

# **BOTANY**

## **B.Sc .Botany (Honours) Three Years Degree Course.**

There shall be two theoretical and one practical paper each in the I year and II year examinations, carrying 75 marks in each theory paper and 50 Marks in each practical paper. In the III year , there shall be three theory and one practical paper , carrying 100 marks each.

### **B.Sc. (H) Part-I**

<b>Paper I</b> : General Biology, Microbiology, Mycology and Plant Pathology	3 Hrs	75 marks each
<b>PaperII</b> : Plant Diversity	3 Hrs	

Practical based on Paper I and II 4Hrs- 50Marks.

### **B.Sc. (H) Part-II**

<b>Paper III</b> : Angiosperms and Economic Botany	3 Hrs	75 marks each
<b>PaperIV</b> : Cell Biology, Cytogenetics and Plant Breeding	3 Hrs	

Practical Based on Papers III & IV 4Hrs- 50Marks.

### **B.Sc. (H) Part III**

<b>PaperV</b> : Molecular Biology and Biotechnology. <b>PaperVI</b> : Plant Physiology and Biochemistry <b>PaperVII</b> : Biodiversity and Enviromental Biology <b>Paper VIII</b> : Practicals based on papers V, VI, and VII	Theory - 3 Hours each  Practical – 6 Hours	100 marks each
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## **B.Sc. Part I Botany Honours (Theory Papers.)**

### **Paper I: General Biology, Microbiology, Mycology and Plant Pathology.**

Ten questions are to be set, three each from group A and group B and four from group C.  
Five questions are to be answered, selecting at least one question from each group.

#### **Group A: General Biology & Microbiology**

##### **(i) General Biology**

1. An elementary study of origin of life, Evolution, Natural Selection, Darwinism and Neo Darwinism.
2. A Comparative account of two kingdom, five kingdom and three domain classification system.

##### **(ii) Microbiology**

1. Conceptual History of Microbiology
2. Techniques of isolation of Micro-organisms and Culture media preparation.
3. Structure, growth and reproduction of Bacteria.
4. Structure and reproduction of TMV and bacteriophages.
5. Industrial Importance of Bacteria
6. Roles of Microbes in nitrogen fixation.
7. Structure, reproduction and economic importance of Cyanobacteria.

#### **Group B: Mycology**

1. General Study of structure, reproduction and classification of fungi.
2. Structure and life History of following genera; *Synchytrium*, *Albugo*, *Eryisphe*, *Peziza*, *Ustilago*, *Puccinia*, and *Alternaria*.

#### **Group C: Plant Pathology**

1. Role of Toxin and Enzymes in plant diseases.
2. Etiology, Symptoms and Control of the following plant diseases.
  - (a) Late blight of Potato
  - (b) Wart disease of Potato
  - (c) White rust of Crucifers.
  - (d) Powdery mildews
  - (e) Loose Smut of wheat.
  - (f) Brown Leaf Spot of Rice.
  - (g) Rust of Wheat and Linseed.
  - (h) Red Rot of Sugarcane.
  - (i) Wilt of Pigeon Pea.
  - (j) Citrus Canker.
  - (k) Tobacco Mosaic Disease.
  - (l) Little Leaf of Brinjal.
3. Transmissions of Plant Viruses and Control measures.

## **Paper II: Plant Diversity**

Ten questions are to be set , five from group A and five from group B. Five questions are to be answered, selecting at least two questions from each group.

### **Group A.**

#### **(a) Algae -**

1. A general Study of the structure, reproduction and classification of Algae.
2. Structure, Life History and evolutionary significance of following genera.

***Nostoc, Rivularia, Chlamydomonas, Volvox , Oedogonium, Chara, Vaucheria, Ectocarpus, Fucus, Batrachospermum, and Polysiphonia.***

#### **(b) Lichens - A general account**

#### **(c) Bryophytes -**

1. General characteristics and classification of Bryophytes.
2. A comparative study of the structures and life history of the following genera with particular reference to gametophytes and sporophytes.

