

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

Paper I : General Biology, Microbiology, Mycology and Plant Pathology	3Hrs	75Marks.
PaperII: Plant Diversity	3Hrs	75Marks.
Practical based on Paper I and II	4Hrs	50Marks.

B.Sc.(H) Part-II

Paper III: Angiosperms and Economic Botany	3Hrs	75Marks.
PaperIV: Cell Biology, Cytogenetics and Plant Breeding	3Hrs	75Marks.
Practical Based on Papers III & IV	4Hrs	50Marks.

B.Sc.(H) Part III

PaperV: Molecular Biology and Biotechnology.	3Hrs	100Marks.
PaperVI: Plant Physiology and Biochemistry	3Hrs	100Marks.
PaperVII: Biodiversity and Enviromental Biology	3Hrs	100Marks.
Paper VIII: Practicals based on papers V, VI, and VII	4Hrs	100Marks.

B.Sc. Part I Botany Honours
Theory Papers.

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

Time:-3Hours.

Full Marks 75

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. *(Lamarckism must be included in the syllabus)*
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*, *Erysiphe*, *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

Time :3Hours

Full Marks:75

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 alge.
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 lfie 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 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.

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 C: Phanerogames

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

(i) Taxonomy:

(a) Classification of Angiosperms with reference to the system of classification of systems of George Benthem & J.D Hooker Adolf Engler & Karl Prantl and John Hutchinson.

(b) Important rules of plant nomenclature:

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

- (a) Ranunculaceae (b) Euphorbiaceae, (C) Curubitaceae (d) Apocynaceae, (e) Acanthaceae
(f) Lamiaceae, (g) Amaranthaceae (h) Cyperaceae and (i) Poaceae.

(ii) Anatomy:

(a) Meristem

(b) Initiation, activity and functions of cambium

(c) Anomalous secondary growth in *Boerhaavis*, *Tinospora* and *Dracaena*

(d) Rootstem transition.

(iii) Embryology:

(a) Structure and development of anther, pollen grains, embryo sac, endosperm and embryo.

(b) A general account of the process of fertilization.

(c) An elementary study of experimental Embryology.

B.Sc . Part-I , Botany Subsidiary Course.

Practicals

Cryptogams and Phanerogams

Time:-3Hours

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. 08marks
2. Description of an angiospermic plant belonging to a family prescribed in the syllabus and identification up to family level. 04marks
3. Study of the primary and secondary (Both normal and abnormal) structure of roots and stems of following plants. 03marks
4. Spots 1-5 05marks
5. Pratical Records. 05marks

B.Sc . Part-II Botany Honours

Theory Papers

Paper III:- Angiosperms and Economic Botany.

Time:- 3Hours

Full Marks:75

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,Phyletics and Cladistics.
2. An elementary study of nomenclatural with particular references to the following:- Naming of taxa , Nomenclatural tupes (Holotype, Isotype , Paratype,Syntype, lectotype and neotype) and rule of priority.
3. A comparative study of the classification systems of Carolus Linnaeus. G. Benthem &J.D Hooker Adolf Engler & Karl Prantl and John Hutchinson.
4. A study of diagnostic features and relationships of Ranunculaceae, Annonaceae, Magnoliaceae, Cryophyllaceae, Tiliaceae, Euphorbiaceae, Curubitaceae, Rubiaceae, Apocynaceae,

Asclepiadaceae, Bonaginaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Orchidaceae, Comunelinaceae, Cyperaceae and Poaceae.

Group B : Anatomy

1. Mechanical tissues –their structure , distribution and function.
2. Orgnaisation of Tissue in relation to environment.
3. Anamalous , origin and function.
4. Peiderm –Structue and function , various theories regarding organization of special meristems.
5. Meristerms structure and function , various theories regarding organization of special meristems.

Group C: Embryology

1. Microsporogenesis and male gametophyte.
2. Megasporogenesis and female gametophyte
3. Fertilizaiton
4. Embroygency
5. Endosperm
6. An elementar4y 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

Time:-3 Hours

Full Marks 75

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 cello biology
 - (a) Principles of light, Phase Contrast, fluorescense and Electron microscopy, autoradiography and their application.
 - (b) Staining Techniques : Acetocarmine and Fuelgen.

