

B.Sc. First Year Botany

There shall be Three theory papers and a practical examination as follows:

Paper I: Diversity of Viruses, Bacteria and Fungi	M. M.: 50
Paper II: Diversity of Algae, Lichens and Bryophytes	M. M.: 50
Paper III: Diversity of Pteridophytes and Gymnosperms	M. M.: 50
Practical: Based on papers I - III	M. M.: 50

B.Sc. First Year Practical

Time: 4.00 hrs

Max Marks: 50

1. Temporary slide preparation and Identification (Fungi/ Plant Pathology)	07 Marks
2. Temporary slide preparation and Identification (Pteridophyte/Gymnosperm)	07
3. Temporary Mount and Identification (Algae)	06 Marks
4. Temporary Mount and Identification (Bryophyte)-Rhizoid/Scale/Spore	05 Marks
5. Bacteria Gram staining	05 Marks
6. Identify and Comment upon spots (1-10)	10 Marks
7. Viva-Voce	05 Marks
8. Practical class record	05 Marks
Total Marks	50

(There will be 9 questions in each paper and candidate has to attempt only 5 questions. Q.1 will be compulsory and based on units I - IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks.

Paper I: Diversity of Viruses, Bacteria and Fungi**M.M. 50****Unit-I**

History, nature and classification of Viruses, Bacteria and Fungi:

History of virology and bacteriology; prokaryotic and eukaryotic cell structure (bacteria, mycoplasma and yeast); structure, classification and nature of viruses; structure (gram positive and gram negative) and classification (based on cell structure) of bacteria; classification, thallus organization and reproduction in fungi; economic importance of fungi.

Unit-II

Viruses: Symptoms of virus infection in plants; transmission of plant viruses; genome organisation, replication of plant virus (tobacco mosaic virus); techniques in plant viruses - purification, serology and electron microscopy; structure and multiplication of bacteriophages; structure and multiplication of viroids.

Unit-III

Bacteria: Nutritional types of bacteria (based on carbon and energy sources), metabolism in different nutritional types (basics only) and nitrogen cycle; bacterial genome and plasmids; bacterial cell division, variability in bacteria - mutation, principles of genetic recombination; techniques of sterilisation, bacterial culture and staining; economic importance of bacteria.

Unit-IV

Fungi: The characteristics and life cycles of the following: Mastigomycotina: *Albugo*, *Pythium*; Ascomycotina: *Saccharomyces*, *Aspergillus*, *Ascobolus*; Basidiomycotina: *Ustilago*, *Puccinia*, *Polyporus*, *Agaricus*; Deuteromycotina: *Fusarium*, *Cercospora*.

Paper II - Diversity of Algae, Lichens and Bryophytes**M.M. 50****Unit-I**

General characters: Range of thallus organization, classification, ultrastructure of eukaryotic algal cell and cyanobacterial cell, economic importance of algae. Lichens classification, thallus organization, reproduction, physiology and role in environmental pollution, Ecological and economic importance of lichens

Unit-II

The characteristics and life cycles of the following: Cyanophyta: *Microcystis*, *Oscillatoria*, Chlorophyta: *Volvox*, *Hydrodictyon*, *Oedogonium*, *Coleochaete*, *Chara*; Bacillariophyta: *Navicula*; Xanthophyta: *Vaucheria*; Phaeophyta: *Ectocarpus*; Rhodophyta: *Polysiphonia*.

Unit-III

Bryophytes: General characters, classification, reproduction and affinities. Gametophytic and sporophytic organization of Bryopsida: *Pogonatum*; Anthocerotopsida: *Anthoceros*.

Unit-IV

Gametophytic and sporophytic organization of **Hepaticopsida**: *Riccia*, *Marchantia*.

Paper III: Diversity of Pteridophytes, Gymnosperms and elementary Palaeobotany**M.M. 50****Unit-I**

Pteridophytes: General features, classification, stellar system and its evolution. Comparative study of morphology, anatomy, development, vegetative and reproductive systems of Lycopsida: *Lycopodium*, *Selaginella*; Psilopsida: *Rhynia*.