***Marchantia, Pellia, Anthoceros, Sphagnum and Pogonatum.***

### **Group B.**

#### **(a) Pteridophytes -**

1. General Characteristics and Classification
2. Stelar Evolution
3. Structures and life history of the following:

***Psilotum, Lycopodium, Selaginella , Equisetum, Marsilea, Ophioglossum and Azolla***

4. Fossils: ***Rhynia, Lepidodendron*** and ***Calamities***

**(b) Gymnosperms-** A Comparative and Evolutionary study of the morphological, anatomical and embryological features of gymnosperms with special reference to the following taxa-

Living: ***Cycas, Pinus, Taxus*** and ***Gnetum.***

Fossils: ***Lygenopteris*** and ***Cycadaeoidea.***

## **B.Sc. Part I Botany Honours (PRACTICALS.)**

**Time: 4Hours**

**Full Marks 50**

### **Microbiology, Mycology, Plant Pathology and Plant Diversity**

**1. Any one of the following:**

- Study of bacterial and viral disease. or
- Gram staining . or
- Preparation of a solid culture medium. or
- Isolation and inoculation of saprophytic fungi.

**2. Study the local fungal diseases.**

**3. Preparation of temporary stained microscopic slide of the forms prescribed in the syllabus and their identification.**

(i)	Algae	-	03
(ii)	Lichen	-	02
(iii)	Bryophyte/Pteridophyte	-	05
(iv)	Gymnosperms	-	05

**4. Comments upon the spots (1-5)**

**5. Class record**

**6. Viva-voce**

## **B.Sc. Part II Botany Honours (Theory Papers.)**

### **Paper III - Angiosperms and Economic Botany.**

In all ten questions are to be set, at least three from Group A and Two each from Group B and Group C and three questions from group D. Five questions are to be answered, Selecting at least one question from each group.

#### **Group A: Taxonomy:**

- 1. Introduction:** Systematic, Taxonomy, Nomenclature, Classification and Phylogeny, Phenetics, Phyletic and Cladistics.
- An elementary study of International Code of Botanical Nomenclature with particular references to the following -  
Naming of taxa, Nomenclatural types (Holotype, Isotype, Paratype, Syntype, lectotype and neotype) and Rule of priority.
- A comparative study of the classification systems of :
  - Carolus Linnaeus.
  - G. Benthem & Hooker
  - Adolf Engler & Karl Prantl
  - John Hutchinson.
- A study of diagnostic features and relationships of : **Ranunculaceae, Annonaceae, Magnoliaceae, Cryophyllaceae, Tiliaceae, Euphorbiaceae, Curubitaceae, Rubiaceae, Apocynaceae, Asclepiadaceae, Boraginaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Orchidaceae, Commelinaceae, Cyperaceae and Poaceae.**

#### **GroupB : Anatomy:**

- Mechanical tissues –their structure, distribution and function..
- Organisation of Tissue in relation to environment.
- Anomalous secondary growth.
- Periderm- Structure, origin and function.
- Meristems structure and function. Various theories regarding organization of special meristems.

#### **Group C: Embroyology:**

1. Microsporogenesis and male gametophyte.
2. Megasporogenesis and female gametophyte.
3. Fertilization.
4. Embroygeny.
5. Endosperm.
6. An elementary study of experimental embryology.

#### **Group D: Economic Botany**

1. Cereals.
2. Pulses
3. Oil Seeds
4. Sugar and Starch Yielding plants
5. Fruits and Vegetables.
6. Spices and Condiments
7. Beverages, Narcotics, gums, resins and rubber
8. Essential Oil.
9. Fiber Yielding Plants
10. Timber Yielding Plants.
11. Medicinal Plants.

## **Paper IV: Cell Biology, Cytogenetics and Plant Breeding**

In all ten questions are to be set, five from Section A and five from Section B. Five questions are to be answered, selecting at least two from each selection.

