

# M. Sc. Previous Biotechnology Exam – 2017-18

## Paper -I Enzyme Technology

### SEMESTER-I

**Min. Pass Marks: 36**

**Duration: 3 Hours**

**Max. Marks: 100**

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

#### **Unit- I**

Biochemical evolution: Chemogeny, Biogeny and evolution of chromosome. Organization and genetic regulatory mechanism, time factor in evolution. Evolution of enzyme systems.

#### **Unit- II**

Enzymes:- Classification. Nomenclature and general properties of enzymes. Effects of substrate, temperature, ph and inhibitors of enzyme activity. Enzyme isolation, purification and large scale Production.

#### **Unit- III**

Mechanism of enzyme action and regulation: Active and regulatory sites, chemical modification. General mechanistic principles, feedback inhibition. Isozymes, enzyme activation, zymogens, multi-enzymes complexes and multifunctional enzymes.

#### **Unit- IV**

Steady state kinetics: Methods of estimation of rate of enzyme catalysed reaction with special reference to Michaelis-menton kinetics.

#### **Unit-V**

Vitamins, micro and macro nutrients : classification, structure, function, separation and characterization techniques. Catabolism and the generation of chemical energy.

#### **Reference Books:**

1. Biochemistry Ed Lubert Stryer. W.H. Freeman and Company, New York.
2. Principles of Biochemistry. Ed Lehninger, Nelson and Cox. CBS publishers and distributors.
3. Harper's Biochemistry. Ed. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell. Appleton and Lange, Stanford, Connecticut.
4. Textbook of Biochemistry with Clinical Correlations. Ed. Thomas M. Devlin. Wiley-Liss Publishers
5. Principles and techniques of practical biochemistry. Ed Keith Wilson and John Walker. Cambridge University Press.
6. Biochemistry. Ed Donald Voet and Judith G. Voet. John Wiley & sons, Inc

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## SEMESTER-I

### Paper II Biophysics and Bioelectronics-I

**Min. Pass Marks: 36**

**Duration: 3 Hours**

**Max. Marks: 100**

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

#### Unit- I

Bioenergetics: Basic bioenergetics. Cellular bioenergetics, whole body bioenergetics. Entropy. Gibbs free energy. Bioenergetic pathways. Bioenergetics and biocommunication. Control of bioenergetics.

#### Unit- II

Molecular interactions: Molecular interactions of primary importance. Strong and weak interactions. Biomolecular interactions- DNA protein interactions, Elementary account of DNA drug interactions. Molecular interaction forces-intermolecular and intramolecular forces. Attractive and repulsive forces generated within molecules and their overall effect on molecular interactions.

#### Unit- III

Sensory receptors: Common senses. Classification of sense organs- nature, stimulus or location. General properties of sensory receptors. Sense detection. Mechanoreception, Chemoreception, Photoreception, Thermoreception.

#### Unit- IV

Photoreceptors : Types of photoreceptors in plants and animals. Human vision and colour perception. Comparison of human vision and machine vision. Causes and control of vision loss. Eye chip vision sensors and Dobbelle artificial vision system.

Phonoreceptors : Types of Phonoreceptors in animals. Human ear and auditory function. Resonance theory and telephone theory. Cause and control of hearing loss. Hearing aids and their basic components.

#### Unit-V

Biochip: Biochip principle. Micro fluidic chips, silicon chips and biochips, Molecular chips. Bio computers. What is bio computing. Genetic discrimination and bio computing. Sound and image processing with optical bio computers. Future of Bio computers.

#### Reference Books:

- 1.Introduction to Electron Microscopy - S. Wischnitzer.
2. Electron Microscopy in Biology - J.R.Harris (ed.).
- 3.Biophysics by R.N.ROY
4. Biophysics - V. Pattabhi & N. Gautham (Narosa, New Delhi).
- 5.Fundamentals of Molecular Spectroscopy - C.N. Banwell, (Tata-McGraw Hill)
- 6.Biological Spectroscopy- I.D. Cambell & R.A. Durk, (Benjamin Cummings)
7. Physical Biochemistry - D. Freifelder (W.H. Freeman & Co.)
- 8.Physical Biochemistry - K.E. Van Holde (Prentice Hall)
9. Biophysical Chemistry, Vol.II - C.R. Cantor & P.R. Schimmel, (W.H. Freeman &Co.)

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## SEMESTER-I

### Paper III Concept of Microbiology

**Min. Pass Marks: 36**

**Duration: 3 Hours**

**Max. Marks: 100**

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

#### Unit-I

Introduction to microbiology-scope and history, physical and chemical methods of sterilizations. Culture media and methods of their preparation. Ultra structure, broad classification, isolation, cultivation and uses in agriculture, industry and environment of fungi, algae, protozoa, bacteria and prions.

#### Unit-II

Elementary account of most common diseases caused by microorganisms in human (Typhoid, Tuberculosis, Diphtheria, Polio, Hepatitis, Malaria, Amoebiasis), animals (Fowl pox, brucellosis, Rinderpest, Food and mouth disease of cattle and rabies) and plants (citrus canker, TMV, potato mosaic, green ear disease)

#### Unit-III

Role of microbes in carbon, nitrogen, phosphorus and Sulphar cycles in nature and the biochemistry of these conversions.

#### Unit-IV

Viruses: History, classification, phylogeny, chemical and physical characteristics, virus isolation, purification, cultivation and replication, serology and plaque assay.

#### Unit-V

Microscopy: Simple, light and compound microscopes, dark field, fluorescence and electron (SEM and TEM) microscopy-their principles and applications.

