Lecturer in Botany
in Government Junior College of Arts, Commerce & Science,
Maharashtra Education Service , Group B (Collegiate Branch).

Standard : Degree | **Total Marks** : 150
Medium : English | **Total Questions** : 150
Nature of Paper : Objective Type | **Duration** :1 ½ Hours

Algae & Fungi **20 Questions**

1. A Algae

.01) Occurrence, distribution and classification of algae.
.02) Thallus organization in algae.
.03) Origin and evolution of sex in algae.
.04) Types of life cycles in algae.
.05) Important features and life history of Chlorophyceae - Volvox, Oedogonium, Coleochaete, Xanthophyceae – Vaucheria, Phaeophyceae - Ectocarpus, Sargassum, Rhodophyceae – Batrachospermum.
.06) Economic importance of algae.

B Fungi :

.01) General characters, classification, reproduction and economic importance of fungi.
.02) Important features of Mastigomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina and Life histories of Pythium, Mucor, Saccharomyces, Puccinia, Colletotrichum.
.03) General account of lichens.
.04) Mushroom cultivation.

Bryophytes and Pteridophytes / Microbiology and Plant Pathology - 20 Questions

2. A Bryophytes and Pteridophytes

.01) Structure, classification, reproduction and alternation of generations in bryophytes and pteridophytes.
.02) General characters of Hepaticopsida (e.g. Marchantia), Anthocerotopsida (e.g. Anthoceros) and Bryopsida (e.g. Funaria).
.03) General account of pteridophytes with reference to structure of sporophyte, sori, sporangia and gametophytes.
.04) Alternation of generations in pteridophytes.
.05) Important characteristics of Psilopsida, Lycopsida, Sphenopsida and Pteropsida.

B Microbiology and Plant Pathology :

.01) Viruses, bacteria and plasmids - structure and reproduction.
.02) General account of infection and phytoimmunology.
.03) Applications of microbiology in agriculture, industry and medicine.
.04) Role of microbes in controlling pollution of air, soil and water.
.05) Important plant diseases caused by viruses, bacteria, mycoplasmas, fungi and nematodes and their control measures.
.06) Molecular basis of infection and disease resistance/defence mechanisms.

Gymnosperms & Angiosperms **20 Questions**

3. A Gymnosperms :

.01) General features of gymnosperms.
.02) Classification, diversity and evolution of gymnosperms.
.03) Salient features of living Cycadales, Coniferales and Gnetales, their structure and reproduction.

B Angiosperms :

.01) A general account of the origin and evolution of angiosperms. Major contributions of cytology, phytochemistry and taximetrics to taxonomy.
.02) Comparative account of various systems of classification and the details of the systems proposed by Bentham and Hooker and Engler and Prantl.
.03) Study of angiospermic families - Magnoliaceae, Ranunculaceae, Brassicaceae, Rosaceae, Fabaceae, Euphorbiaceae, Malvaceae, Apiaceae, Asclepiadaceae, Verbenaceae, Solanaceae, Rubiaceae, Cucurbitaceae, Asteraceae, Poaceae, Arecaceae, Liliaceae, Musaceae, Orchidaceae, Dipterocarpaceae.
.04) Stomata and their types, anomalous secondary growth, anatomy of C3 and C4 plants.
.05) Development of male and female gametophytes.
.06) Pollination, fertilization, endosperm, its development and function.

.07) Patterns of embryo development.

.08) Polyembryony and apomixis.

Palaeobotany / Plant Utility and Exploitation **15 Questions**

4. A Palaeobotany :

.01) Carbon dating and applications of palaeobotany in oil and coal exploration

.02) General account of Cycadofilicales, Bennettitales and Cordaitales.

B Plant Utility and Exploitation :

.01) Origin of cultivated plants, Vavilov's centres of origin.

.02) Plants as sources of food, fodder, fibers, drugs, beverages, narcotics, insecticides, timber, resins, dyes and gums.

.03) Latex, cellulose, starch and their products.

.04) Importance of Ethnobotany in Indian context.

.05) Energy plantation, Petrocrops and biofuels.

.06) Botanical Gardens and Herbaria.

.07) The structure of plant based industries in Maharashtra; the present scenario and future prospects.

Cell Biology I & Cell Biology II **20 Questions**

5. A Cell Biology I :

.01) Techniques of Cell Biology. Ultrastructural details of Prokaryotic and Eukaryotic cells.

