

## M.SC BIOREOURCES

### P. G. ENTRANCE TEST SYLLABUS - 2020

**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.

1. Chemical bonding, types and bond strength, laws of thermodynamics, concept of equilibrium, , free energy, enthalpy, entropy, principles of bioenergetics, redox reactions, redox potential, ATP as a biological currency. Importance of water to 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, concept of pH, buffers).
2. 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. Organization of genetic material with special reference to nucleosome model. Cell cycle, mitosis and meiosis.
3. 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), Numerical changes in chromosomes (aneuploidy and euploidy), structural changes in chromosome, deletions, duplications, inversions and translocations.
4. Plant and animal reproduction: Development of anther and pollen, structure and types of ovule and embryo sac, types of pollination, double fertilization, structure of endosperm, dicot and monocot embryo, polyembryony and apomixes. Gametogenesis and fertilization in mammals, types and patterns of cleavage, blastulation and gastrulation, extra embryonic membranes, types of placentation.

5. Photosynthesis, pigments, photosystem I and II, enhancement effect, electron transport chain, photophosphorylation, C<sub>3</sub>, C<sub>4</sub> and CAM pathways, photorespiration. Aerobic and anaerobic respiration, glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation (chemi-osmotic mechanism), gluconeogenesis, glycogenolysis, glycogenesis, biological nitrogen fixation, urea cycle.
6. Nomenclature, structure and properties of saturated and unsaturated fatty acids. Degradation of saturated fatty acids ( $\beta$ -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).
7. Enzymes, classification and nomenclature, concept of holozymes, apoenzymes, coenzymes and cofactors, mechanism of enzyme action. Levels of structure in protein architecture (primary, secondary, tertiary and quaternary). Classification of proteins based on solubility and shape. Amino acid structure (classification, acid base properties, and stereochemistry).
8. DNA replication, mechanism, major enzymes involved in replication and their roles. Gene expression- 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, mechanism of translation (initiation, elongation and termination). Gene regulation, lac operon (operon model), structure of mitochondrial and plastid DNA; structure and functions of plasmids.
9. Innate and acquired immunity, cell and organs of the immune system, Concept of immunoglobins and antigens, concept of vaccines. Viruses, types, structure of viruses (TMV), lytic and lysogenic cycles in viruses, viroids, prions. Bacterial classification, growth and reproduction; archaebacteria and eubacteria, bacterial genome, bacteria as a source of antibiotics.
10. Homeostasis and control systems: Biological clocks and their effects. Physiological effects of auxins, gibberellins, cytokinins, abscisic acid and ethylene, dormancy, photomorphogenesis. Sources and effects of vertebrate hormones (pituitary glands, adrenal glands, pancreatic Islets, thyroid glands, parathyroid glands, pineal gland, thymes gland, gonads).

11. Centres of origin of agriculture (Vavilov's work); morphology and origin of Rice and Wheat; medicinal importance of *Saussurea costus*, *Arnebia benthamii* and *papaver somniferum*. Aquaculture (carp and trout culture), Economic importance of insects - sericulture (rearing and diseases), apiculture (Bee keeping methods and diseases).
12. Concept of biodiversity, (components and levels); values of biodiversity; loss of biodiversity, biological hotspots, conservation strategies (in-situ and ex-situ); Biological classification (artificial, natural and phylogenetic approaches), taxonomic categories, species concept, binomial nomenclature, taxonomic keys, primary and secondary characters of population, inter and intra population interaction. Ecosystem, biotic and abiotic components, food chains, food webs, ecological pyramids, energy flow.
13. Theories of evolution (Lamarckism and Darwinism); variation (concept and types); microevolution (mutations and genetic drift); natural selection and adaptation; speciation (allopatric and sympatric); biogeography and continental drift, Evolution of horse and man.
14. Man and Biosphere: Biogeochemical cycles of carbon and nitrogen, causes and consequences of air, water and land pollution, global warming, green house effect, ozone depletion, Acid rain.
15. Principles and applications of paper, thin layer and gas liquid chromatography, principle and working of spectrophotometry, gel electrophoresis and ultracentrifugation. Recombinant DNA technology, restriction enzymes, types of vectors, transformation techniques (calcium chloride method and electroporation), *Agrobacterium* mediated gene transfer. Polymerase chain reaction, GMO's (mice, cattle, BT cotton and tomatoe).