



DEPARTMENT OF BIORESOURCES

School of Biological Sciences

University of Kashmir, Hazratbal, Srinagar-190006

NAAC Accredited Grade A⁺

P. G. ENTRANCE TEST SYLLABUS- 2023

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.

The syllabus has been redrafted and is based on syllabi of core courses of Bioresources and Allied subjects taught at UG level as per CBCS Scheme.:

- 1. Biodiversity and Bioresource:** Concept of biodiversity, components and levels of biodiversity; loss of biodiversity and extinction, biological hotspots, types of biomes, conservation strategies (in-situ and ex-situ), IUCN threat categories; Basic taxonomic categories, species concept, binomial nomenclature; Ecosystem, biotic and abiotic components, food chains, food webs, ecological pyramids, energy flow, ecological succession.
- 2. Plant Resources:** Centres of origin of agriculture (Vavilov's work); Morphology and origin of Rice and Maize; Morphology and medicinal importance of *Arnebia benthamii*, *Atropa acuminata*, *Saussurea costus*, and *Rheum emodi*; Morphology and importance of wild vegetables—*Taraxacum officinale*, *Cichorium intybus*, *Malva sylvestris*; Surface and bast fibres (cotton and jute).
- 3. Animal Resources:** History of domestication; Important methods of selection and systems of breeding in farm animals, applications of inbreeding and out-breeding; Genetic basis of heterosis and its use; High milk yielding breeds of cattle; Aquaculture (carp and trout culture), Economic importance of insects - sericulture (rearing and diseases), apiculture (Bee keeping methods and diseases).
- 4. Microbial Resources:** Viruses, types, structure of viruses (TMV), lytic and lysogenic cycles in viruses, virioids, prions; Bacterial growth and reproduction, archaeobacteria and eubacteria; Microbes in production of alcohol, cheese and bread, bacteria as a source of antibiotics, microbial cells as food (single cell proteins), antibiotics from fungi, edible mushrooms—*Agaricus* and *Morchilla* (Life cycle).
- 5. Chemical Basis of Life:** 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).

6. **Cell Structure:** 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.

7. **Reproductive Biology:** Plant and animal reproduction: Development of anther and pollen, structure and types of ovule and embryosacs, 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.

8. **Hormonal regulation and Immune system:** Physiological effects of auxins, gibberellins, cytokinins, abscisic acid and ethylene, dormancy, photo-morphogenesis; Sources and effects of vertebrate hormones (pituitary glands, adrenal glands, thyroid glands, parathyroid glands, pineal gland, thymes gland, gonads); Innate and acquired immunity, cells and organs of the immune system, concept of immunoglobins and antigens.

9. **Basic Metabolic Processes:** Photosynthesis, pigments, photosystem I and II, enhancement effect, electron transport chain, photophosphorylation, C₃, C₄ and CAM pathways, and photorespiration. Aerobic and anaerobic respiration, glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation (chemi-osmotic mechanism), Degradation of saturated fatty acids (β -oxidation); biological nitrogen fixation, urea cycle.

10. **Carbohydrates and Lipids:** 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); Nomenclature and classification of lipids; structure and properties of saturated and unsaturated fatty acids; Functions of lipids. Stored foods in plants and animals.

11. **Proteins and Enzymes:** 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).

12. **Inheritance and Variation:** 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.

13. **Genetic material and Gene regulation:** 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).

14. **Environment and Energy:** Biogeochemical cycles of carbon and nitrogen; Causes and consequences of air, water and soil pollution; Global warming, Green house effect; Ozone depletion; Acid rain. Renewable energy— Biogas production, Energy plantation (Jatropha & Jojoba).

15. **Bio-techniques and Biotechnology:** 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, structure and functions of plasmids, types of vectors, transformation techniques (calcium chloride method and electroporation), Agrobacterium mediated gene transfer. Polymerase chain reaction, GMO's (mice, cattle, BT cotton and tomato).