

**SYLLABUS FOR COMPUTER BASED RECRUITMENT TEST (CBRT)**  
**FOR THE POST OF ASSISTANT PROFESSOR IN GOVERNMENT COLLEGE**  
**(BOTANY)**  
**UNDER**  
**DIRECTORATE OF HIGHER EDUCATION**  
**(Advt No. 05 Year 2020 and 06 Year 2022)**

**I. General English including Grammar - 05 marks**

**II. General Knowledge, Current Affairs and Events of National and International Importance - 10 marks**

**III. Logical Reasoning and Analytical Ability - 10 marks**

**IV. Core: - 50 marks**

**Plant Physiology**

- Nitrogen metabolism: Nitrogen nutrition, organic nitrogen, nitrogen fixation in legumes, nitrate and ammonia assimilation: Sulfur metabolism and amino acid synthesis. Inter relationship between photosynthesis, respiration and nitrogen metabolism.
- Photosynthesis: Light reaction: Radiant energy, photosynthetic apparatus, pigments and their biosynthesis; light harvesting complex; light absorption and composition and characteristics of two photosystems, photosynthetic electron transport, Mehler reaction,
- Dark reaction: Carbon dioxide fixation in C<sub>3</sub>, C<sub>4</sub> and CAM plants
- Respiration: Aerobic and anaerobic respiration;
- Enzymes: Structure and classification; mechanism of action; allosteric enzymes, isozymes, co-enzymes and vitamins;
- Phytohormones: their synthesis, distribution; and physiological effects. Molecular mechanism of action.

**Plant Molecular Biology Syllabus:**

- DNA: Structure of nucleotides, Bonding, double helix and other helices. Factors affecting DNA structure.
- Molecular Biology of DNA Replication: Enzymes involved in replication, DNA replication is semi-conservative, Meselson-Stahl expt., a Primosome complex,
- 4. Transcriptions: Enzymes in transcriptions; Basic features of transcription, Initiation elongation and termination, promoters and enhancers;
- Regulation of Gene Expression: I, expression of lac operon,
- RNA Molecules and RNA Processing: Processing of messenger RNA, transfer RNA, ribosomal RNA,
- The Genetic Code and Translation: Molecular relation between Genotype & Phenotype,

The Genetic Code, Factors involved in initiation, elongations and termination of translation,

### **Plant Genetic Engineering**

- Restriction and modification of DNA: Basic principle of genetic engineering; restriction enzyme, cutting and joining the DNA; Vectors: plasmids, Bacteriophage and cosmid, single and double standard vectors;
- Agrobacterium-mediated gene transfer: Biology and molecular basis of Agrobacterium mediated plant transformation Direct gene transfer methods,
- General organisation of nuclear, mitochondrial and chloroplast genome;
- Gene silencing in plants: RNAi, Antisense.
- Application of plant genetic engineering for traits such as herbicide resistance, insect resistance, virus and abiotic stress resistance; improvement of crop yield and quality, manipulation of fruit ripening, Golden rice.
- Genetic Engineering and public Concerns:

### **Algae, Microbiology and Pathology Syllabus:**

- Algae, classification and economic importance
- **Mycological Dimensions of Plants:** Plants and fungi interaction through the window of evolution; present knowledge of fungal biodiversity, phylogeny and classification; fungal plant ecology and fungal endophytes; forms, structure and functions of Fungi; Modern fungal systematics, Morphology and molecular-based taxonomy;
- **Study of different groups of fungi with suitable native examples:** Slime moulds, Chytridiomycota; Oomycota; Glomeromycota; Zygomycota; Ascomycota and Basidiomycota; Straminopile fungi. Study of economic importance of fungi;
- **Tropical Plant Pathology:** Diseases of plants in the tropics and their systematic studies using modern techniques. Symptomatology in fungal, bacterial, viral and mycoplasma diseases of plants; Physiology of host-pathogen interaction; Control of crop diseases
- **Taxonomic Methods and Classification of Angiosperms Syllabus**
- Plant taxonomy: Scope and importance; Conservation priorities, bioprospecting
- International Code of Plant Nomenclature: Taxonomic characters other than morphology: Characters from anatomy, embryology, palynology, chromosomes, secondary metabolites, proteins, nucleic acids in taxonomy.
- Phytogeography: Basic terminologies and their understanding; endemism – types and causes; vicariance; phytogeography and applications; floristic regions of the world (Takhtajan).
- Phylogeny and Classification of Angiosperms: Fossil angiosperms and their ecology. APG III system of classification of angiosperms; characteristics and phylogeny of clades: Orders – Amborellales, Nymphaeales, Austrobaileyales, Chloranthales; Clades (Magnoliids), (Monocots (Commelinids)), Order Ceratophyllales, (eudicots (core eudicots (rosids (malvids, fabids)) (asterids (campanulids, lamids)

## **Cytogenetics and Plant Breeding Syllabus**

- Cell division and Cell cycle: Mitosis and Meiosis,
- Morphology of eukaryotic chromosomes: Chromosome number, size and general morphology; Karyotype; Chromosomes banding patterns; Specialized chromosomes;
- Molecular organization of Eukaryotic chromosomes: Chemical composition, chromosome structure; Organization of chromatin fibres; Molecular structure of Centromere and telomere.
- Molecular mechanisms to mutation and DNA repair: mechanism of DNA repair.
- Introduction to Plant Breeding: Objectives and achievements; Pattern of evolution in crop plants; Plant introduction - Purpose of plant introduction; some important achievements of plant introduction; Domestication and acclimatization; Germplasm collections.
- Heterosis and inbreeding depression: Inbreeding depression; Effects of inbreeding; Degrees of inbreeding depression; Homozygous and Heterozygous balance; Heterosis in cross and self-pollinated plants; Genetic basis of heterosis and inbreeding depression; Dominance hypothesis; Over-dominance hypothesis; Physiological basis of heterosis; Commercial applications.

## **Advanced Ecology Syllabus**

- Ecology of climate change and development (ECCD): Climate change-the current picture after COP-20;
- Tropical Soil Ecology (TSE): Classification and characteristics of tropical soils; Soils as a biological habitat, tropical Soil biodiversity; soil erosion and soil fertility management.
- Landscape and plant ecology (LE): Historical development, Applications of landscape ecology, Definitions and terminology in LE, Pattern, heterogeneity, patches, Scale and hierarchy on landscapes; Change and long temporal scales; Causes of pattern; Landform and landscape position; Land use- Social and cultural landscapes; The role of disturbance on landscapes-Spatial dynamics of disturbance, Disturbance, equilibrium, and scaled landscapes, Principles of plant ecology, plant communities, ecotones, edge effect; Forest landscape succession-Succession as a spatial process , Modeling landscape succession and management, biodiversity and landscape management, Landscape restoration, Landscape management: Natural variability, scientific uncertainty, and sustainability; Case studies from India-habitat fragmentation in western ghats, in mining areas etc.
- Environmental impact assessment (EIA): History of EIA, EIA, EIS, EMP; EIA laws and regulations, projects requiring EIA in India; EIA methodology-Checklist, overlay, modeling, Network, Matrix, computer assisted; EIA software packages and tools; Biological impact assessment; preparing EIA reports, public hearing procedures; EIA case studies from India; Study of EIA manuals.

### **Note:**

**Duration for C.B.R.T : 90 Minutes**

**Maximum Marks for C.B.R.T : 75 Marks**