Section B :- Cytogenetics 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. Interaciton 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. Extranuclear 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. Cytogenetics in crop Improvement.
17. General Principles of breeding for crop improvement
18. Centres of origin of cultivated plants.

B.Sc Part-II , Botany Hons.

Practicals

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 | 6marks |
| 2. Genetical Problem Base on interaction of genes | 6marks |
| 3. Systematics study of a flowering plant and identification up to the rank of family | 8marks |
| 4. Anatomical Study of anomalous secondary growth. | 6marks |
| 5. Study of economic botany | 4marsk |
| 6. Spots 1-5 | 5marks |
| 7. Viva-Voice | 5marks |
| 8. Class record | 10marks. |

B.Sc Part-II, Botany Subsidiary Course

Theory

Paper-II

Full marks-75

Time:-3Hours

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_3 & C_4 plants and factors
5. Respiration : Aerobic and anaerobic, Glycolysis , Kreb's cycle and Electron transport.
6. Nitrogen Cycle, Symbiotic and asymbiotic nitrogen fixation.
7. Hormones – a general account.
8. Growth-Role of light, temperature an humidity.
9. Movements –Phototropic and Geotropic movements.

Section B ; Enviromental 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 river
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

Practicals

Time 3 hours

Full Marks 25

- | | |
|---|---------|
| 1. Plant physiology experiment to be performed. | 7 marks |
| 2. Ecology adaptations in hydrophytes, Mesophytes, Xerophytes and epiphytes | 5 marks |
| 3. Performance of Biochemical test | 3 marks |
| 4. Spotting 1-5 | 5 marks |
| 5. Practical Records | 5 marks |

B.Sc Part-III Botany Honours

Theory Papers

Paper V:- Molecular Biology and Biotechnology

Time – 3Hours

Full Marks:-100

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 Phages.
5. Isolation and synthesis of foreign DNA: DNA 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. Explain culture and protoplast culture.
11. Application of plant tissue culture : Commercial applications of plant tissue culture : Mass propagation Transgenic plants.
12. Bioinformatics: An elementary study.

**B.Sc Part-III Botany Honorous
Paper-VI : Plant Physiology and Biochemistry**

Time:-3Hours

Full marks-100

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. Mechansim of stomatal movement and factors controlling it.
6. Photosynthesis : pigment system, Photophosphorylaiton, Clavin cycle and Hatch & Slack cycle
7. Respiration:Glycolysis, Kreb'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, Cofactors and Coenzymes, Isoenzymes, Kinetic of Enzyme action,Significance, factors affecting enzyme activity.
3. Secondary plant metabolities and their roles.
4. Protein synthesis.
5. Regulation of protein synthesis in prokaryotes and eukaryotes.

B.Sc Part-III Botany Honours
Paper-VII : Biodiversity and Environmental Biology

Time: 3 hours

Full Marks: 100

In All **Ten** Question are to be set. **Five** Question 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 autoecology and synecology. Methods of studying autecology and Syecology.
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 Eactors : insolation precipitaon and climate edaphic factors, biotic factors.
11. Envirnomental Population and public Health : Environmental pollutants Air and water pollution Radioactive and Noice Pollution ; Pollition control message.
12. Major vegetational belts of india.
13. An elementary study of Aerobiology.
14. An introduction to MBA programme, Resource Ecology Conservation Forestry Wild Life Management and Aquaculture.

Paper-VIII
Practicals

Time:-6Hours

Full Marks -100

Molecular Biology and Biotechnology, Physiology and Biochemistry and Environmental Biology

1. A major experiment in Plant Physiology/Biochemistry	20
2. A minor experiment in Plant Physiology/Biochemistry	10
3. A major experiment in Molecular Biology/Biotechnology	12
4. A minor experiment in Molecular Biology/Biotechnology	08
5. Field Study of Community structure	10
6. Laboratory Experiment on-	
(a) Plant Ecology	05
(b) Aerobiology	05
7. Spotting	10
8. Class Records	10
9. Viva –Voice	10