.02) Structure and function of extracellular matrix (Cell wall) and membranes, cell adhesion, membrane transport and vesicular transport.

.03) Structure and functions of cell organelles (Chloroplasts, mitochondria, endoplasmic reticulum, golgi complex, ribosomes, endosomes, lysosomes and peroxisomes.)

B Cell Biology II :

.01) Ultrastructure and functions of nucleus, nucleolus, nuclear pore complex, nucleosome and chromatin.

.02) Cell signalling and cell receptors. Signal transduction (G-1 proteins etc.). Mitosis and meiosis, molecular basis of cell cycle.

.03) Numerical and structural variations in chromosomes and their significance. Study of polytene, lampbrush and B-chromosomes, their structure, behaviour and significance.

Genetics / Molecular biology and Evolution **20 Questions**

6. A Genetics :

.01) Development of genetics, gene versus allele concepts (Pseudoalleles). Mendel's laws of inheritance.

.02) Quantitative genetics and multiple factors. Linkage and crossing over, methods of gene mapping including molecular maps (idea of mapping function).

.03) Sex chromosomes and sexlinked inheritance, sex determination and molecular basis of sex differentiation.

.04) Mutation(biochemical and molecular basis).Cytoplasmic inheritance and cytoplasmic genes.

B Molecular biology and Evolution :

.01) Structure and synthesis of nucleic acids and proteins.

.02) Genetic code and regulation of gene expression. Multigene families.

.03) Organic evolution - evidences, mechanism and theories.Role of RNA in origin and evolution.

Plant Breeding/ Biotechnology/ Biostatistics **20 Questions**

7. A Plant Breeding :

.01) Methods of plant breeding - Introduction, selection, hybridization (pedigree, backcross, mass selection, bulk method), polyploidy and induced mutations.

.02) Male sterility and heterosis breeding.

.03) Use of apomixis in plant breeding.

B Biotechnology :

.01) Plant tissue culture – Micropropagation, production of haploids, somatic hybrids and cybrids, embryo rescue and somaclonal variation and their applications.

.02) Genetic Engineering - Gene identification, isolation and cloning. Methods of gene transfer and transgenic crops. Development and use of molecular markers in plant breeding. Varietal characterization, varietal testing and seed release. Structure of seed industry in Maharashtra and IPR.

C Biostatistics :

Standard deviation, coefficient of variation (CV). Test of significance (Z-test, t-test, Chi-square test).

Probability and distributions (normal, binomial and Poisson distributions). Correlation, regression and ANOVA.

Physiology and Biochemistry/Ecology,Plant Geography and Computer Applications 15 Questions

8. A Physiology and Biochemistry :

.01) Water relations, mineral nutrition, ion transport and mineral deficiencies.

.02) Photosynthesis – photochemical reactions, photophosphorylation, carbon pathways, photorespiration and CAM pathways.

.03) Respiration (anaerobic and aerobic), electron transport chain and oxidative phosphorylation.

.04) Nitrogen fixation and nitrogen metabolism.

.05) Enzymes, co-enzymes, energy transfer and energy conservation.

.06) Importance of secondary metabolites, pigments as photoreceptors (plastidal pigments and phytochromes).

.07) Photoperiodism and flowering, vernalization, senescence. Growth substances - their chemical nature, role and application in Agrihorticulture, growth indices, growth movements.

.08) Stress physiology (heat, water, salinity, metal). Fruit and seed physiology, dormancy, storage and germination of seed.

.09) Fruit ripening - its molecular basis and manipulation.

B Ecology, Plant Geography and Computer Applications :

.01) Ecological factors, concepts and dynamics of community, plant succession.

.02) Concept of biosphere. Ecosystems and their conservation.

.03) Pollution and its control (including phytoremediation), ecotoxicology.

.04) Forestry in India - afforestation, deforestation, social forestry and wasteland development.

.05) Endangered plants, endemism and Red Data Book. Biodiversity assessment and conservation.

.06) Sovereign Rights and Intellectual Property Rights.

.07) **Global warming :** Causes, impacts and preventive measures.

.08) **Computer Applications :** Computer operation, DOS, WINDOWS, UNIX, Networking, Collection of course material and generation of data base. Genomic information. Biostatistical analysis of data. Use of EXCEL, Power Point operation. Archiving and updating.

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