

BHAKTA KAVI NARSINH MEHTA UNIVERSITY



**COURSE STRUCTURE
& SYLLABUS FOR
UNDERGRADUATE PROGRAMME
IN
BIOCHEMISTRY 3rd and 4th Semester
CORE COURSES UNDER
CHOICE BASED CREDIT SEMESTER SYSTEM
w.e.f June, 2019**

Bhakta Kavi Narsinh Mehta University
Semester 3rd Syllabus of Biochemistry (CBCS) Biochemistry –
301

BIOMOLECULES

Credit : 4

Theory : 6 lectures/week

Total Lectures: 60

UNIT I: Carbohydrates.

[12 hours]

Structure, occurrence and biological importance of monosaccharides, disaccharides, oligosaccharides and polysaccharides e.g. cellulose, chitin, agar, pectin, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides. Glycoproteins.

Stereoisomerisms and optical isomerism of sugars. Ring structure and anomeric forms, mutarotation. Reactions of sugar due to aldehyde or ketone groups and hydroxyl groups.

UNIT 2: Lipids.

[12 hours]

Introduction, classification, nomenclature, structure and properties of different classes of lipids. saturated and unsaturated fatty acids. Essential fatty acids.

Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats- hydrolysis, saponification value, rancidity of fats Reichert- Meissel number and reaction of glycerol. Biological significance of fats.

Glycerophospholipids (lecithin, lysolecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmogens). Sphingomyelins, glycolipids- cerebroside, gangliosides. Properties and functions of phospholipids and steroids.

UNIT 3: Proteins.

[12 hours]

Amino acids: Common structural features, stereo-isomerism and RS system of designating optical isomers, classification and structures of standard amino acids, physical and chemical properties, titration of amino acids, non -standard amino acids. **Peptides:** Structure of peptide bond. Determination of the amino acid sequence of polypeptide chain.

Protein structure: Primary, secondary, tertiary and quaternary structure of proteins. Denaturation and renaturation of proteins. Behavior of proteins in solutions, salting in and salting out of proteins.

Introduction, classification based on solubility, shape, composition and functions.

Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (hemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

UNIT 4: Nucleic acids:

[12 hours]

Nature of genetic material; evidence that DNA is the genetic material, composition of RNA and DNA, generalized structural plan of nucleic acids, nomenclature used in writing structure of nucleic acids, feature of DNA double helix.

Denaturation and annealing of DNA, structure and roles of different types of RNA. Size of DNA in prokaryotic and eukaryotic cells. Central dogma of molecular biology, Gene, genome & chromosome.

UNIT 5: Porphyrins and Vitamins:

[12 hours]

Porphyrins: Porphyrin nucleus and classification of porphyrins. Important metalloporphyrins occurring in nature. Detection of porphyrins spectrophotometrically and by fluorescence.

Bile pigments- chemical nature and their physiological significance.

Vitamins: Introduction, classification, biological significance and deficiency symptoms of different vitamins.

Biochemistry Practicals : 301

Credit: 3

6 Hours / Week (2 Days)

- 1) Qualitative analysis of carbohydrates.
- 2) Qualitative analysis of amino acids and proteins.
- 3) Qualitative analysis of different classes of lipids.
- 4) Introduction to colorimeter and spectrophotometer and their use in quantitative analysis.
- 5) Estimation of reducing sugars by DNSA method.
- 6) Quantitative estimation of amino acids by Ninhydrin method.
- 7) Estimation of proteins by Biuret method.
- 8) Estimation of RNA by orcinol method.

