – II : Carbohydrates

12 hours

Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone). Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose, , structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans. Bacterial cell wall polysaccharides blood group substances.

Unit – III Lipids

12 hours

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids, sphingolipids and cholesterol. Prostaglandins- structure and biological role of PGD₂, PGE₂ and PGF₂ . Lipoproteins: Types and functions. Biomembranes:., Membrane composition and organization – Fluid mosaic model.

Unit-IV : Amino Acids and Peptides

12 hours

Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. Titration curve of glycine and pK values. Essential and non-essential amino acids, non-protein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides – glutathione, enkephalin.

Unit-V: Proteins

12 hours

Proteins: Classification based on solubility, shape, and function. Determination of amino acid composition of proteins. General properties of proteins, denaturation, and renaturation of proteins. Structural organization of proteins- primary, secondary, tertiary, and quaternary structures (Eg Hemoglobin and Myoglobin), forces stabilizing the structure of protein.

B.Sc. BIOCHEMISTRY SEMESTER-II SYLLABUS
(w.e.f. 2017 2018)

Module -II: Nucleic acids and Biochemical Techniques

Unit-I: Nucleic Acids 12 hours

Nature of nucleic acids. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and

formation of phosphodiester linkages, Structure of Nucleic acids- Watson-Crick DNA double helix structure, introduction to circular DNA, super coiling, helix to random coil transition, denaturation of nucleic acids- hyperchromic effect, T_m -values and their significance.

Reassociation kinetics, cot curves and their significance. Types of RNA and DNA.

Unit-II: Porphyrins 9 hours

Structure of porphyrins; Protoporphyrin, porphobilinogen properties Identification of Porphyrins.

Structure of metalloporphyrins – Heme, cytochromes and chlorophylls.

Unit-III: Biochemical Techniques I 15 hours

Methods of tissue homogenization: (Potter-Elvehjem, mechanical blender, sonicator and enzymatic). Principle and applications of centrifugation techniques- differential, density gradient.

Ultracentrifugation-preparative and analytical..

Principle and applications of chromatographic techniques- paper, thin layer, gel filtration, ion-exchange and affinity chromatography. Elementary treatment of an enzyme purification.

Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis.

Unit-IV: Biochemical Techniques II 12 hours

Colorimetry and Spectrophotometry- Laws of light absorption- Beer-Lambert law. UV and visible absorption spectra, molar extinction coefficient, biochemical applications of spectrophotometer.

.Tracer techniques:, use of radioactive isotopes in biology.

Unit- V : Techniques employed in metabolic studies 12 hours

Broad outlines of Intermediary metabolism, methods of investigation, Intermediary metabolism in vivo studies such as analysis of excretion, Respiratory exchange, Removal of organs and perfusion studies, in vitro studies such as tissue slice techniques; Homogenates and purified enzyme systems; isotope tracer studies, use of inhibitors and antimetabolites.

List of Recommended Books for Biochemistry

General Biochemistry

1. Lehninger's Principles of Biochemistry . Nelson.D.L. and Cox.M.M., Freeman &Co.
2. Biochemistry . Berg.J.M., Tymoczko.J.L. and Stryer.L., Freeman & Co.
3. Biochemistry . Voet.D and Voet., J.G., John Wiley & Sons .
4. Textbook of Biochemistry . West.E.S., Todd.W.R, Mason.H.S..and. Bruggen, J.T.V., Oxford & IBH Publishers.
5. Principles of Biochemistry: General Aspects-Smith, E. L., Hill, R.L. Lehman, I. R. Lefkowitz, R.J. Handler, P., and White, A. McGraw-Hill
6. Outlines of Biochemistry . Conn.E.E., Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
7. Harper's Illustrated Biochemistry . Murray, R.K., Granner.D.K. & Rodwell,V.W., McGraw-Hill
8. Biochemistry-Lippincott's Illustrated Reviews. Champe, P.C. and Harvey, R. A. Lippincott
9. Fundamentals of Biochemistry .Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
10. Biochemistry . Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
11. Biochemistry . Rama Rao. A and Ratna Kumari. D, Kalyani Publishers.
12. Biochemistry- The Molecular Basis of Life . McKee. T and McKee, J. R, McGraw-Hill.
13. Biophysical Chemistry by C.R. Cantor and P.R. Schimmel
14. Physical Biochemistry by K.E.van Holde, C. Johnson and P. S. Ho
15. Biophysical Chemistry by Upadhyay
16. Biophysical Chemistry by Gurtu

Annexure-III

Practical examination pattern for year end examinations (w.e.f. 2014- 2015)

Practical – I :

Practical examination in Dept. of Biochemistry is held before 2nd semester exam once in a year to test practical skills among the students.

Total marks allotted for practicals are 50 marks for the duration of **three** hours.

The division of marks is as follows

Major Expt.	Minor Expt.	Viva	Record	Total Marks	Max. Time
25 marks	10 marks	5 marks	10 marks	50 marks	3 hours

List of practicals

PRACTICAL – I:

Max. Marks: 50

Qualitative Analysis and Enzymology:

Introduction to Good Laboratory Practice (GLP). Principles of Laboratory Hygiene and Safety.

List of experiments:

1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Qualitative identification of carbohydrates- glucose, fructose, maltose, sucrose, lactose, starch/glycogen.
3. Qualitative identification of amino acids - histidine, tyrosine, tryptophan, cysteine, arginine.
4. Qualitative tests for lipids: solubility, saponification, acrolein test, Salkowski test,
5. Lieberman-Burchard test.
6. Preparation of Osazones and their identification.
7. Absorption maxima of colored substances- *p*-Nitrophenol / Methyl orange.
8. Absorption spectra of protein-BSA; nucleic acids- Calf thymus DNA.
9. Assay of amylase

Semester I

List of practicals

PRACTICAL - I:

Max. Marks: 50

Qualitative Analysis:

Introduction to Good Laboratory Practice (G.L.P). Principles of Laboratory Hygiene and Safety.

List of experiments:

1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
3. Qualitative identification of amino acids - histidine, tyrosine, tryptophan, cysteine, arginine.
4. Qualitative identification of lipids- solubility, saponification. Lieberman-Burchard test.
5. Preparation of Osazones and their identification.
6. Absorption maxima of coloured substances- *p*-Nitrophenol, Methyl orange.

List of practicals

Semester II

PRACTICAL - II

Max. Marks: 50

1. Isolation of egg albumin from egg white.
2. Isolation of cholesterol from egg yolk.
3. Isolation of starch from potatoes.
4. Isolation of casein from milk.
5. Separation of amino acids by paper chromatography.
6. Separation of serum proteins by paper electrophoresis.
7. Separation of plant pigments by T.L.C.

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