

M.Sc. Bioresources 2018

Note: The syllabus prescribed for the entrance test has been divided into fifteen units. Each unit carries a Weightage of four marks. Paper setters are required to set four multiple choice type questions with only one correct or most appropriate answer separately for each unit, giving uniform representation to the whole syllabus contained therein.

Unit

1. The chemistry of life from inorganic perspective: Atoms, molecules and chemical bonding. Chemical reactions and the concept of equilibrium, the laws of thermodynamics, free energy, enthalpy, entropy, principles of bioenergetics, redox reactions, redox potential, ATP as a biological currency. Importance of water to plant and animal life, physical properties of water (structure of water, water as a solvent, the hydrophobic effect, osmosis, imbibition, diffusion). Chemical properties of water (ionization of water, acid base chemistry, buffers).
2. Discovery and nomenclature of enzymes, characteristics of enzymes, concept of holozymes, apoenzymes, coenzymes and cofactors, mechanism of enzyme action. Levels of structure in protein architecture (primary, secondary, tertiary and quaternary). Denaturation and renaturation of proteins. Classification of proteins based on solubility, shape and functions. Amino acid structure (general properties, peptide bonds, classification, acid base properties, and stereochemistry).
3. Nomenclature, structure and properties of saturated and unsaturated fatty acids. Structure and biological functions of triacylglycerols, biosynthesis and degradation of saturated fatty acids (β -oxidation). Structure, Occurrence and biological importance of monosaccharides, oligosaccharides, polysaccharides and glycoproteins (glucose, sucrose, starch, glycogen, chitin, proteoglycans, peptidoglycans). Configuration and conformation of monosaccharides (elementary idea).
4. Structure and functions of cell wall, plasma membrane, golgi apparatus, endoplasmic reticulum, chloroplast, mitochondria, ribosomes, and central vacuole, Fluid mosaic model of plasma membrane, ultrastructure of nuclear membrane. Morphology of chromosomes, centromere and telomere; secondary constriction and satellite chromosomes, nucleolus, organization of chromosomes with special reference to nucleosome model; mitosis and meiosis; chromosome alterations, origin, meiotic behaviour and genetic consequences of deletions, duplications inversions and translocations, transposable elements (maize and *Drosophila*).
5. Mendel's laws of inheritance, allelic and non-allelic interactions; dominance, incomplete dominance, codominance, independent assortment; epistasis (13:3, 12:3:1), duplicate (15:1) and complementary (9:7) genes with suitable examples. Structure and functions of nucleotides and nucleic acids, structure and forms of DNA (A, B and Z), Satellite and repetitive DNA; structure and functions of mitochondrial and plastid DNA; structure and functions of plasmids. DNA damage and repair.

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6. Mechanism of DNA replication, major enzymes involved in replication and their roles. Concept and structure of genes, gene expression and its regulation, lac operon (operon model), transcription and its mechanism, role of enzymatic machinery involved in transcription. Translation- concept of genetic code, structure and functions of rRNA, tRNA, mRNA in translation and activation of amino acids, mechanism of translation (initiation, elongation and termination); tools and techniques of recombinant DNA technology.
7. General concept of viruses, lytic and lysogenic cycles in viruses, infectious particles smaller than viruses (viriods, prions). Characteristics of bacteria, bacterial classification, growth and reproduction, archaeobacteria and eubacteria, bacterial genome, bacteria as a source of antibiotics.
8. Principles and applications of paper, thin layer and gas liquid chromatography, gel electrophoresis and ultracentrifugation. Use of spectroscopy and radioisotopy in biology (elementary idea). Photosynthetic pigments, absorption and action spectra, phosphorescence, fluorescence, enhancement effect, concept of two photosystems, Z-scheme, photophosphorylation, C₃, C₄ and CAM pathways. Aerobic and anaerobic respiration, glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation (chemi-osmotic mechanism).
9. Homeostasis and control systems, negative and positive feedback, regulation of temperature; biological clocks and their effects. Physiological effects of auxins, gibberellins, cytokinins, abscisic acid and ethylene. Sources and effects of vertebrate hormones (pituitary glands, adrenal glands, pancreatic islets, thyroid glands, parathyroid glands, pineal gland, thymus gland, gonads).
10. Plant and animal tissues, types of plant tissues (meristems, simple and complex tissues), types of animal tissues (epithelial, connective, muscle and nervous tissues). Growth, differentiation and morphogenesis; phases of growth, physiology of dormancy, photomorphogenesis, discovery and role of phytochrome and cryptochrome.
11. Morphological, anatomical and physiological adaptation of plants and animals to water temperature and light. Population ecology, primary and secondary characters of population, regulation, inter and intra population interaction. Ecosystem structure, biotic and abiotic components, food chains, food webs, ecological pyramids, energy flow, biogeochemical cycles of carbon and nitrogen.
12. Biological classification (artificial, natural and phylogenetic approaches), taxonomic categories, species concept, binomial nomenclature, taxonomic keys. Theories of evolution (Lamarckism and Darwinism); variation (concept and types); microevolution (mutations, genetic drift, and inbreeding); natural selection and adaptation; speciation (allopatric and sympatric); process of fossilization and the origin of various life forms; biogeography and continental drift.

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13. Identification of edible and poisonous mushrooms, scope and future of mushroom industry in J&K state. Requirements for artificial mushroom cultivation, raw material and equipment for mushroom farming, morphology, economic importance, nutritional value and life cycle of *Agaricus bisporus* and *Pleurotus* spp. Methods of fruit and vegetable preservation. Economic importance of insects (medicinal and agriculture), economic importance of molluscs; Aquaculture (carp and trout culture; Sericulture (rearing and diseases; Apiculture (Bee keeping methods and diseases).
14. Biodiversity and Conservation: Concept of biodiversity, (components and levels); values of biodiversity; loss of biodiversity; conservation strategies (*in-situ* and *ex-situ*); concept of sustainable development. Morphology, cultivation and economic importance of Rice, Wheat and Maize; rosaceous fruits of Kashmir (apple, cherry, almond); extraction and processing of mustard; distribution status, cultivation, part used and medicinal importance of *Podophyllum*, *Atropa* and *Artemisia*.
15. Human impact on Biosphere: causes and consequences of air, water and land pollution, global warming, green house effect, ozone depletion, deforestation, non renewable energy resources (fossil fuels, coal and petroleum). alternate energy sources.

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