

**M.Sc. Semester-111 (2019-20)**  
**Paper 1. Enzymology**

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

**Unit I**

Isolation and purification, Classification and nomenclature of enzymes. Enzyme catalysis: enzyme specificity and the concept of active site, determination of active site. Stereospecificity of enzymes.

**Unit II**

Enzyme kinetics: Factors affecting rates of enzyme catalyzed reactions, unisubstrate reactions, concept of Michaelis -Menten, Briggs -Haldane relationship, Determination and significance of kinetic constants, catalytic rate constant and specificity constant, Limitations of Michaelis-Menten Kinetics.

**Unit III**

Classification and kinetics of multisubstrate reactions. Reversible and irreversible inhibition, competitive, non competitive and uncompetitive inhibitions.

**Unit IV**

Mechanism of catalysis: Proximity and orientation effects, general acid-base catalysis, concerted acid -base catalysis, nucleophilic and electrophilic attacks, catalysis by distortion, metal ion catalysis. Theories on mechanism of catalysis. Mechanism of enzymes action: mechanism of action of lysozyme, chymotrypsin, carboxypeptidase. Multienzyme system, Mechanism of action, regulation and coenzymes of pyruvate dehydrogenase and fatty acid synthetase complexes.

**Unit V**

Enzyme regulation: General mechanisms of enzyme regulation, Allosteric enzymes, sigmoidal kinetics and their physiological significance, Symmetric and sequential modes for action of allosteric enzymes. Reversible and irreversible covalent modifications of enzymes  
.Immobilised enzymes and their industrial applications.

**Suggested readings:**

- 1.Enzymes-Trevor palmer.
- 2.Enzymes-Dixan & web
- 3.Application enzymology-T.devasana.

## Paper 2. Metabolism I

Credit: 05  
Marks: 80+20=100

### Unit I

The concept of Gibbs free energy, exergonic and endergonic reactions, redox potential. High energy bond and key position of ATP, substrate level and oxidative phosphorylation. Electron transport chain, Inhibitors and uncouplers of ETC.

### Unit II

**Carbohydrate metabolism** : digestion and absorption of carbohydrates, glycolysis and its regulation, Pyruvate dehydrogenase complex, Krebs-cycle and its regulation, pentose phosphate pathway.fermentation (lactic acid and alcoholic fermentation)

### Unit III

glycogenesis and glycogenolysis and their regulation, glycogen storage diseases. gluconeogenesis, Cori's cycle. uronic acid pathway.

### Unit IV

**Lipid metabolism**: Oxidation of fatty acids-mitochondrial  $\beta$ -oxidation,  $\alpha$ - and  $\omega$ -oxidation in brief, Oxidation of unsaturated and odd-chain fatty acids, ketone bodies. Biosynthesis of saturated and unsaturated fatty acids, desaturase enzymes.

### Unit V

Phospholipids and glycosphingolipids-synthesis and degradation, lipid storage diseases. Cholesterol synthesis and degradation including bile acids. Regulation of lipid metabolism.

### Suggested readings:

1. Text book of Medical Biochemistry-Chatterjee & Shinde..
2. Text book of Biochemistry - West and Todd
3. Text book of Biochemistry - Lehninger.
4. Text book of Biochemistry- O.P.Agrawal.
5. Biochemistry-Harper.

**M.Sc. Semester-111(2019-20)**  
**Paper 3. Plant Biochemistry**

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

**Unit I**

Photosynthesis :Structure of chloroplast, Thylakoid membrane protein complexes -PS I, PS II,LHC II, Cyt b6f, ATP synthase complexes.

Light reaction :dissipation of excitation energy by chlorophyll, photolysis of water,Photosynthetic electron transport chain.

Photophosphorylation, ATP Synthesis in chloroplast.

**Unit II**

Calvin cycle : Biochemistry of RuBP carboxylase/oxygenase, activation of RUBISCO, oxygenation reaction, stereochemistry of RUBISCO, photorespiration and compensation point, photosynthetic efficiency .

**Unit III**

Regulation of enzymes of carbon dioxide fixation by light; Hatch and slack pathway, CAM plants; productivity of C4 plants.

**Unit IV**

Nitrogen Metabolism : Nitrogen fixation, nitrogenase complex, mechanism of action of nitrogenase. Structure of 'NIF' genes and its regulation. Hydrogen uptake and bacterial hydrogenases.

Nitrate Metabolism : Enzymes of nitrate metabolism, regulation of their synthesis and activity.

**Unit V**

Special features of secondary plant metabolism,  
Water and mineral balance in plants, structure, function and mechanism of action of phytohormones, Defence system in plants.

**Suggested readings:**

1. Biochemistry & molecular biology of plants-Buchanan.
2. Text book of Biochemistry by Lehninger.
3. Introduction to plant physiology by William G.Hopkins

**M.Sc. Semester-111(2019-20)**  
**Paper 4. Biotechnology**

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

**Unit I**

Basic principles of genetic engineering: Methods of creating recombinant DNA molecule, splicing, properties of restriction endonucleases and their mode of action, Construction of DNA library, chemical synthesis of gene.

## **Unit II**

Cloning vectors (lambda phage, plasmid, M-13 phage, cosmid, shuttle vectors, expression vectors). Selection/screening.