### **Section A: Cell Biology**

1. Conceptual history, cell theory, a comparative account of pro-and eukaryotic cells, characteristics of archaebacteria and mycoplasma.
2. Structure and function of cell organelles.
3. Cell wall and Cell membrane.
4. Ultrastructure of chromosomes.
5. Cell Division and its regulation.
6. Techniques in cell biology:
  - ◆ Principle of light, phase contrast, fluorescence and electron microscopy, autoradiography and their application.
  - ◆ Staining techniques: Acetocarmine and Feulgen

### **Section B: Cytogenetic and Plant Breeding**

1. Structure of the nucleus and chromosomes including Lampbrush Chromosomes, B-Chromosomes, Polytene Chromosomes.
2. Cell Cycle, Mitosis and Meiosis.
3. Physical and Chemical Basis of Heredity.
4. Mendelian Inheritance.
5. Interaction of genes.
6. Polyploidy.
7. Chromosomal aberrations.
8. Linkage and Crossing Over.
9. Structure, Replication and expression of DNA, Genetic Code.
10. Mutation: Induction and biochemical basis.
11. One gene-One Polypeptide chain Hypothesis.
12. Extra nuclear Inheritance.
13. Chromosomal and genetic sex-determination mechanism and Sex-Linked inheritance.
14. Human Genetics.
15. Genetics of bacteria and their viruses with special reference to conjugation, transduction and transformation.
16. Cytogenetic in crop Improvement.
17. General Principles of breeding for crop improvement.
18. Centres of origin of cultivated plants.

## **B.Sc. Part II Botany Honours (Practical)**

Based on Paper III and Paper IV

Time:-4Hours

Full Marks-50

1. Study of various stages of mitosis and meiosis using appropriate plant material. (6 marks)
2. Genetical problems based on interaction of genes. (6 marks)
3. Systematics study of a flowering plant and identification up to the rank of family. (8 Marks)
4. Anatomical Study of anomalous secondary growth. (6 Marks)
5. Study of economic botany. (4 Marks)
6. Spots 1-5. (5 Marks)
7. Viva-Voce (5 Marks)
8. Class record (10 Marks)

## **B.Sc. Part III Botany Honours (Theory Papers.)**

### **Paper V: Molecular Biology and Biotechnology**

In all ten questions are to be set. Five questions are to be answered

1. DNA replication and repair: General Principles, Mechanism of Prokaryotic and Eukaryotic replication; DNA damage and repair (mismatch repair, nucleotide excision repair, base excision repair)
2. Transcription and Translation: General Principles and mechanism of transcription and translation in prokaryotes and eukaryotes.
3. Gene Regulation: Prokaryotic gene regulation (Operon Concept), Inducible and repressible system. An elementary study of eukaryotic gene regulations.
4. Genetic Engineering: Tools and Techniques of genetic engineering, Restriction enzymes and Ligase, Reverse transcriptase, Cloning vectors: Plasmids and Phage.
5. Isolation and synthesis of foreign DNA: cDNA synthesis, Organochemical synthesis of gene; genomic library & cDNA library.
6. Strategy for creation of recombinant DNA and its transfer in host.
7. PCR and DNA fingerprinting.
8. Role of genetic engineering in human welfare.
9. Plant Biotechnology: An introduction to tissue culture; Definition, Principle and significance of tissue culture; Requirements for growth and differentiation of cultured cells and tissues.
10. Explant culture and protoplast culture.
11. Application of plant tissue culture: Commercial applications of plant tissue culture; Mass preparation of transgenic plants.
12. Bioinformatics: An elementary study.

## **Paper VI: Plant Physiology and Biochemistry**

In all ten questions are to be set. Five questions are to be answered at least one questions from each section.

### **Section A - PLANT PHYSIOLOGY**

1. Imbibition, Diffusion and Osmosis.
2. Active and passive transport of water and solutes.
3. Conductive of water.
4. Phloem transport.
5. Mechanism of stomatal movement and factors controlling it.
6. Photosynthesis: Pigment system, Photophosphorylation, Calvin cycle and Hatch & Slack cycle.
7. Respiration: Glycolysis, Krebs's Cycle, oxidative phosphorylation.
8. Phytohormones: General account and roles of Auxins, Giberellins and Cytokinins.
9. Physiology of flowering: Photoperiodism, role of pigment and hormones.
10. Vernalisation.
11. Growth and Differentiation.
12. Plant Movement.
13. Biological Nitrogen fixation and its mechanism.
14. Micro and Macro nutrients and their role in plant nutrition.
15. Fat Synthesis.