Unit-II

General and comparative account of gametophytic and sporophytic system in Filicopsida: *Pteridium*, *Nephrolepis*, *Marsilea*. Heterospory and seed habit

Unit-III

Gymnosperms: General characters, classification. Comparative study of morphology, anatomy, development of vegetative and reproductive parts in Cycadales: *Cycas*.

Unit-IV

Study of morphology, anatomy, development and reproductive parts in Coniferales: *Pinus*, Gnetales: *Ephedra*.

Affinities and relationship of Gymnosperms, evolutionary significance

Elementary Palaeobotany: General account, types of fossils, methods of fossilization and geological time scale.

B.Sc. (Botany) Second Year

Paper I: Diversity of Angiosperms: Systematics, Development and Reproduction	M.M. 50
Paper II: Cytology, Genetics, Evolution and Ecology	M.M. 50
Paper III: Plant Physiology and Biochemistry	M.M. 50
Practical: Based on papers I-III	M.M. 50

B.Sc. Second Year Practical**Time: 4.00 hrs****Max Marks: 50**

1. Description, Identification and Classification of given Angiospermic Plant	07 Marks
2. To perform and write the observations, results and conclusion (Physiology)	07 Marks
3. Temporary slide preparation and Identification (Anatomy)	06 Marks
4. Temporary Mount (Embryology)/ Biochemistry Exercise	05 Marks
5. Cytology/Genetics Exercise	05 Marks
6. Identify and Comment upon spots (1-10)	10 Marks
7. Viva-Voce	05 Marks
8. Practical class record	05 Marks
Total Marks	50

(There will be 9 questions in each paper and candidate has to attempt only 5 questions. Q.1 will be compulsory and based on units I - IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks)

Paper I: Diversity of Angiosperms: Systematics, Development and Reproduction**M.M. 50****Unit-I**

Systematics: Principles of classification, Binomial nomenclature; comparative study of different classification systems, viz. Linnaeus, Bentham & Hooker, Engler & Prantl, Hutchinson, and Cronquist. Herbarium techniques and important Botanical Gardens

Unit-II

Taxonomic study of following families and their economic importance:

Dicots; Nymphaeaceae, Nelumbonaceae, Ranunculaceae, Malvaceae, Bombacaceae, Brassicaceae, Cucurbitaceae, Rosaceae, Leguminosaceae, Myrtaceae, Rutaceae, Apiaceae, Apocynaceae, Solanaceae, Convolvulaceae, Cuscutaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae, Euphorbiaceae, and Amaranthaceae.

Monocots: Cyperaceae, Poaceae, Arecaceae, Liliaceae.

Unit-III

External morphology of vegetative and floral parts, modifications – phyllodes, cladodes, and phylloclades

Meristems types, study of tissue system - epidermal, ground and vascular

Anatomy of roots, stems and leaves

Cambium - its function and anomalies in root and stem; root and stem transition

Unit-IV

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

Paper II: Cytology, Genetics, Evolution and Ecology**M.M. 50****Unit-I**

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

Unit-II

Genetics: Laws of inheritance, gene interaction, linkage, cytoplasmic inheritance, sex determination

Unit-III

Mutation: Spontaneous, induced mutations, molecular mechanism and evolutionary significance

Polyploidy: origin, kinds and role in evolution

Evidences and theories of evolution

Unit-IV

Ecology: relation with other disciplines. Plant types: Hydrophytes - *Hydrilla*, *Eichhorina*, *Nymphaea*, *Typha*, Xerophytes – *Nerium*, *Casuarina*, *Saccharum*, *Begonia*. Plant succession – xeroseres, hydroseres; Ecosystems - concept, basic types, components and functioning

Paper III : Plant Physiology and Biochemistry.**M.M. 50****Unit-I**

Plant and water relationship: Colligative properties of water, free energy concept; 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

Unit-II

Photosynthesis and Chemosynthesis: photosynthetic pigments, O₂ evolution,

photophosphorylation, CO₂ fixation in C₃, C₄ 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

