

**Devi Ahilya Vishwavidyalaya  
Indore**

**Syllabus for M.Sc. (Biochemistry) for Colleges  
2016-18**

**Semester I**

**Paper 1. Chemistry of Biomolecules (85+15 marks)**

**Paper 2. Analytical Biochemistry (85+15 marks)**

**Paper 3. Cell Biology (85+15 marks)**

**Paper 4. Biostatistics (85+15 marks)**

**Practical (100 marks)**

**M.Sc. Semester I (2016-18)**  
**Paper I Chemistry of Biomolecules**

**Unit I**

Carbohydrates: Occurrence, stereochemistry, classification, structure, properties and biological importance of carbohydrates, mucopolysaccharides and amino sugars.

**Unit II**

Proteins: Classification, structure and properties of amino acids, essential amino acids, biologically active peptides.

Classification and properties of proteins, sequencing of proteins, conformation and structure of proteins-primary, secondary, tertiary and quaternary structure, coagulation and denaturation of proteins.

**Unit III**

Lipids: Structure, distribution and biological importance of fats and fatty acids, chemical properties and characterization of fats, waxes, cerebrosides, gangliosides, phospholipids and proteolipids. Steroids and bile salts. Prostaglandins.

**Unit IV**

Nucleic acids: Structure of purines, pyrimidines, nucleosides and nucleotides, structure, types and biological role of RNA and DNA.

**Unit V**

Vitamins: Structure and biochemical properties of water soluble and fat soluble vitamins and their coenzyme activity.

Hormones : Mechanism of hormone action and its regulation.

**Paper 2. Analytical Biochemistry**

**Unit I**

The concept of pH, dissociation and ionization of acids and bases, pKa, buffers and buffering mechanism, Henderson Hasselbalch equation, ionization of amino acids and proteins, measurement of pH.

General principle and different types of chromatography, adsorption and partition, Column, Paper and Thin layer.

*R. Jindal*  
*28/7/2017*

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*28/7/2017*

## Unit II

Principle, materials used and applications of Ion-exchange chromatography, gel filtration chromatography, affinity chromatography and high performance liquid chromatography.

## Unit III

Electrophoresis: Moving boundary and zonal electrophoresis, paper and gel electrophoresis, PAGE and SDS-PAGE, isoelectric focussing technique.  
Sedimentation: Sedimentation velocity, preparative and analytical ultracentrifugation techniques, differential and density gradient centrifugation, subcellular fractionation.

## Unit IV

Radioactivity: Disintegration of radionuclides, half-life of radioactive compounds, measurement of radioactivity, scintillation counting, use of radioisotopes, *in vivo* and *in vitro* labeling, isotopic tracer techniques, autoradiography.

## Unit V

Spectrophotometry: Beer-Lamberts law, extinction coefficient and its importance, design of colorimeter and spectrophotometer, applications of uv-vis spectrophotometry.  
Atomic absorption spectrophotometry and its application in biology.  
Principle of optical rotatory dispersion, circular dichroism and X-ray diffraction and their applications in structure determination.  
Principle of NMR spectroscopy, application of NMR in Biology.

## Paper 3. Cell Biology

### Unit I

Structure of plant and animal cell, plant cell wall and its composition, plasmodesmata, models of the biomembrane, structure, constituents and fluidity of plasma membrane, cytoskeleton

### Unit II

Transport of metabolites across the plasma membrane, non-mediated and mediated, passive and active transport, primary and secondary active transport.

### Unit III

Structure of mitochondria, different enzymes and their location, electron transport complexes, ATP synthase, mitochondrial DNA.  
Structure of chloroplast, protein complexes and photosynthetic electron transport chain, DNA of the chloroplast.

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21/7/2017

#### Unit IV

Structure and functions of ribosomes and endoplasmic reticulum, protein sorting and signal hypothesis

#### Unit V

Structure and functions of golgi body and lysosomes, mechanism of secretory processes, Structure of nucleus, nuclear membrane and chromatin.

### Paper 4. Biostatistics

#### Unit I

Types of data, collection of data, sampling and non sampling methods  
Representation of Data: Frequency distribution, Line diagram, Bar diagram, Histogram and Relative Frequency Histogram. Frequency polygon and Frequency curve. Pie diagram, cumulative frequency distribution. Ogive and curve.

#### Unit II

Measures of Central Tendency: Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean.  
Measures of Dispersion: Range, Semi-interquartile range, Mean deviation, Standard deviation, Coefficient of variation, Skewness and their applications in biochemistry.

#### Unit III

Correlation and Regression: Scatter diagram. Correlation coefficient, Method of Least Squares, Fitting of regression line, Coefficient of determination. Non - linear regression.

#### Unit IV

Probability and Probability distributions: Classical and Statistical definitions of probability. Conditional Probability. Binomial, Poisson and Normal Distributions and their applications in Biochemistry.

#### Unit V

Tests of Significance Tests based on t, z, F and Chi-square distributions. Analysis of Variance: One way and Two way classification and their applications in biochemistry. P-value and its significance.

R. Indu  
Main Set

R. Indu 2017

## List of Practicals

### Semester I:

1. Qualitative identification of carbohydrates and proteins.
2. Normal and abnormal constituents of urine.
3. Free & total acidity in gastric juice
4. Quantitative estimation of proteins by different methods.
5. Quantitative estimation of carbohydrates.
6. Estimation of Amino Acids by Sorenson formol titration.
7. Separation of amino acids, sugars and phospholipids by chromatography.
8. Isolation of casein from milk, lecithin from egg yolk and glycogen from liver.
9. Isolation of cell organelles.

## M.Sc. Semester II (2016-18)

### Paper-I. Physiology

#### Unit I

Composition and function of blood, plasma and blood corpuscles, functions of plasma proteins, structure and function of haemoglobin, abnormal haemoglobins, Blood coagulation - mechanism and regulation. Blood groups.

#### Unit II

Structure of nephron, composition and mechanism of urine formation, glomerular filtration, tubular reabsorption of glucose, water and electrolytes, tubular secretion. Regulation of water and electrolyte balance, role of kidneys and hormones in their maintenance.

#### Unit III

Hydrogen ion homeostasis, acid-base balance, metabolic and respiratory acidosis and alkalosis. Respiratory unit, exchange and transport of respiratory gases in the body, role of 2,3 DPG, Bohr effect and chloride shift.

#### Unit IV

Classification of muscles, Structure of skeletal, smooth and cardiac muscles. Actin, myosin, tropomyosin, troponin, Z disc and H line components. The sliding filament mechanism and subcellular ion movements during the contraction cycle in skeletal muscles.

#### Unit V

Structure of neuron, nerve impulse, origin and transmission, neuromuscular junction, mechanism of nerve conduction. Reflex action and reflex arc.

*R. Indu*      *M. Anurag*

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28/7/2017