

B.Sc. Part I: Paper I (B-101) Diversity Viruses, Bacteria and Fungi

After completing this paper students will be able to understand and explain:

- History, nature and classification of Viruses
- Genome organization and replication of TMV, Bacteriophages and viroids
- Techniques in plant viruses - purification, serology and electron microscopy
- Economic importance of viruses
- History, nature and classification, bacterial genome and plasmids of Bacteria
- Bacterial reproduction, techniques of sterilization and staining
- Economic importance of Bacteria
- History, nature and classification, thallus organization and reproduction of fungi
- Economic importance of fungi.
- The life cycles of *Albugo*, *Pythium*,; *Saccharomyces*, *Aspergillus*; *Ascobolus*; *Ustilago*, *Puccinia*, *Polyporus*, *Agaricus*; *Fusarium*, *Cercospora*.

B.Sc. Part I: Paper II (B-102) Diversity of Algae, Lichens and Bryophytes

After completing this paper students will be able to understand and explain:

- General characters and range of thallus organization of Algae
- Classification and ultrastructure of eukaryotic algal cell and cyanobacterial cell
- Economic importance of Algae
- The characteristics and life cycles of *Oscillatoria*, *Volvox*, *Hydrodictyon*, *Oedogonium*, *Chara*, *Navicula*, *Vaucheria*, *Ectocarpus*, *Saragassum* and *Polysiphonia*.
- Classification and thallus organization of Lichens
- Reproduction and physiology, ecological and economic importance of lichens.
- General characters, classification, reproduction and affinities of Bryophytes.
- Gametophytic and sporophytic organization of *Riccia*, *Marchantia*, *Anthoceros* and *Pogonatum*.

B.Sc. Part I: Paper III (B-103) Diversity of Pteridophytes, Gymnosperms and Elementary Palaeobotany

After completing this paper students will be able to understand and explain:

- General features, classification, stelar system (with its evolution) of Pteridophytes
- Heterospory and seed habit.
- Comparative study of morphology, anatomy, development, vegetative and reproductive systems of *Lycopodium*, *Selaginella*; *Rhynia Pteridium*, *Equisetum*. *Marsilea*.
- General characters, classification, affinities and relationship and evolutionary significance of Gymnosperms
- Comparative study of morphology, anatomy, development of vegetative and reproductive parts in: *Cycas*, *Pinus* and *Ephedra*.
- Elementary Palaeobotany: general account, types of fossils, methods of fossilization and geological time scale.

B.Sc. Part II: Paper I (B-201) Diversity of Angiosperms: Systematics, Development & Reproduction

After completing this paper students will be able to understand and explain:

- Principles of classification, Binomial nomenclature; comparative study of different classification systems, viz. Linnaeus, Bentham & Hooker, Engler & Prantl, Hutchinson, and Cronquist. Herbarium techniques and important Botanic Gardens.
- Taxonomic study of following families and their economic importance (Dicots): Ranunculaceae, Malvaceae, Brassicaceae, Cucurbitaceae, Rosaceae, Leguminosaceae, Myrtaceae, Rutaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae, Verbenaceae, Euphorbiaceae, and Amaranthaceae.
- Monocots: Cyperaceae, Poaceae, Arecaceae, Liliaceae.
- External morphology of vegetative and floral parts; modifications – phyllodes, cladodes, and phylloclades.
- Meristems-kinds study of tissue system - epidermal, ground, and vascular.
- Anatomy of roots, stems, and leaves. Cambium - its function and anomalies in roots and stems; root -shoot transition.
- Structure and development of male and female gametophytes – microsporogenesis microgametogenesis, megasporogenesis, and megagametogenesis, embryo sac types.
- Double fertilization development of embryo, endosperm development and its morphological nature, apomixis and polyembryony.

B.Sc. Part II: Paper II (B-202) Cytology, Genetics, Evolution & Ecology

After completing this paper students will be able to understand and explain:

- Cell structure: cell organelles, nucleus, chromosome structure, nucleosome and solenoid model, salivary gland, lampbrush and B chromosomes.
- Cell division: mitosis, meiosis; their significance, chromosomal aberrations, cell cycle.
- Genetics: laws of inheritance; gene interaction; linkage and crossing over;
- Cytoplasmic inheritance; sex determination.
- Mutation: spontaneous, induced mutations, molecular mechanism and evolutionary significance;
- Polyploidy origin, kinds and role in evolution.
- Evidences and theories of evolution.
- Ecology, relation with other disciplines.
- Plant types: Hydrophytes - *Hydrilla*, *Eichhornia*, *Nymphaea*, *Typha*.
- Xerophytes – *Nerium*, *Casuarina*, *Asparagus*, *Calotropis*, *Parkinsonia*.
- Plant succession – xeroseres, hydroseres.
- Ecosystems - concept, basic types, components, & functioning.
- Food chain, food web, energy flow and productivity.

