

Semester III

# M.Sc. Biochemistry III sem.

- Paper 1. Enzymology (85+15 marks)
- Paper 2. Metabolism I (85+15 marks)
- Paper 3. Plant Biochemistry (85+15 marks)
- Paper 4. Biotechnology (85+15 marks)
- Practical (100 marks)

Semester IV

- Paper 1. Molecular Biology (85+15 marks)
- Paper 2. Metabolism II (85+15 marks)
- Paper 3. Immunology (85+15 marks)
- Paper 4. Clinical Biochemistry (85+15 marks)
- Practical (100 marks)
- Project (50 Internal= 50 External=100 marks)

Passing marks 28/85 in theory, for CCE 05/15 and for Practical 17/50

*R. D. Prade*  
*M. S. Bhatnagar*

### List of Practicals Semester II:

1. Estimation of reducing sugars by Nelson Somogyi Method.
2. Estimation of maltose by DNS Method.
3. Estimation of creatinine, chloride and inorganic phosphate in urine sample.
4. Estimation of ascorbic acid and riboflavin.
5. Estimation of methionine, tyrosine and tryptophan.
6. RBC and WBC Count, Hb estimation and blood group determination.
7. Cultivation, isolation and staining of microorganisms.
8. Determination of iodine value and saponification number of fats.

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

#### Paper I. Enzymology

##### 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.

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*M. Anwar* *Ra*

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*98/17/2017*

## Paper 2. Metabolism I

### 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. ETC, Inhibitors and uncouplers of ETC.

### Unit II

Carbohydrates : glycogenesis and glycogenolysis, glycogen storage diseases glycolysis and gluconeogenesis, Cori's cycle,

### Unit III

Pyruvate dehydrogenase complex, Krebs-cycle, glyoxalate pathway, pentose phosphate pathway and uronic acid pathway.  
Regulation of carbohydrate metabolism.

### Unit IV

Lipids. Oxidation of fatty acids- mitochondrial  $\beta$ -oxidation,  $\alpha$ - and  $\omega$ -oxidation, oxidation of unsaturated and odd-chain fatty acids, ketone bodies.  
Biosynthesis of fatty acids, desaturases.

### Unit V

Phospholipids and glycosphingolipids- synthesis and degradation, lipid storage diseases.  
Salient features of the metabolism, cholesterol and bile acids.  
Regulation of lipid metabolism.

## Paper 3. Plant Biochemistry

### Unit I

Structure of chloroplast, Photosynthesis, dissipation of excitation energy by chlorophyll, Photosynthetic electron transport chain. Thylakoid membrane protein complexes - PS I, PS II, LHC II, Cyt  $b_6/f$ , ATP synthase complexes, cyclic photophosphorylation.

### 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.

*R. Indre*  
*M. Jain* *Re*

*R. Indre*  
4/8/17/2017

#### 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.

### Paper 4. Biotechnology

#### 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).

#### 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.

*R.P. Indre*  
*Ashwin* *SR*

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*28/7/2017*

### Semester III

#### List of Practicals

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 phosphate in serum.
5. Estimation of creatinine in serum.
6. Estimation of calcium in serum.

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

#### Paper 1. Molecular Biology

##### Unit I

Concept and definition of the gene, complexity of the eukaryotic gene. Structural organization of the DNA in the nuclear material- General properties of histones, nucleosomes and solenoid structure.

##### Unit II

DNA synthesis: The enzymes of DNA replication in prokaryotes and eukaryotes, mechanism of replication in bacteria and viruses, reverse transcriptase, salient features of eukaryotic nuclear and mitochondrial DNA replication.

##### Unit III

RNA synthesis: The enzymes of transcription in prokaryotes and eukaryotes, mechanism of transcription in bacteria, heteronuclear RNA, post transcriptional processing of RNA, role of ribozymes.

##### Unit IV

Protein synthesis: Concept of the genetic code, structure of r-RNA and t-RNA, enzymes of translation in prokaryotes and eukaryotes, mechanism of protein synthesis, post translational processing of proteins.

##### Unit V

Regulation of gene expression in prokaryotes and eukaryotes, structure and mechanism of various operons, such as Lac, Trp and Ara.

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28/7/2017

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