RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SCHEME & SYLLABUS FOR THE POST OF ASSISTANT CONSERVATOR FOREST & FOREST RANGE OFFICER GRADE Ist COMPETITIVE EXAMINATION, 2018 FOREST DEPARTMENT

OPTIONAL SUBJECT - BOTANY

1. Plant viruses : General structure, classification and replication. Mycoplasma and Phytoplasma - Biology and economic importance.
Bacteria : Ultra-structure, classification, reproduction/ genetic recombination, and economic importance, Archebacteria-general account.
Algae: General characters of major groups of algae, their classfication, reproduction and economic importance.
Fungi: General characters, cell wall composition, nutrition, classification, (Alexopoulos and Mims, 1979) reproduction and economic importance of major groups of fungi. Important plant diseases: Little leaf of Brinjal, Citrus canker, Black Rust of wheat.

2. Bryophyta - General characteristics, classification, thallus organization and evolution, reproduction and economic importance.
Pteridophyta: General characteristics, classification and alternation of generations.

3. General characters and classification of Gymnosperms : their life-cycle and economic importance.
Classification of Angiosperms : salient features of system of classification proposed by Bentham Hooker. Type concept, binomial system of nomenclature and principle of priority.
Diversity of angiosperm plants as illustrated by the members of families Ranunculaceae, Fabaceae, Apiaceae, Asteraceae and Poaceae. Important herbaria and botanical gardens of India and World. Role of BSI in Inidia.

4. Morphology of root, stem and leaves of Angiosperms. Types of inflorescence, flower as a modified Shoot.
Tissue system : Primary and secondary tissues, simple and complex tissues, normal anatomical features of monocot and dicot stem, root and leaves. Vascular system-types of vascular bundles, apical and cambial meristem. Origin of lateral roots.
General account of wood-characteristics of growth rings, sapwood and heart wood, periderm. Normal secondary growth in dicot root and stem. Anamolous type of secondary growth in *Boerhavia, Leptadenia, Salvadora, Baugainvillia, Dracaena*.
Pollination, development of male and female gametophytes, types of ovules. Double fertilization, types of embryo sacs, development of embryo in dicots. Endosperm types. Strucure of dicot and monocot seeds.

5. Utilization of plants : Source, cultivation, improvement in plants of economic value and human welfare with special reference to cereals crops (Wheat, Maize, Bajra).
Important oil-seeds (Groundnut, mustard) and seed spices (coriander fenugreek, cumin) Important fibre crops (Jute, Cotton).
Important medicinal plants, cultivation and utilization with special reference to *Withania, Commiphora, Plantago.*
Forest resources : Timber (*Tactona, Dalbergia, Tecomella*), Gum and oleo-gum resin yielding plants (*Acacia, Anogeissus, Boswellia, Butea, Commiphora*). Minor forest produce-*Diospyros* and *Dendrocalamus*. Brief account of ethnobotany with special reference to Rajasthan.

6. Plants and Environment- Atmosphere, water, light, temperature, soil (development, profile and physical-chemical characteristics of soil). Plant adaptation in response to environment (Hydrophytes, Xerophytes and Halophytes).
Ecosystems - Structure, abiotic and biotic components, food chain, food web, ecological pyramids, energy flow and biogeochemical cycles (carbon, nitrogen and phosphorus)
Ecotypes, ecads, community characteristics, frequency, density, abundance and cover. Ecological succession.
Phytogeography - Phytogeographical regions of India, vegetation types of India-Forests and grasslands. Vegetation of Rajasthan. Plant conservation strategies-*in situ* and *ex situ* conservation.Red Data Book and IUCN classification. Endangered and threatened plants of Rajasthan.

7. Plant water relations : Physical properties of water.Diffusion and osmosis, Transpiration, physiology of stomatal movement. Essential macro- and micro-elements and their role in plant growth.
Photosynthesis : Photosynthetic pigments, concept of two pigment system, photophosphorylation, carbon cycle, C_3 and C_4 pathways, CAM plants.
Respiration : Aerobic and anaerobic respiration, Kreb's cycle, electron transport system, Oxidative phosphorylation Pentose phosphate pathway. Fermentation.
Plant Growth Regulation : Phases of growth. Seed germination and factors affecting the process. Concept of photoperiodism and vernalization. Plant Growth Regulators, their synthesis and physiological functions with special reference to auxins, gibberellins, cytokinins, ABA and synthetic plant growth regulators.

8. Cell Biology : Prokaryotic and Eukaryotic cells, Structure and functions of important cell organelles.
Ultra-structure and functions of chromosomes, Chromosomal abberations. Polyploidy cell-cycle, mitosis and meiosis.
Concept of heredity, Mendel's laws of heredity. Linkage, structure of gene, transfer of genetic information, transcription and translation. Mutation- spontaneous and induced.
Plant breeding : Domestication, introduction acclimatization, selection and improvement.Plant breeding methods-emasculation, hybridization, test cross, back cross, hybrid vigour (heterosis) .

9. Nucleic acids : DNA and its structure, replication, functions. Types of DNA. Extra chromosomal DNA (mitochondria, chloroplast and plasmids). RNA-its structure, types and functions.

Gene regulation and expression in prokaryotes and eukaryotes. Mechanism of protein synthesis, protein structure and function.

Tools and techniques of recombinant DNA technology.Gene isolation, cloning, introduction and expression. Cloning vehicles-plasmids, cosmids, phages, methods of gene transfer in plants (direct and indirect methods).

cDNA library, genomic library, transposable elements, DNA finger printing, genetic mapping.

10. Concept of asepsis and methods of sterilization. Physical and chemical methods of sterilization (Autoclave,Oven, UV radiations, Surface disinfectants, HEPA filtration, Laminar flow Clean Air Bench).

Tissue Culture Media. Chemical composition (Macro- and micronutrients, Vitamins, Carbon source, amino acids and PGRs) of different media viz. Murashige and skoog's medium, white's medium and Shenk and Hildebrandt's medium. Methods of their preparation.

Concept of cell totipotency in plants. Types of Culture- callus culture, suspension culture, single cell culture, organ culture. Ex-plant preparation, sterilization and inoculation. Methods of *in-vitro* plant propagation. Callus organogenesis and somatic embryogenesis.

Strategies for production of transgenic plants with special reference to herbicide tolerance and insect resistance. Transgenic crops such as Bt cotton, Bt Brinjal, Round-up Ready Soyabean.

Note :- **Pattern of Question Paper**

1. Objective type paper
2. Maximum Marks : 200
3. Number of Questions : 120
4. Duration of Paper : Three Hours
5. All questions carry equal marks.
6. There will be Negative Marking.