

BOTANY**B.Sc. Part - I****Paper - I****(Fungi, Bacteria, Virus, Lichens & Plant Pathology)****I. Fungi & Lichens****M.M. 45**

1. Outlines of classification of fungi : Anisworth Sparow (General Account).
2. General characteristic, systematic position structure and reproduction of mastigomycotina (Phytophthora), Zygomycotina (Mucor) Chytridiomycetes (Synchitrium), Ascomicotina Sachromyces (yeast), Peziza, Eurotium), Basidiomycotina (Puccinia, Agaricus) Deuteromycotina (Cercospora, Alternaria).
3. General account of lichens : Structure and reproduction.
4. Economic importance of fungi and lichens.

II. Bacteria Virus & Mycoplasma

1. General account of Bacteria, Virus and mycoplasma
2. Structure, nutrition and reproduction in Bacteria.
3. Structure and multiplication of viruses and mycoplasma (with reference to TMV and Bacteriophage)
4. Introduction to Archaeobacteria (Archaea).
5. Economic importance of Bacteria.

III. Plant Pathology

1. General account of fungal, bacterial and viral diseases of plants.
2. Study of plant diseases with emphasis to causal organism, symptoms, disease cycle and control.

IV. Suggested Practical Exercises

1. Study of fungal types prescribed in theory with the help of preparation of slides and permanent slides.
2. Study of bacteria - gram positive and gram-negative stains and preparation of slide from bacterial culture.
3. Examination of local diseases of plants representing fungal, bacterial and viral disease.
4. Observation of Crustose, foliose, fruticose lichens thalli.

B.Sc. I (Botany)
Paper II
(Algae and Bryophyta)

I. Algae

1. General Characters and classification with reference to Fritsch's classification.
2. Range of Thallus organization in algae.
3. Systematic position, structure and mode of reproduction of representative genera .

Chlorophyceae *Coleochaete, Volvox, Oedogonium*

Xanthophyceae *Voucheria*

Charophyceae *Chara*

Phaeophyceae *Ectocarpus, Sargassum*

Rhodophyceae *Poysiphonia*

Cyanophyceae *Nostoc, Scytonema*

4. Economic importance of Algae, Algal culture and as industrial use.

II. Bryophyta

1. Out-lines of classification of Bryophytes.
2. System position, structure and reproduction of important genera.

Hepaticopsida *Riccia, Marchantia, Pellia*

Anthocerotopsida *Anthoceros*

Bryopsida *Sphagnum, Funaria*

Practical Exercises : (Based on Paper II)

1. Study of Algal types with the help of temporary and permanent slides.
2. Study of types of bryophytes with help of suitable preparation with reference to morphology, anatomy and reproductive organs (gametophyte & sporophyte).

B.Sc. I. (Botony)**Paper - III****(Pteridophyta, Gymnosperm, & Palaeobotany)****I. Pteridophyta**

1. Out-lines of classification (with reference to Reimer's classification.

2. Important characteristics of psilopsida, Lycopsida, Sphenopsida, and pteropsida.
3. Structure (morphology and anatomy), systematic position and reproduction of important genera - *Rhynia*, *Lycopodium*, *Selaginella*, *Equisetum*, and *Marselia*, *Pteris* etc.

II. Gymnosperm & Palaeobotany

1. Characteristics of primitive seed plants (Gymnosperm with special reference to affinities and classification).
2. Diversity of gymnosperm (distribution in India).
3. Systemic position, structure (morphology & anatomy) of vegetative and reproductive parts of *Cycas*, *Pinus*, *Ephedra*.
4. Economic importance of Gymnosperm.
5. Palaeobotany : General account, types of fossil, fossilization and geological time-scale.

Practical Exercises : (Based on Paper III)

1. Study of habit, morphology, reproductive parts, and anatomy of example genera cited in theory under pteridophyta.
2. Preparation of slides (hand sections) of anatomical sections and reproductive parts of pteridophytes and gymnosperm material prescribed in theory.