Reference Books:

- 1) Principles and techniques of practical biochemistry by K.Wilson and Walker, Cambridge University press.
- 2) Biophysical biochemistry by Upadhyay and Nath.
- 3) Tools of biochemistry by cooper.
- 4) Outlines of biochemistry by Eric Conn., P.K.Stumpf. John Wiley and Sons.
- 5) Lehninger's Principles of Biochemistry by Nelson, David & Cox., Macmillan NY.
- 6) Fundamentals of Biochemistry by Donald Voet, Judith Voet and Charlotte Pratt. John Willey and Sons.
- 7) Biochemistry by Lubert Stryer, W.H.Freeman and Co.
- 8) Standard methods of biochemical analysis by S.R.Thimmaiah, Kalyani publishers Delhi, India.
- 9) Fundamentals of Biochemistry by J.L.jain, Sunjay Jain,Nitin jain.
- 10) Lippincott's illustrated Reviews- Biochemistry by Champe, Harvey, Ferrier.
- 11) Biochemistry by U. Satyanarayana
- 12) Biochemistry and Molecular Biology by Willium Elliott and Daphne Elliott.
- 13) Biochemistry-The Molecular basis of life by T. McKee and J. McKee.

Bhakta Kavi Narsinh Mehta University
Semester 4th Syllabus of Biochemistry (CBCS)

PAPER NO 401
BIOCHEMISTRY – CBCS BIOPHYSICAL AND BIOCHEMICAL
TECHNIQUES

Credit: 4

Theory: 6 lectures/ week

Total Lectures: 60

Unit I Spectroscopic techniques: [12 hours]

1. Electromagnetic radiation and spectra. Quantitative aspects of light absorption; Beer- Lamberts laws of light absorption with their limitations. Extinction coefficients.
2. Instrumentation, principles, components and working of single and double beam colorimeter and spectrophotometer.
3. Advantages of double beam instruments. Applications of UV-Visible spectroscopy.

UNIT 2 Hydrodynamic techniques: [12 hours]

1. Sedimentation- the concepts of Centrifugal force (F) and Relative centrifugal force (RCF).
2. Preparative and analytical centrifugation- instrumentation, techniques, and their applications.

UNIT 3 Radio isotopic techniques: [12 hours]

1. Types of radioisotopes used in biochemistry, units of radioactivity.
2. Techniques for measurement of radioactivity (gas ionization and liquid scintillation counting).
3. Biological applications of radioisotopes. Biological hazards of radiation and safety measures in handling radioisotopes.

UNIT 4: Chromatography: [12 hours]

General principles, methods and applications of the following techniques:

1. Paper and thin-layer chromatography techniques.
2. Ion exchange chromatography.
3. Molecular sieve chromatography.
4. Affinity chromatography
5. Gas-Liquid chromatography (GLC)
6. High performance liquid chromatography (HPLC)

UNIT 5: Electrophoresis. [12 hours]

1. Basic principles of electrophoresis and factors affecting electrophoretic mobility.
2. Principle, materials used and applications of Agarose and Polyacrylamide gel electrophoresis (PAGE).
3. Techniques of Isoelectric focusing, SDS-PAGE, 2-D Gel electrophoresis and their importance

Practicals 401:

- 1) Introduction to principle and working of Colorimeter and spectrophotometer.
- 2) Determination of absorption spectrum and absorption maxima of given compound.
- 3) Verification of Beer's Law of light absorption using colored solutions.
- 4) Introduction to principle and working of centrifuge.
- 5) Separation of amino acids using paper chromatography. Determination of R_f values and identification of amino acids from mixtures.
- 6) Separation of lipids by thin layer chromatography.
- 7) Separation of compounds using column chromatography.
- 8) Agarose Gel electrophoresis of DNA.

References:

- 1) Physical biochemistry by D.Frifelder, W.H.Freeman and Co.
- 2) Physical biochemistry by Vanholde K.E., Practice Hall Inc. New Jersey.
- 3) Principles and techniques of practical biochemistry by K.Wilson and Walker, Cambridge university press.
- 4) Biophysical biochemistry by Upadhyay and Nath.
- 5) Tools of biochemistry by cooper.
- 6) Outlines of biochemistry by Eric Conn., P.K.Stumpf. John Wiley and Sons.