#### Reference Books:

1. Microbiology - M.J.Pelczar, E.C.S.Chan & N.R.Kreig (Tata McGraw Hill)
2. General Microbiology - R.Y.Stanier, J.L.Ingraham, M.L.Wheelis & P.R.Painter (McMillan)
3. Microbiology - L.M.Prescott, J.P.Harley & D.A.Klein (Mcgraw Hill)
4. Fundamental Principles of Bacteriology - A.J. Salle (TATA McGRAW-HILL)
5. Virology - R. Dulbecco and H.S.Gensberg
6. Molecular Biology - D. Freifelder (Narosa Publishing House)
7. Microbiology - Schaum Series
8. Immunology - Goldsby-Kindt-Osborne –Kuby, W.H Freeman & Co.
9. Cellular and Molecular Immunology - Abbas-Lichtman-Pober, W.B SAUDERS
10. Immunology - Roitt
11. Immunology and Immunotechnology - A.K Chakraborty, Oxford University Press, 2006

# M. Sc. Previous Biotechnology Exam – 2017-18

## SEMESTER-I

### Paper IV Molecular Biology

**Min. Pass Marks: 36**

**Duration 3 hrs.**

**Max. Marks: 100**

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

#### UNIT- I

Genetic Material: Structure, chemical composition and organization of DNA. DNA super coiling, Different forms of DNA, artificial chromosomes (BAC, YAC, HAC). Repetitive DNA and satellite DNA. Experimental proof of DNA as genetic material.

#### UNIT- II

DNA Replication – Mechanism of Replication, Initiation, Elongation and Termination, Enzymology of Replication.

DNA Repair –Types of DNA damage, Types of DNA repair. Mutation- Types and various Mutagens.

#### UNIT- III

Molecular Genetics - DNA Recombination- Holliday model, Site specific Recombination. Transposons – Transposable Elements, Classification of Transposons, Examples in Eukaryotes.

#### UNIT- IV

Transcription – Mechanism in Prokaryotes and Eukaryotic Post Transcriptional modification, Modifications in RNA - 5'-cap Formation, 3'- end processing and Polyadenylation, Ribozymes. Proteins Synthesis: Mechanism in Prokaryotes – Translation: initiation, elongation, termination.

#### UNIT- V

Gene Regulation – Prokaryotic Gene Regulatory Mechanism; Operon concept: Lac and Trp operons. Gene Regulation in Eukaryotes – Attenuation control, Regulation by DNA Methylation, Transcription Factors, Enhancer Element.

Genetic Code – Salient Features and Wobble Hypothesis, Initiation and Termination Codon.

#### Reference Books:

1. "Molecular Biology of the Gene" by Watson-Baker-Bell-Gann-Levine-Losick, 5 th Edn., Pearson Education
2. "Molecular Biology" by D. Freifelder, Narosa Publishing House, New Delhi
3. "Genome" by T.A. Brown, John Wiley & Sons
4. "Microbial Genetics" by D. Freifelder, Narosa Publishing House, New Delhi
5. "Gene VII" by Lewin Benjamin (Oxford)
6. "Molecular Cell Biology" by J.Darnell, H.Lodhis & D.Baltimore (W.H.Freeman & Co.)
7. "DNA Repair & Mutagenesis" by E.C.Friedberg, G.C.Walker and W. Seide (ASM Publisher)
8. Molecular biotechnology- S.B. Primrose
9. Molecular biotechnology- Glick

# M.Sc. (P) Biotechnology-2017

## SEMESTER-I

### PRACTICALS

**Min. Marks: 72**

**Duration: 10 Hrs. (2 days)**

**Max Marks: 200**

1. pH meter: Buffering capacity of a buffer, indicators. To determine the pKa value and hence the dissociation constant of a given acid by using pH meter.
2. Colorimetry: To determine the association constant of a given indicator colorimetrically and to prepare the buffer solutions in pH range of 2.2 to 8.0.
3. Potentiometry : Redox potential of  $\text{Fe}^{+2}$  and  $\text{Fe}^{+3}$ .
4. Viscometry:
  - (a) Radius determination: Glycerol molecule
  - (b) Molecular weight determination - Proteins and DNA
5. Spectrophotometry: To find out absorption spectrum of given chromophore and /or oxidised and reduced forms (sodium nitrate and borohydrate).
  - (a) Haemoglobin and Methaemoglobin
  - (h) NAD and NADH
6. Double beam and recording spectrophotometry, Derivatives and difference spectra Indicators, cytochromes, haemoglobin.
7. Estimation of protein: Lowry, Biuret and Bradford methods, standard curves, linear regression and assessment of ranges and reliability.
8. Enzyme assays (LDH, beta galactosidase, acid phosphate, arginase, succinic dehydrogenase) Time, Temperature, Protein concentration, cofactors. LDH:  $K_m$  and  $V_{max}$  various kinetic plots: Use of computer packages for parametric and non-parametric methods and non-linear regression.
9. Protein purification: Amonium sulphate, acetone, TCA pptn. dialysis, concentration.
10. Thin layer chromatography: lipids, mixture of dyes.
11. Chlorophyl estimation: spectrum and turbidity correction in chloroplasts.
12. Polyacrylamide gel electrophoresis of proteins.
13. Microscopy: a) simple, compound, phase contrast b) Micrometry: Calibration of stage and. ocular micrometer and measurement of the given biological sample c) Haemocytometer d) Photography and videotaping (motility, morphometry).
14. Subcellular fractionation: a) Isolation: chloroplast, mitochondria, nuclei etc. b) Centrifugation: differential, density gradient (sucrose.  $\text{CsCl}_2$ ), c) Spectrophotometer: absorption spectrum, activity of the fraction of 260/280 ratio etc.