Scheme of B.Sc. I, Practical Examination

Time 4 hrs	M.M. 65
1. Study of material 'A' representing Pteridophytes	(3+3) = 6.
2. Study of material 'B' representing Gymnosperm	(3+3) = 6.
3. Study of material 'C' representing Bryophytes	(3+3) = 6.
4. Study of material 'D' representing fungi or plant pathology or microbiology	(3+3) = 6
5. Study of material 'E' representing Algae	(3+3) = 6
6. Comment upon spots (1-10)	(10 x 2) = 20
7. Viva Voce	= 05
8. Clases records / Collection / Model / Chart	= 10

B.Sc. II (Botany)**Paper - I****(Angiosperm : Taxonomy, Anatomy, Economic, Botany)****I. Taxonomy**

1. Classification as proposed by Bentham & Hooker, and Hutchinson.
2. Botanical nomenclature : Principles and rules, taxonomic ranks type concept.
3. Collection, Preservation and preparation of Herbarium.
4. Contribution of cytology and phytochemistry to taxonomy.
5. Diversity of flowering plants, systematic position, characters of important families.

Polypetalae : Ranunculaceae, Brassicaceae, Papaveraceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae.

Gamopetalae : Rubiaceae, Acanthaceae, Apocynaceae, Asclpiadaceae, Solanaceae, Convolvulaceae, Lamiaceae, Chaenopodiaceae, Asteraceae.

Monochlamydae : Euphorbiaceae.

Monocotyledon : Liliaceae, Poaceae, Arecaceae.

II. Anatomy

1. Meristems
2. Structure of periderm (cork and cork cambium), Xylem, and phloem.
3. Anamolous secondary growth of dicot and monocot stem.
4. Characteristics of wood.

III. Economic Botany

1. Economic importance of plants with special reference to .
 - (a) **Food** - cereals (rice, wheat, maize), Millets (Penicetum and sorgham), Potato, Sugarcane, Legumes (soyabean, gram and pea), Oil crops, Fruits (Apple, peach).
 - (b) Fiber yielding plants (cotton, hemp, jute, coir).
 - (c) Medical plants (Papaver, Rauwolfia, Azadirachta).
 - (d) Timber plants (shorea, Dalbergia, Tectona, Cedrus, Pinus).

Practical Exercise : (Based on Paper - I)

1. Describing of flowering plants in semitechnical language of representative species of families prescribed in theory. Teachers may

select plant species from their locality. A tentative list is only indicative of suitable for study.

Ranunculaceae (*Ranunculus, Delphinium*), Brassicaceae (*Brassica, Coronopsis*), Malvoaceae (*Hibiscus, Abutilon, Sida*), Rutaceae (*Murraya*), Fabaceae (*Cajanus, Melilotus, Cassia, Mimosa, Accacia*), Apiaceae (*coriander*) Acanthaceae (*Adhatoda, Peristrophe*), Apocynaceae (*Vinca, Thevetia, Nerium*), Asclpiadaceae (*Calotropis*) Solanaceae (*Solanum, Datura*), Euphorbiaceae (*Euphorbia, Croton*), Lamiaceae (*Oscimum, Salvia*), Chaenopodiaceae (*Chaenopodium*), Liliaceae (*Asphodelus, Asparaugus*) Poaceae (*Triticum, Hordeum*) etc.

2. To cut T.S. and preparation of double stained glycerine mount of hand section of given anatomical material (root, stem, leaf) with particular reference to anomalous secondary growth in dicot and monocot stems e.g. *Bignonia, Nyctanthus, Boerhaavia, Amaranthus, Salvadoria, Orchid root, Tinospora - root Ficus-root and Nerium leaf Dracena stem - etc.*

B.Sc. II (Botany)

Paper - II

(Plant Physiology and Biochemistry)

I. Plant Physiology

- 1. Water relation to plants :** Definition of osmosis, permeability, plasmolysis, Water potential and component potentials, Mechanism of Absorption, Ascent of sap, Transpiration physiology of stomatal function.
- 2. Mineral relation to plants :** Macro and Micro-nutrient elements, their physiological role and deficiency symptoms, Absorption and translocation.
- 3. Photosynthesis :** Historical evolution of photosynthetic study, photosynthetic apparatus (chloroplast), photosynthetic pigments, mechanism of light reaction (cyclic and noncyclic photophosphorylation), Dark reaction (C_3 - calvin cycle, C_4 - H.S.K. - pathway, crassulacean Acid Metabolism (CAM), Blackman's law of limiting factors.
- 4. Respiration :** Glycolysis, Krebs's cycle, Oxidative phosphorylation.
- 5. Fat Metabolism :** Synthesis and β Oxidation.
- 6. Growth & Development :** Phytohormones (Auxirus, Gibberlins and Cytokinines) with reference discovery, chemical nature, function. Photoperiodism and Vernalization Seed dormancy, Seed germination.

