

IASE Deemed University
Gandhi Vidya Mandir, Sardarshahr
Combined Entrance Test for M.Phil./Ph.D. : 2012-13

Duration: 2 Hours

Written test:

Max. Marks : 300

Viva-Voce:

Max. Marks : 30

SYLLABUS

The question paper will contain 100 Multiple Choice Questions of 3 marks each. Answers will be made on OMR sheet. Question papers in Science subjects will be in English and rest, other than those of languages, will be both in English and Hindi.

Botany

1. MOLECULES AND THEIR INTERACTION RELAVENT TO BIOLOGY

- A. Structure of atoms, molecules and chemical bonds.
- B. Composition, structure function of biomolecules (carbohydrates, lipids, protein, nucleic acids and vitamins)
- C. Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties)
- D. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
- E. Confirmation of nucleic acids (A-, B-, Z-DNA), t-RNA, micro-RNA)
- F. Stability of protein and nucleic acid structures.
- G. Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

2. CELLULAR ORGANISATIONS

- A. **Membrane structure and function** : Structure of model membrane, lipid bilayer and membrane, protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membrane.
- B. **Structural organization and function of intracellular organelles**: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, active transport reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure and function of cytoskeleton and its role in motility.
- C. **Organisation of genes and chromosomes**: Operon, interrupted genes, gene families, structure of chromatin and chromosome, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
- D. **Cell division and cell cycle**: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

3. SYSTEM PHYSIOLOGY- PLANT

- A. **Photosynthesis**: Light harvesting complexes; mechanisms of electron transport photoprotective mechanisms: CO₂ fixation-C₃, C₄ and CAM pathways.
- B. **Respiration and photorespiration**: Citric acid cycle, plant mitochondrial electron transport and ATP synthesis, alternative oxidase: photorespiratory pathway.

- C. Nitrogen metabolism:** Nitrate and ammonium assimilation: amino acid biosynthesis.
- D. Plant hormones:** Biosynthesis, storage, breakdown and transport: physiological effects and mechanism of action.
- E. Sensory photobiology:** Structure, function and mechanisms of action of Phytochromes. Cryptochromes and phototropins: stomatal movement: photoperiodism and biological clocks.
- F. Solute transport and photassimilate translocation:** uptake, transport and translocation of water, ions, solutes and macromolecules from soil through cells, across membranes, through xylem and phloem, transpiration mechanisms of loading and unloading of photoassimilates.
- G. Secondary metabolites:** biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.
- H. Stress physiology:** responses of plants to biotic (pathogen and insects) and abiotic (water temperature and salt) stresses: mechanisms of resistance to biotic stress and tolerance to abiotic stress.

4. SYSTEM PHYSIOLOGY- ANIMAL

- A. Blood and circulation:** Blood corpuscles, haemopoiesis and formed elements plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.
- B. Cardiovascular System:** Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG- its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.
- C. Respiratory system:** Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.
- D. Nervous System:** Neurons, action potential, gross neuroanatomy of the brain and spinal cord. Central and peripheral nervous system, nervous control of muscle tone and posture.
- E. Sense Organs:** Vision, hearing and tactile response.
- F. Excretory System:** Comparative physiology of excretion, kidney, urine formation urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.
- G. Thermoregulation:** Comfort zone, body temperature, physical, chemical, neural regulation, acclimatization.
- H. Stress and adaptation**
- I. Digestive System:** digestion, absorption, energy balance, BMR
- J. Endocrinology and reproduction :** Endocrine glands, basic mechanism of hormone action, hormone and disease, reproductive processes, neuroendocrine regulation.

5. INHERITANCE BIOLOGY

- A. Mendelian principles:** Dominance, segregation, independent assortment, deviation from Mendelian inheritance.
- B. Concept of gene:** Allele, multiple alleles, pseudoallele, complementation tests.
- C. Gene mapping methods:** Linkage maps, tetrad analysis, mapping with molecular markers,

mapping by using somatic cell hybrids, development of mapping population in plants.

- D. **Extra chromosomal inheritance:** Inheritance of mitochondrial and chloroplast genes, maternal inheritance.
- E. **Microbial genetics:** Methods of genetic transfers- transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.
- F. **Human genetics:** Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorder.
- G. **Mutation:** Types, causes and detection, mutant types- lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants, insertional mutagenesis.
- H. **Structural and numerical alternations of chromosome:** Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
- I. **Recombination:** Homologous and non-homologous recombination, including transposition, site-specific recombination.

6. ECOLOGY PRINCIPLES

- A. **The Environment:** Physical environment: biotic and abiotic interactions.
- B. **Habitat and niche:** Concept of habitat and niche, niche width and overlap, fundamental and realized niche: resource partitioning: character displacement.
- C. **Population ecology:** Characteristics of a population, population growth curves, population regulation: life history strategies (r and k selection): concept of metapopulation – demes and dispersal, interdemographic extinctions, age structured populations.
- D. **Species interactions:** Types of interactions, interspecific competition, herbivory, carnivory, pollination symbiosis.
- E. **Community ecology:** Nature of communities: community structure and attributes: levels of species diversity and its measurement: edges and ecotones.
- F. **Ecology succession:** Types, mechanisms, changes, involved in succession: concept of succession.
- G. **Ecosystem:** Structure and function: energy flow and mineral cycling (CNP): primary production and decomposition: structure and function of some Indian Ecosystem terrestrial (forest, grassland) and aquatic (freshwater, marine, estuarine).
- H. **Biogeography:** Major terrestrial biomes: theory of island biogeography: biogeographical zone of India.
- I. **Applied Ecology:** Environmental pollution, global environmental change, biodiversity- status, monitoring and documentation: major drivers of biodiversity change, biodiversity management approaches.
- J. **Conservation biology:** Principles of conservation, major approaches to management, Indian case studies on conservation management strategy (Project Tiger Biosphere reserves).

7. Applied Biology:

- A. Microbial fermentation and production of small and macro molecules.
- B. Application of immunological principles (vaccines, diagnostics). Tissue and cell culture methods for plants and animals.
- C. Transgenic animal and plants, molecular approaches to diagnosis and strain identification.

D. Biosource and uses of biodiversity.

E. Biosensors.

8. Methods in Biology

A. Molecular biology and recombinant DNA methods: Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods, analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, isoelectric focusing gel: molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems: expression of recombinant proteins using bacterial, animal and plant vectors: isolation of specific nucleic acid sequences: generation of genomic and cDNA libraries in plasmids, phage, cosmid, BAC and YAC vectors

B. Embryology: Elementary Knowledge

C. Economic Botany: Elementary Knowledge

D. Medicinal Plants : General plants of local plants of medical importance along with ocimum, commiphora, m convolvulus, centella, chorophytum, perpever Aloe etc.

E. Algae in diversified habitats(terrestrial, fresh water, marine) salient features of proto chlorophyta, chlorophyta, charophyta, xanthophyta, Bacillareophyta, Phacophyta and Rhodophyta. Alegal blooms, Alegal biofertilizers, algae as food, feed and uses in industry.

F. Etiology and control of the following crop diseases-

- Paddy-Bacterial and leaf blight.

-Wheat- Tundu disease.

-Bajra- Ergot.

-Sugar Cane- Redrot

-Groundnut- Tikka disease