## **Unit III**

Analysis of genomic DNA by Southern hybridization, Northern and Western blotting techniques.

Restriction mapping : Restriction fragment length polymorphism (RFLP), Random amplified polymorphic DNA (RAPD)..

## **Unit IV**

DNA sequencing techniques: plus and minus, dideoxynucleotide, Maxam and Gilbert method, Amplification of DNA by polymerase chain reaction (PCR) Site directed mutagenesis.

## **Unit V**

Gene transfer methods for animals and plants; Agrobacterium mediated gene transfer, electroporation and particle gun  
Application of genetic engineering in medicine and agriculture, vaccine production.

### **Suggested readings:**

1. Fundamental & application of Biotechnology-Purohit.
2. Biotechnology-B.D.Singh.
3. Biotechnology-U.Satyanarayan.

**M.Sc. Semester-111(2019-20)**

**Paper( ELECTIVE ) : Environmental toxicology  
(\*In option for paper IV biotechnology\*)**

**Credit: 05**

**Marks: 80+20=100**

### **Unit I**

Fundamental of toxicology . Definition and scope ,types of toxic substances, Dose response relationship ,xenobiotic metabolism : 1)absorption 2)distribution 3)metabolism 4)phase – I reaction and phase II reaction

### **Unit II**

Types of exposure ,types of toxic response. Tissue specificity and organ specificity and organ specificity of toxicity (w.r.t. liver ,lungs, kidney) Diagnosis of toxic changes in liver changes in liver and kidney ,drugs as toxic substances metabolism of haloalkanes,haloalkenes and paracetamol with their toxic effects on tissue. Food toxicology :Role of diet of in cardio vascular disease and cancer ,Toxicology of food additives.

### **Unit III**

Pesticides toxicology 1) Insecticide toxicology: orgnochlorines organophosphates , Carbamates 2)Herbicide toxicology paraquat, Metal toxicity :1) Arsenic 2) Mercury 3)lead 4) cadmium

### **Unit IV**

Environmental pollution : Air pollution ,common air pollutants and their sources acid rain , ozone layer depletion water pollution.

### **Unit V**

Toxicity by natural products: plant toxins, Animal Toxins, Microbial Toxins (Fungal and bacterial) Toxicity by household products: carbon monoxide ,Antifreeze ,Ethylene glycol, Alcohol.

Toxicity testing ; Acute Toxicity Test, Sub Acute Toxicity Tests ,Chronic Toxicity Tests

### **Suggested readings:**

1. Text book of veterinary Toxicology by H.S. sandhu ,R.S. Brar
2. Principles of Biochemistry Toxicology by Jone Trimbell
3. Introduction and Toxicology by B.K. Rao
4. Pharmacology and Toxicology by B. K. Rao.

**M.Sc. Semester-111(2019-20)**

**semester III List of Practicals**

**Practical I : extraction and estimation of biomolecules**

**(100 marks)**

1. Extraction and estimation of proteins from plant material.
2. Extraction and estimation of RNA from biological material
3. Extraction and estimation of DNA from biological material
4. Estimation of chlorophyll from plants material.
5. Estimation of carotenoid pigment from plant material.

**Practical II : Enzyme study**

**(100 marks)**

1. Determination of peroxidase activity in plant material.
2. Determination of Nitrate reductase activity in plant material.
3. Determination of GDH activity in plant material.
4. Effect of enzymes concentration on enzyme activity.
5. Effect of substrate concentration on enzyme activity.
6. Effect of temperature on enzyme activity.
7. Effect of PH on enzyme activity

**M.Sc. III sem**

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

<b>Enzymology (PAPER I)</b>	<p>The study of enzymology gives the knowledge about the structure, function, mechanism of action and regulation of enzyme actions.</p> <p>Study of enzymes is significant because the enzymes are most required molecules for metabolic processes. Enzymology is the study of enzymes, which are molecules acting as biocatalysts means increases the rate of biochemical reactions.</p>
<b>Metabolism I (PAPER II)</b>	<p>In this paper the main chemical processes occurring within the body are studied. The paper includes information right from intake of diet till its utilization by body for energy production and other functions. Metabolism is the degradation and synthesis of various biomolecules inside the body. The metabolism reaction occurs in each and every cell of body.</p>
<b>Plant biochemistry (PAPER III)</b>	<p>Plant biochemistry mainly covers the processes occurring in plants such as photosynthesis, respiration, nutrition and plant hormones. It also includes tropism, photoperiodism, germination and dormancy, stomata function and transportation. Plant biochemistry is the branch of botany dealing with the study of internal processes of plants. It rely on the morphology and anatomy of plants.</p>
<b>Biotechnology (PAPER IV)</b>	<p>Biotechnology applies the knowledge of biology to enhance and improve the environment, health and food supply. Using biotechnology we can develop environment friendly alternatives to fossil fuel and plastics, new medicines, vaccines and disease diagnostic tools and higher yielding and more nutrient rich crop plants. Biotechnology isa branch of biology that uses techniques and living organisms for substances from those organisms to make or modify a product, to improve plants or animals or to develop microorganism for specific uses.</p>