II. Biochemistry

1. Enzymes & coenzymes (structure, nomenclature, classification).
2. Carbohydrate : classification and structure
3. Protein structure.

Practical Exercises (Based on Paper II)

1. Comment on physiological experiment sets based on osmosis, plasmolysis, permeability, transpiration, photosynthesis, fermentation, respiration (in stem root, leaf, germinating seeds), R.Q., Root pressure, Growth measurements, movement- cyclosis (rotation and circulation).
2. To perform given biochemistry experiment.
 - (a) Isolation and extraction of protein from seed and to test by biurette reagent.
 - (b) To show diastase enzyme activity, and catalase enzyme.
 - (c) Separation of plant pigment by paper chromatography.
 - (d) Isolation of reducing sugar from plant material and to test by Fehling's reagent.

B.Sc.-II (Botony)**Paper-III****(Cell Biology, Genetics & Molecular Biology)****Unit-I (Cell Biology)**

1. Cell theory, Cell types, Ultrastructure of plant cell and subcellular organelles (Mitochondria, Robosome and Golgi apparatus)
2. Chromosome Organization -Morphology, centromere, chromosomal alterations-delition, duplication, translocation inversion. aneuploidy, polyploidy, and sex chromosome.
3. Cell Division (mitosis and meiosis)

Unit-II (Genetics)

1. Gentic inheritance, Medelism- law of seggregation and indipendent assortment, Linkage, Allelic and non-allelic interaction of genes.
2. Sex-determination
3. Mutation (spontaneous, induced), Transposable genetic elements, DNA- damage and repair.

Unit-III (Molecular Biology):

1. Structure of DNA and RNA

2. Gene concept, Transfer of genetic information (Transcription) gene expression (translation), Regulation of protein synthesis.
3. Genetic code : Characteristics.

Practical exercises : (Based on Paper-III)

1. Study of mitosis and meiosis, Preparation of squash of give root lip/flower bud and to observe various stages of cell division.
 2. Demonstration technique of another Culture
- Scheme of B.Sc. II., Botany Practical Examination

Time -4 hours

Max. marks 65

1. To describe material 'A' and 'B' (flower plnts) in semitechnical language and to assign their systematic position according to Benthams and Hooker's system of classification (6+4) = 10
2. To prepare a double stained glycerine mount of material 'C' and to describe features of anatomical interest (3+3) = 6
3. Comment upon two physiology experiment sets (4+4) = 8
4. To Perform one plant Biochemistry experiment 4
5. To demonstrate two stages of mitosis/meiosis 4
6. Comment upon the spots (1-10) (representing morphology, anatomy, economic botany and cytogenetics) 20
7. Viva-Voce 5
8. Records/Herbarium 8

Total : 65

B.Sc. III (Botany)**Paper I****(Ecology & Environmental Biology, Soil Science)****Unit-I (Plant Ecology) :**

1. Ecological factors (climatic, biotic, and Edaphic)
2. Ecosystem :- with special reference to biotic and abiotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycle (C,N &P.)
3. Ecological niches- Biological indicators
4. Community ecology : Characteristics, frequency, density, dominance, 'IV', Biological spectrum ecological succession.
5. Biogeographical regions of India.

Unit- II (Environmental Biology)

1. Pollution (Air, Water, Soil, Noise, and radiation).
2. Conservation (Water bodies and Soil), Soil erosion.
3. Plant Adaptations (Xerophyte, Hydrophyte, Halophyte, Epiphyte, Ecotypes, Ecades) with special reference to morphological, anatomical and physiological adaptations in response to, water temperature, light and salinity etc.