### **Section B – BIOCHEMISTRY**

1. Biochemical Component of the cell: Carbohydrate, Proteins, Fat and Nucleic Acid.
2. Enzymes: Classification nomenclature, Physio-Chemical Properties, Co-factors and Coenzymes, Iso-enzymes, Kinetics of enzyme action, significance, factors affecting enzyme activity.
3. Secondary plant metabolites and their roles.
4. Protein synthesis.
5. Regulation of protein synthesis in prokaryotes and eukaryotes.

## **Paper VII: Biodiversity and Environmental Biology**

In all ten questions are to be set. Five questions are to be answered

1. An introduction to the concept of Biological Diversity/Biodiversity, Loss of Biodiversity and Conservation.
2. An elementary study of the causes and consequences of loss of biodiversity and conservation strategies.
3. Concept of Environment, Ecology, Environmental Science Environmental Biology Biosphere, Biome, Ecosystem, Habitat, Niche, Community and population.
4. Concept autecology and synecology. Methods of studying autecology and Synecology.
5. Structure and Function of Ecosystem. A general Study of grass land, fresh water and forest ecosystem.
6. Ecological energetics: Energy environment; Fixation of energy by autotrophs; Energy flow beyond producers and concept of productivity, food chains and food webs; Energy flow models; Energy pyramids and biomass.
7. Biogeochemical Cycles: Hydrological cycle and water harvesting; Gaseous and sedimentary nutrient cycle.
8. Community Ecology Structure and organization individualistic and organismic nature of communities; functional aspects of communities. Methods of studying plant communities with the help analytical and synthetic characters. Ecological Succession seral and climax communities, succession in terrestrial and aquatic ecosystem.
9. Population Ecology, An Elementary study of population growth structure and population regulation.
10. Ecological factors: insolation, precipitation and climate, edaphic factors, biotic factors.
11. Environmental pollution and public health: Environmental pollutants, Air and water pollution, Radioactive and Noise Pollution; Pollution control measures.
12. Major vegetational belts of India.
13. An elementary study of Aerobiology.
14. An introduction to MAB programme, Resource Ecology, Conservation Forestry, Wild Life Management and Aquaculture.

## **Paper VIII: PRACTICALS**

**Time – 3 Hours**

**Full Marks - 100**

### **Molecular Biology and Biotechnology, Physiology and Biochemistry and Environmental Biology**

1. A major experiment in Plant Physiology/Biochemistry. (20 marks)
2. A minor experiment in Plant Physiology/Biochemistry. (10 marks)
3. A major experiment in Molecular Biology/Biotechnology. (12 marks)
4. A minor experiment in Molecular Biology/Biotechnology. (08 marks)
5. Field Study of Community structure. (10 marks)
6. Laboratory Experiment on :
  - Plant ecology (05 marks)
  - Aerobiology (05 marks)
7. Spotting (10 marks)
8. Class records (10 marks)
9. Viva voce (10 marks)

## **B.Sc. Botany Subsidiary Course**

Each year there shall be one paper of theory carrying of 75 marks and one paper of practical carrying 25 marks, each of three hours duration.

### **1st Year: Paper I**

**Time : 3 Hours**

**Full Marks - 100**

**Section A:** Microbiology

**Section B:** Cryptogams

**Section C:** Phanerogams

### **Practical based on Paper –I**

### **1st Year: Paper II**

**Time : 3 Hours**

**Full Marks - 100**

**Section A:** Plant Physiology and Biochemistry.

**Section B:** Environmental Biology

**Section C:** Cell Biology, Cytogenetic and Plant Breeding.

### **Practical based on Paper –II**

## **B.Sc. Part-I , Botany Subsidiary Course (Theory)**

**Time 3 hours**

**Full Marks: 75**

In all ten questions are to be set, **Two** from section **A**, Three from section **B** and **five** from section **C**.  
Five questions are to be answered, selecting atleast from each section.

### **SECTION A: MICROBIOLOGY**

1. **Viruses** – A general account.
2. **Bacteria** – Structure, Growth and Reproduction.
3. Economic importance of viruses and bacteria.

### **SECTION B: CRYPTOGAMS**

Structure, life history, diagnostic features and economic importance of Algae, Fungi, Lichens, Bryophytes, and Pteridophytes based on the types whatever mentioned.

