

UNIVERSITY OF MYSORE
DEPARTMENT OF STUDIES IN MOLECULAR BIOLOGY 2017-18

SYLLABUS FOR ENTRANCE EXAMINATION FOR ADMISSION TO M.Sc. IN MOLECULAR BIOLOGY

Unit-I: Buffers and Chemical bonding

Avogadro's number, mole, mole fraction, Molarity, Equivalent weight, Normality, Molality, percentage. Lewis concept of acids and bases. Ionic product of water. pH scale, buffers, Henderson Hasselbach equation, buffer capacity, preparation of acidic and basic buffer solutions. Transition metals, properties (Colour, Oxidation states, Magnetic Properties).

Unit-II: Biomolecules

Nucleic acids. Isolation of DNA and RNA. Composition of DNA. Nucleosides and Nucleotides. Chargaff's rule. Watson and Crick model of DNA. Melting of DNA (T_m). Composition RNA, types (mRNA, tRNA and rRNA), Secondary structures of tRNA – Clover leaf model. Chemical reactions of RNA and DNA with acid and alkali, colour reactions of DNA and RNA. Structure and functions of carbohydrates (Mono-, oligo- and poly saccharides), proteins (primary, secondary and tertiary structure) and amino acids and lipids (neutral, phospho and sphingolipids and cholesterol).

Unit-III: Structures and Chemical reactions

Stereoisomerism, types, Fischer-projection formulae, asymmetric carbon atom, molecular dissymmetry, chirality, optical isomerism example: Glyceraldehydes, Lactic acid and Tartaric acid. Nomenclature of enantiomers. D and L system, R and S system, Racemisation and resolution. Coordinate bond, double and complex salts – differences with examples. Postulates of Werner's theory. Type of ligands, uni, bi and polydentate with examples. Coordination number. Porphyrin nucleus and classification. Important metallo porphyrins occurring in nature structure and their biological importance (Hb, cytochrome, chlorophyll, Vit-B12). Bile pigments chemical nature and their role.

Unit-IV: Techniques

Paper chromatography, TLC, R_f value, column chromatography (gel, ion-exchange and affinity), HPLC, Retention time, FPLC, centrifugation (sub cellular fractionation), micro centrifugation, electrophoresis (agarose, SDS-PAGE), Southern, Northern, Western blotting, ELISA, PCR, colorimeter, spectrophotometer and fluorimeters as analytical tool. Natural and artificial radioactivity. Characteristics of radioactive elements, units of radioactivity, disintegration constant, half life, alpha, beta and gamma radiations. Detection of radioactivity by GM counter. Application of radioisotopes – ^3H , ^{14}C , ^{131}I , ^{60}Co , ^{32}P . Biological effect of radioactivity..

Unit-V: Enzymology

Isolation and purification of enzymes, nomenclature and classification of enzymes, Enzyme kinetics, Factors affecting enzyme activity, Mechanism of enzyme action, Co enzymes and cofactors. Restriction endonucleases, exonucleases, ligases, reverse transcriptase, alkaline phosphatase, and S1 nuclease in recombinant DNA technology.

Unit-VI: Organic reactions and Metabolism

Concept of inductive effects and resonance. Classification of organic reactions. (substitution addition, elimination and rearrangement), with one example for each. Concepts of the following – carbocations, free radicals, carbenes, nucleophiles and electrophiles. Occurrence, structural formula and importance of Furan, Pyrrole, Thiophene, Pyridine, Pyran, Thiazole, Pyrimidine, Purine, Indole, Imidazole, Quinoline and Isoquinoline.

Carbohydrate metabolism- Glycolysis, gluconeogenesis, TCA cycle, Bioenergetics- Electron transport chain and oxidative phosphorylation, Photosynthesis, Amino acid metabolism- Glucogenic and ketogenic amino acids, urea cycle, Lipid metabolism- Beta-oxidation and biosynthesis of fatty acids, Metabolism of nucleotides- Biosynthesis and degradation of purines and pyrimidines

Unit-VII: Cell Biology and Genetics

Structure and functions of Cell organelles, Cell Division and Cell cycle, synaptonemal complex. Fine structure of eukaryotic chromosomes, Polytene and Lampbrush chromosomes. Ultrastructural organization of cell - Structure and Functions of cell organelles. Cell-cell interaction and motility, Special cells- Blood cells, Cancer cells

Genetics- Laws of inheritance, Sex-linked inheritance, Mutation- Chemical, physical and biological mutagens, structure of eukaryotic chromosomes, Chromosomal aberrations, Chromosomal disorders, Genetic recombination in bacteria: Transformation, transduction and conjugation.

Unit-VIII: Physiology and Cell Culture

Neurotransmission, Muscle contraction, composition of bone and body fluids, acid base balance, digestion, excretory, endocrine and circulation systems, Principles of tissue culture, Organ culture, Micropropagation in plants, Somatic embryogenesis, Suspension culture, Protoplast culture and fusion Animal Cell Culture - laboratory facilities, chemically defined media, Primary culture, cell lines and cloning, somatic cell fusion.

Unit-IX: Molecular Biology and Genetic Engineering

DNA as genetic material, replication of DNA in prokaryotes, gene concept- promoter, introns and exons, *lac* operon, Transcription of prokaryotic genes, genetic code, translation Genetic engineering- Restriction endonucleases, Taq DNA polymerase, Gene cloning vectors- plasmids, Recombinant DNA technology, isolation of mRNA, preparation of cDNA, gene and cDNA library, Genetic engineering techniques, DNA sequencing.

Unit-X: Immunology and Microbiology

Types of immunity, Antigens, Antibodies, Immunization, T-cells, B-cells, Immune disorders, Hypersensitivity, Immunotechniques, immunodiffusion, Vaccine production. Monoclonal antibodies, transplantation, autoimmune disorders. Basic microbiological techniques, structure, classification and reproduction of bacteria, virus and fungi, Microbial nutrition and growth, antimicrobial agents, Biological nitrogen fixation,

Eligibility for admission:

1. Students of Bachelors of Science degree from any UGC recognized Universities with life science subjects are eligible including professional degrees such as Pharmacy, Dental, Agricultural, Medical, Veterinary, Engineering with Life Science subjects.
2. The candidate shall have obtained a minimum of 45% (40% in case of SC/ST and Category I candidates) of marks in life science subjects put together from all the years of the examination of the course.
3. In case a candidate has taken longer than prescribed duration to pass the qualifying course, a deduction of 3% from the percentage of the aggregate of marks of cognate/optional subjects for every additional year shall be applied and the candidate should have obtained the minimum marks prescribed even after such deduction to become eligible for admission.
4. The candidate seeking admission to M.Sc. Molecular Biology shall have to appear for Entrance examination.
5. The date of the Entrance Examination will be given in the prospectus, and also notified in the Department Notice board and in the university web site.
6. The Entrance Examination shall be of 1 hr duration with 50 multiple choice questions of 1 mark each for a maximum of 50 marks.
7. The syllabus for the Entrance examination will be uploaded in the University web site.
8. The results of the Entrance examination will be announced in the Department Notice board and also in the University web site.
9. There shall be no provision for revaluation with respect to Entrance examination.
10. Entrance examination fee has to be paid through Demand Draft.
11. Fees paid for the Entrance examination is not refundable.
12. Marks list will be prepared by taking 50% of B.Sc. life science subjects and 50% marks obtained from the Entrance examination.

13. The candidates list – selection list/waiting list will be announced in the Department Notice board and also in the University web site.

14. Separate intimation will not be sent to the candidates.

15. Students from Foreign National degree will apply through equivalence committee.