

**M.Sc. Semester I (2019-20)**  
**Paper I Chemistry of Biomolecules**

**Credit: 05**  
**Marks: 80+20=100**

**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: 1. Hormones produced by pituitary gland, pancreas, thyroid gland, adrenal and gonads.

2. Mechanism of hormone action and its regulation.

**Suggested readings:**

1. Text book of Biochemistry by Stryer.
2. Text book of Biochemistry by West and Todd
3. Text book of Biochemistry by Lehninger
4. Text book of Biochemistry by O.P. Agrawal.

**M.Sc. Semester I (2019-20)**  
**Paper 2. Analytical Biochemistry**

**Credit: 05**  
**Marks: 80+20=100**

**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.

## 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 radionuclids, 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.

### Suggested readings:

1. Analytical chemistry –Chatwal and anand.
2. Modern experimental biochemistry-Rodney and Boyer.
3. Biophysical chemistry –Upadhyay, Upadhyay and Nath

**M.Sc. Semester I (2019-20)**  
**Paper 3. Cell Biology**

**Credit: 05**  
**Marks: 80+20=100**

## Unit I

Cell : types of cell ,ultrastructure of plant and animal cell, prokaryotic ad eukaryotic cell, plant cell wall structure and composition and fuction, plasmodesmata structure and its function.

cytoskeleton : microtubules,actin filament,intermediate filament.

cell-cell interaction :types and junction, protein involve in junction.

## **Unit II**

Biomembrane : models of the biomembrane structure, constituents and fluidity and assymetry of plasma membrane. Transport of metabolites across the plasma membrane, non-mediated and mediated, Exocytosis and endocytosis.Passive and active transport.Primary and secondary active transport.

## **Unit III**

Structure of mitochondria, different enzymes and their location, electron transport complexes, ATPsynthase, mitochondrial DNA.

Structure of chloroplast, protein complexes and photosynthetic electron transport chain, DNA of the chloroplast.

## **Unit IV**

Structure and functions of ribosomes and endoplasmic reticulum, protein sorting and signal hypothesis. Structure and functions of golgi body and lysosomes, mechanism of secretary processes.

## **Unit V**

Nucleus : Structure of nucleus, nuclear membrane, nucleopore,nucleolus

Chromatin: heterochromatin and euchomatin special features and function.

Cell cycle: mitosis ,meiosis( interphase and M phase) and its regulation.

### **Suggested readings:**

1. Cell and molecular biology-Roberties EDP.

2.Cell biology,Genetics and Molecular biology-P.S.Verma and K.Agarwal

**M.Sc. Semester I (2019-20)**

**Paper 4. Biostatistics**

**Credit: 05**

**Marks: 80+20=100**

## **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.

### **Suggested readings:**

1. Methods of biostatistics by B.K.Mahajan.
2. Research methodology-C.R.Kothari
3. Fundamental of statistics-Elhans.
4. Statistics –Sahay & Sahay.

### **M.Sc. Semester I (2019-20)**

#### **Practical I : Biochemical work**

**(100 marks)**

1. Qualitative identification of carbohydrates

2. Qualitative identification of Proteins
3. Qualitative identification of Lipids.
4. Estimation of percentage purity of amino acids by Sorenson formal titration.
5. Separation of amino acids, sugars and phospholipids by chromatography.
6. Determination of saponification number of given lipid sample.
7. Determination of iodine number of given lipid sample.

**Practical II : Estimations**

**(100 marks)**

1. Determination of Normal constituents of urine.
2. Determination of abnormal constituents of urine.
3. Quantitative estimation of proteins by different methods (Biuret method).
4. Quantitative estimation of carbohydrates by Folin wu method.
5. Quantitative estimation of carbohydrates by Anthrone method.
6. Isolation of casein from milk.
7. Isolation of lecithin from egg yolk .

**M.Sc. I Sem**  
**Outcome of papers of M.Sc I SEM**

<b>Chemistry of Biomolecules (PAPER I)</b>	<p>Biomolecules are the basic molecules of life. In this paper the structure, properties and functions of various biomolecules in living system are studied. This paper forms the basis of BIOCHEMISTRY as all the other papers depend on the knowledge of biomolecules. The biomolecules like carbohydrates, proteins, lipids nucleic acids forms the body organization and are important for all life processes.</p>
<b>Analytical Biochemistry (PAPER II)</b>	<p>Basically it deals with the principle, working and applications of various techniques and instruments used in</p> <ol style="list-style-type: none"> <li>(1) Analysis of various biomolecules.</li> <li>(2) Measuring quantities of molecules.</li> </ol> <p>In this paper various techniques are studied like</p> <ol style="list-style-type: none"> <li>(a)Chromatography</li> <li>(b)Electrophoresis</li> <li>(c)Sedimentation</li> <li>(d)Spectroscopy</li> <li>(e)Radioactivity</li> <li>(f)Microscopy</li> </ol> <p>These techniques are widely used in research, study of biomolecules and study of biochemical reactions etc.</p>

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**Outcome of papers of M.Sc I SEM**

<b>Cell Biology (PAPER III)</b>	<p>Cell Biology is concerned with the physiological properties, metabolic processes, signaling pathways, life cycle, chemical composition and interactions of cell with their environment. It gives the detailed knowledge of a prokaryotes and eukaryotes cells, their components and functions. Cell Biology deals with the study of structure and functions of cell components and organelles of a cell.</p>
<b>Biostatistics (PAPER IV)</b>	<p>Biostatistics is the use of statistics in biological science. It involves the various formulae related to research methodology.</p> <p>It is the numerical data that deals with the collections, tabulation, analysis and interpretation of data in data for various studies and researches in biology. It finds answer to problems of human health and diseases.</p>