# UNIVERSITY OF KASHMIR, SRINAGAR

## Syllabus for Entrance test for Admission to M.Sc Biotechnology program -2020

Note – The following syllabus prescribed for the entrance test is comprised of fifteen units. Each unit carries a weightage of four marks. Paper setters are required to set four multiple type questions with only one correct or most appropriate answer from each unit giving uniform representation to the whole syllabus.

**Unit-I**

General science: Structure and properties of Water, ion product of water. pH, pK and pI, Buffers, concentration units in biological solutions. Acid- base equilibrium, Dissociation and Association Constants, Solubility and Criteria for Solubility, Hydrophobicity and Hydrophilicity. Laws of Thermodynamics. Concept of heat of reaction, enthalpy, entropy and Free energy, Phosphoryl transfer potential, Concept of Chemical bonding, Electron Displacements, Dipole-Dipole interactions, hydrogen bond, Vander-waal`s forces, hydrophobic and hydrophilic interactions,

**Unit-II**

Biomolecules: Carbohydrates, Lipids, Proteins, Vitamins and Nucleic acids – Types, structure and function

**Unit-III**

Enzymology: History, general characteristics, nomenclature and classification of enzymes, enzyme activity and factors affecting enzyme activity, Types of reversible inhibitions, Allosteric regulation of enzyme activity.

**Unit-IV**

Cell biology: Prokaryotic and Eukaryotic cell - Structure and Function of: Plasma Membrane, Nucleus, Endoplasmic Reticulum, Mitochondria, Golgi Apparatus, Ribosomes, peroxisomes, Lysosomes, Chloroplast. Membrane proteins and types of membrane transport.

**Unit-V**

Metabolism: Carbohydrate, Lipids, Amino Acids and Nucleotide turn over and regulation,. Glycolysis, TCA cycle, Urea Cycle, Gluconeogenesis, Glyoxalate cycle and Pentose Phosphate Pathway.

**Unit-VI**

Biological oxidations: Oxidation-reduction potentials, Electron acceptors and donors in plants and animals. ATP synthesis – oxidative and photo-phosphorylation.

**Unit-VII**

Molecular Biology: Prokaryotic and Eukaryotic Replication, Transcription, Translation-Mechanism and their regulation. DNA repair systems – Direct Repair, Excision Repair, Mismatch repair and Recombination Repair. Post transcriptional and translational modifications.

**Unit-VIII**

Concept of Recombinant DNA Technology, Cloning Vectors: Plasmids, Bacteriophages, Cosmids, Phagemids, YACs, Restriction enzymes, Ligases, Phosphataes, T4 Polynucleotide kinase, DNA Pol I and Klenow fragment. Selection marker genes of bacterial and yeast vectors.

**Unit-IX**

Immunology: innate and adaptive immunity, Antigen and Super antigens. Structure and function of immunoglobulins, MHC, T-cells and B-cells, Inflammation, cytokines, organization and structure of lymphoid organs, mechanism of cell mediated and humoral immune response, complement system, Monoclonal antibodies.

**Unit-X**

Bio-Techniques: Chromatography, Centrifugation, Electrophoresis, Spectrophotometry, Blotting and radioactive techniques. PCR. Immunotechniques- RIA, ELISA, Immunodiffusion, Immunoelectrophoersis.

**Unit-XI**

Genetics: Mendelian laws of inheritance, linkage and crossing over, gene mapping, theories of mutation and evolution, genetic disorders.

**Unit-XII**

Plant tissue culture - Plant cell totipotency, role of micro and macro nutrients, vitamins & hormones in plant tissue culture. Initiation & maintenance of callus, suspension, shoot tip culture. Haploids :production & applications. Cybrids, Somatic embryogenesis, Cryopresevation. Gene Transfer in Plants using Agrobacterium tumefaciens, features of Ti plasmid, role of virulent proteins in T-DNA transfer, Binary vectors, vector less gene transfer. General Concept of Transgenic Plants, Golden Rice, Bt Cotton. Issues with genetically modified plant.

**Unit-XIII**

Microbiology: Structure and organization of microbial cells. Bacterial cell wall structure and biosynthesis, structure and function of outer membrane flagella. Kinetics and growth of Microbial cell, Gene transfer in bacteria; Transformation, Transduction and Conjugation. Antimicrobial agents, Drug resistance. Structure & classification of Viruses. Life cycle of lamda phage.

**Unit-XIV**

Sample, Population, Sampling techniques. Mean, Median, Mode and Standard Deviation. Frequency Distribution, Standard error of Mean (SEM), p-Value, Student t- Test (Paired and Unpaired), Chi square Test; Representation of Data (Histogram, Bar Chart, Pie chart, Frequency curve).

**Unit-XV**

Animal cell culture- Primary and secondary cell line cultures, cancer cell lines, suspension and adherent monolayer culture, basic techniques of cell culture

Bioreactors: design and types, bioprocess technology, immobilization of enzymes, industrial applications of enzymes.