1. **Algae:** *Nostoc, Oedogonium, Chara, Vaucheria, Ectocarpus* and *Batrachospermum*.
2. **Fungi:** *Albugo, Peziza* and *Puccinia*
3. **Lichens:** A general account
4. **Bryophytes:** *Marchantia, Anthoceros* and *Sphagnum*.
5. **Pteridophytes:** *Selaginella, Equisetum* and *Marsilea*.

### **SECTION B: PHANEROGAMS**

1. **Gymnosperms:** Morphology, Anatomy and Reproduction of *Cycas* and *Pinus*
2. **Angiosperms:**

#### **(a) Taxonomy:**

- (i) Classification of Angiosperms with reference to the system of classification of systems of George Bentham & J.D Hooker, Adolf Engler & Karl Prantl and John Hutchinson.
- (ii) Important rules of plant nomenclature.

A study of diagnostic features and evolutionary relationships of the following families of Angiosperms:

- Ranunculaceae
- Euphorbiaceae
- Cucurbitaceae
- Apocynaceae
- Acanthaceae
- Lamiaceae
- Amaranthaceae
- Cyperaceae
- Poaceae

#### **(b) Anatomy:**

- (i) Meristem
- (ii) Initiation, activity and functions of cambium.
- (iii) Anomalous secondary growth in *Boerhavia, Tinospora* and *Dracaena*
- (iv) Rootstem transition.

#### **(c) Embryology:**

- (i) Structure and development of anther, pollen grains, embryo sac, endosperm and embryo.
- (ii) A general account of the process of fertilization.
- (iii) An elementary study of experimental Embryology.

**B.Sc. Part-I Botany Subsidiary Course**  
**(PRACTICAL)**

**Cryptogams and Phanerogams**

Time – 3 Hours

Full Marks – 25

1. Study of structural details of algae, fungi, bryophytes, pteridophytes and gymnosperms included in the syllabus with the help of temporary slide preparation. (08 marks)
2. Description of an angiosperm plant belonging to a family prescribed in the syllabus and identification up to family level. (04 marks)
3. Study of the primary and secondary (Both normal and abnormal) structure of roots and stems of following plants. (03 marks)
4. Spots 1-5 (05 marks)
5. Practical records (05 marks)

## **B.Sc. Part-II, Botany Subsidiary Course (Theory)**

**Full Marks – 75**

**Time – 3 Hours**

In all ten questions are to be set, three each from section A and Section B and four from section C five questions are to be answered, selecting at least one from each section.

### **Section A: Plant Physiology and Biochemistry**

1. Water and mineral absorption.
2. Transpiration stomatal movement.
3. Mineral nutrition and the role of macronutrients.
4. Photosynthesis, mechanism in C<sub>3</sub> and C<sub>4</sub> plants and factors.
5. Respiration: Aerobic and anaerobic, Glycolysis, Krebs's cycle and Electron transport.
6. Nitrogen Cycle, Symbiotic and asymbiotic nitrogen fixation.
7. Hormones – a general account.
8. Growth-Role of light, temperature and humidity.
9. Movements –Phototropic and Geotropic movements.

### **Section B: Environmental Biology**

1. Plant Communities and ecosystem.
2. Succession (Hydrosere and Xerosere).
3. Enviromental factors affecting vegetation.
4. Pollution: Types, Causes, Prevention and Control.

### **Section C: Cell Biology, Cytogenetic and Plant Breeding**

1. Ultra Structure of cell.
2. Cell Division: Mitosis and Meiosis.
3. Mendel's Laws of inheritance.
4. Linkage and crossing over.
5. Structure and replication of DNA.
6. An elementary study of Polyploidy, Chromosomal aberrations and mutation.
7. An elementary study of Biotechnology
8. An elementary study of plant breeding.

**B.Sc. Part-II Botany Subsidiary Course**  
**(PRACTICAL)**

Time – 3 Hours

Full Marks – 25

1. Plant physiology experiment to be performed. (07 Marks)
2. Ecology adaptations in hydrophytes, Mesophytes, Xerophytes and epiphytes. (05 Marks)
3. Performance of Biochemical test. (03 Marks)
4. Spotting 1-5. (05 Marks)
5. Practical Records. (05 Marks)