Unit- III (Soil Science) :

1. Soil texture and soil types.
2. Soil moisture constants (characteristics)
3. Soil fertility.

Practical Exercises (Based on Paper-I)

1. To determine minimum number and minimum size of quadrat for reliable estimate of grassland vegetation.
2. Study of community- Determination of frequency and relative frequency, density and relative density, dominance and relative dominance, Important Value-Index (IV) by quadrat method
3. To measure soil moisture Constants.
4. Observation of soil texture, rapid test of P^H , deficiency of N,P,K.
5. Determination of transpiration/turbidity of different water bodies using suchi disc and test of P^H of Water at different pollution levels.

B.Sc. III (Botany)**Paper- II****(Biotechnology, Plant Breeding, Plant Propagation.)****Unit-I (Biotechnology)**

1. General principles of gene cloning and genetic engineering.
2. Tools and techniques of recombinant DNA - technology, vectors, Genomic and C. DNA library.
3. Development of transgenic plants - (general account)
4. Biofertilizers.

Unit-II (Plant Breeding) :

1. Basic concept of hybridization, Hybrid vigor.
2. Types of reproduction in flowering plants.
Improvement of crop varieties for higher yield, disease resistance, stress resistance through plant breeding.

Unit-III (Plant Propagation)

1. Preparation of nursery beds
2. Vegetative propagation of soft wood, semihard-wood and hard wood plants.
3. Cutting, budding, Grafting, Gutt, Leaf cuttings, Layering, Micropropagation by tissue culture
4. Cell / tissue culture, organ, and proplast culture

Suggested Practical Exercises (Based on Paper-II)

1. Preparation of nutrient medium for tissue culture.
2. Test of seed viability by tetrazolium salt.
3. Emasculation of flower bud for hybridization and to describe method and Precautions
4. Demonstration of various methods of vegetable propagation.

B.Sc. III (Botany)**Paper-III****Development and reproduction in Flowering Plants/
Embryology****Unit-I (Plant development)**

1. Apical Shoot and root meristem- histological organization.

2. Formation of internode, monopodial and sympodial development.
3. Differentiation of Primary and secondary tissues in plants.

Unit-II (Reproduction/Embryology)

1. Microsporogenesis- Structure and development of anther and male gametophyte
2. Megasporogenesis- Structure and development of embryo sac (female gametophyte) and ovule.
3. Pollination and fertilization.
4. Development of endosperm.
5. development of embryo in dicot and monocot.
6. Apomixis, polyembryony, parthenocarpy (a general account).

Suggested Practical Exercises (Based on Paper- III)

1. Study of permanent slide of T.S. of anther, pollen germination, type of ovules.
2. Dissection of embryo with haustoria from given seed material.

B.Sc. -III (Botany)

Paper-IV

(Applied Botany)

Unit-I

1. Photosynthesis as parameter of plant productivity Importance of C_4 plants, photorespiration and their role in crop production.
2. Role of photoperiodism and vernalization in Crop production.
3. Phytohormone- role in crop improvement and production.
4. Role of Physiological stresses : water stress and salt stress and crop production.

Unit-II

1. Application of Parthenocarpy in production of seedless fruits.
2. Plants Microtechnique : An introduction, with reference to collection, fixation & fixatives, embedding, Sectioning and microtomy, stains and staining technique (Principle/process). Preparation of double stained permanent slides.
3. An introductory of microscopy : Light microscope, phase contrast microscope, Transmission electron Microscope (TEM) and Scanning electron Microscope (SEM).

Scheme of B.Sc.-III Botany Practical Examination**Time 4. hrs.****Max Marks. 100**

1. Study of ecological community one experiment based on plant ecology 15
2. Preparation of double stained slide of hand section of anatomical material with particular reference to principle, method and precautions 15
3. Emasculation of given flower bud with description of principle, method and precautions. 10
4. Dissection of embryo of the given seed material 10
5. Determination of soil moisture constants of given soil sample 10
6. Comment upon the Spots (1-10), based on ecological adaptations, embryology, soil types, ecological instruments and vegetative propagation 10
7. Viva- voce 10
8. Collection / Model / Records 10