Unit-III

Nitrogen metabolism: atmospheric nitrogen fixation, nitrogen cycle, nitrogen assimilation

Growth, general aspects of phytohormones and inhibitors-auxins, kinetin, gibberellins and ethylene, action and their application; photoperiodism and vernalization

Germination, growth movements, parthenocarpy, abscission and senescence

Unit-IV

Biomolecules: Classification, properties and biological role of Carbohydrates, Protein and lipids; Chemistry of nucleic acids

Enzymes: Discovery and nomenclature, characteristics of enzymes, concept of holoenzyme, apoenzyme, coenzyme and cofactors; regulation of enzyme activity, mechanism of enzyme action

B.Sc. (Botany) Third Year

Paper I:	Plant resource utilization, Palynology and Biostatistics	M.M. 75
Paper II:	Molecular Biology and Biotechnology	M.M. 75
Paper III:	Environmental Botany and Plant Pathology	M.M. 75
Practical:	Based on papers I-III	M.M. 75

B.Sc. Third Year Practical**Time: 4.00 hrs****Max Marks: 75**

1. Ecology Exercise (Exercise based on Quadrat / Soil properties)	10 Marks
2. Biotechnology exercise (Tissue culture based/ Biostatistics Exercise)	10 Marks
3. Temporary Mount and Diagram (Pollen grains)	05 Marks
4. Qualitative Test of Carbohydrate, Proteins or Amino acids	07 Marks
5. Identification and comment upon economic use of plant parts	08 Marks
6. Identify and Comment upon spots (1-10)	20 Marks
7. Viva-Voce	05 Marks
8. Practical class record	05 Marks
9. Collection, Model, Chart, Project etc.	05 Marks
Total Marks	75

(There will be 9 questions in each paper and candidate has to attempt only 5 questions. Q.1 will be compulsory based on Units I - IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks)

Paper I: Plant Resource utilization, Palynology and Biostatistics 75 marks**Unit-I**

Centres of diversity of plants, origin of crop plants, Domestication and introduction of crop plants; Concepts of sustainable development; cultivation, production and uses of - wheat, rice, legumes and sugarcane

Unit-II

A general account of plants yielding oils, spices, beverages. An account of major fiber, medicinal and petro plants of Uttar Pradesh.

Unit-III

Conservation of plants resources for agriculture and forestry.

In situ conservation, sanctuaries, national parks, biosphere reserves, wetlands, mangroves.

Ex-situ conservation, botanical gardens, fields, gene banks, seed banks, cryobanks

Unit-IV

An introductory knowledge to 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

Paper II: Molecular Biology and Biotechnology**M.M. 75****Unit-I**

Nucleic acid as genetic material, nucleotides, structure of nucleic acids, properties of genetic code, codons assignment, chain initiation codons, mechanism of protein synthesis and its regulation

Unit-II

Structure and properties of polysaccharides, amino acids, proteins, vitamins and hormones; Enzymes: active sites, specificity, mechanisms, factors, general aspects of enzyme kinetics. Bioenergetics: Laws of thermodynamics, concept of Gibb's free energy, high energy compounds

Unit-III

Replication of DNA in prokaryotes and eukaryotes, gene expression and regulation, Hormonal control and second messengers Ca^{++} , Cyclic AMP, IP₃ etc.

Unit-IV

Introduction to biotechnology, recombinant DNA technology, plant tissue culture, methods of gene transfer, transgenic plants, biotechnology and healthcare, microbial and environmental biotechnology

Paper III- Environmental Botany and Plant Pathology**M.M. 75****Unit-I**

Mineral resources of planet earth, 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.

Unit-II

Environmental pollution: air, water, soil, radioactive, thermal and noise pollutions, their sources, effects and control. (green house effect, ozone depletion and acid rain). CO₂ enrichment and climate change.

Unit-III

Biodiversity and Phytogeography : biotic communities and populations, their characteristics and population dynamics. Natural vegetation of India, static and dynamic plant geography, basic principles governing geographical distribution of plants, endemism

Unit-IV

Etiology of viral, bacterial, fungal and insect-pest diseases: mosaic diseases of 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