B.Sc. Part II: Paper III (B-203) Plant Physiology and Biochemistry

After completing this paper students will be able to understand and explain:

- Plant and water relationship, colligative properties of water.
- Water uptake, conduction, transpiration, mechanism and its regulation by environmental variables.
- Mineral Nutrition : Macro, and micronutrients, their role, deficiency and toxicity symptoms, plant culture practices, mechanism of ion uptake and translocation.
- Photosynthesis and Chemosynthesis : photosynthetic pigments, O₂ evolution, photophosphorylation, CO₂ fixation – C-3, C-4 and CAM plants.
- Respiration : aerobic and anaerobic respiration, respiratory pathways glycolysis, krebs cycle, electron transport, oxidative phosphorylation, pentose phosphate pathway, photorespiration, cyanide resistant respiration.
- Lipid biosynthesis and its oxidation.
- Nitrogen metabolism : atmospheric nitrogen fixation, nitrogen cycle, nitrogen assimilation,
- Growth: general aspects of phytohormones, inhibitors-auxins. kinetin, gibberellins, and ethylene: action and their application; photoperiodism and vernalization.
- Germination, growth movements, abscission and senescence.
- Biomolecules : Classification, properties and biological role of carbohydrates, Protein and lipids
- Chemistry of nucleic acids, vitamins.
- Discovery and nomenclature. Characteristics of enzymes, concepts of holoenzyme, apoenzyme, coenzyme and cofactors.
- Regulation of enzyme activity, Mechanism of action.
- Bioenergetics: Laws of thermodynamics, concept of Gibb's free energy and high energy compounds.

B.Sc. Part III: Paper I (B-301) Plant Resource utilization, Palynology, Plant Pathology and Biostatistics

After completing this paper students will be able to understand and explain:

- Centres of diversity of plants, origin of crop plants.
- Domestication and introduction of crop plants.
- Basic concepts of Plant Breeding, hybridization, heterosis.
- Concepts of sustainable development; cultivation, production and uses of - wheat, rice, legumes, sugarcane
- A general account of plants yielding oils, spices, beverages.
- An account of major fiber, medicinal, petro plants of Uttar Pradesh.
- Etiology of viral, bacterial, fungal and insect-pest diseases: mosaic diseases on tobacco, and cucumber, yellow vein mosaic of bhindi; citrus canker, potato scab, little leaf of brinjal; damping off of seedlings late blight of potato, red rot of sugarcane
- Integrated pest disease management

- An introductory knowledge of palynology, morphology, viability and germination of pollens.
- Classification of data, mean, median and mode. Standard deviation, standard error, variance, co-relation, χ^2 test and experimental designs

B.Sc. Part III: Paper II (B-302) Molecular biology and biotechnology

After completing this paper students will be able to understand and explain:

- Nucleic acid as genetic material, nucleotides, structure of nucleic acids
- Properties of genetic code, codons assignments, chain initiation of codons
- Mechanism of protein synthesis and its regulation
- Replication of DNA in prokaryotes and eukaryotes
- Gene expression and regulation
- Hormonal control and second messengers Ca^{2+} , Cyclic AMP, IP3 etc.
- Introduction to biotechnology, recombinant DNA technology
- Biotechnology and healthcare, IPR issues
- Plant tissue culture, methods of gene transfer, transgenic plants
- Microbial and environmental biotechnology.

B.Sc. Part III: Paper III (B-303) Environmental Botany

After completing this paper students will be able to understand and explain:

- Mineral resources of planet earth and conservation of mineral resources.
- Soils: types, properties and various problem soils;
- Water: the source of water, physico-chemical and biological properties of water.
- Sustainable management of water;
- Energy resources in India;
- Forests: global forest wealth, importance of forests, deforestation.
- Environmental pollution: air, water, soil, radioactive, thermal and noise pollutions, their sources, effects and control.
- Greenhouse effect, ozone depletion and acid rain.
- CO₂ enrichment and climate change.
- Biodiversity: biotic communities and populations, their characteristics and population dynamics.
- Phytogeography: Natural vegetation of India, static and dynamic plant geography, basic principles governing geographical distribution of plants, endemism.
- Conservation of plants resources for agriculture and forestry.
- *In situ* conservation sanctuaries, national parks, biosphere reserves, wetlands, mangroves.
- *Ex situ* conservation; botanical gardens, field gene banks, seed banks, cryobanks.