FACULTY OF SCIENCE

SYLLABI

FOR

B.Sc. (HONOURS SCHOOL) BOTANY
3rd TO 6th SEMESTER

EXAMINATIONS
2016-2017

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Outlines of tests, syllabi and courses of reading in the subject of Botany for B.Sc. 
(Hons. School) semester III-VI examinations of 2016-17

B.Sc. (Hons. School) Semester-III

THEORY (500 Marks)

Paper I : Pteridology 75 (60A+15CA) + 25 (20A+5CA)
Paper II : Plant Anatomy 75 (60A+15CA) + 25 (20A+5CA)
Paper III : Ethnobotany 75 (60A+15CA) + 25 (20A+5CA)
Paper IV : Subsidiary 75 (60A+15CA) + 25 (20A+5CA)
Paper V : Subsidiary 75 (60A+15CA) + 25 (20A+5CA)

B.Sc. (Hons. School) Semester-IV

THEORY (500 Marks)

Paper I : Gymnosperms 75 (60A+15CA) + 25 (20A+5CA)
Paper II : Plant Morphogenesis 75 (60A+15CA) + 25 (20A+5CA)
Paper III : Paleobotany 75 (60A+15CA) + 25 (20A+5CA)
Paper IV : Subsidiary 75 (60A+15CA) + 25 (20A+5CA)
Paper V : Subsidiary 75 (60A+15CA) + 25 (20A+5CA)

B.Sc. (Hons. School) Semester-V

THEORY (500 Marks)

Paper I : Taxonomy of Angiosperms 75 (60A+15CA) + 25 (20A+5CA)
Paper II : Plant Ecology 75 (60A+15CA) + 25 (20A+5CA)
Paper III : Genetics 75 (60A+15CA) + 25 (20A+5CA)
Paper IV : Plant Breeding 75 (60A+15CA) + 25 (20A+5CA)
Paper V : Molecular Biology 75 (60A+15CA) + 25 (20A+5CA)

B.Sc. (Hons. School) Semester-VI

THEORY (500 Marks)

Paper I : Mycology and Lichenology 75 (60A+15CA) + 25 (20A+5CA)
Paper II : Plant Physiology 75 (60A+15CA) + 25 (20A+5CA)
Paper III : Plant Biochemistry 75 (60A+15CA) + 25 (20A+5CA)
Paper IV : Microbiology – Viruses, Bacteria, Mycoplasma 75 (60A+15CA) + 25 (20A+5CA)
Paper V : Embryology of Angiosperms 75 (60A+15CA) + 25 (20A+5CA)

B.Sc. (Hons. School) Semester-III Botany (Subsidiary)

Paper-I : Plant Diversity – III (Plant Anatomy, Applied Botany & Cytogenetics) 75 (60A+15CA) + 25 (20A+5CA)

B.Sc. (Hons. School) Semester-IV Botany (Subsidiary)

Paper-I : Plant Diversity – IV (Plant Ecology & Physiology) 75 (60A+15CA) + 25 (20A+5CA)
Objective: To acquaint the students about the classification, morphology, biology and economic importance of various pteridophytic plants.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper-setter

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I
1. General characters of Pteridophytes.
2. Geological history of the earth, types of fossils and their formation.

UNIT-II
4. Evolution of stelar system: Telome theory.

UNIT-III
5. The earliest known records of Pteridophytes with special reference to Rhynia, Zosterophyllum, Asteroxylon, Sphenophyllum.

UNIT-IV
6. Distribution pattern, habitat, morphology, and life cycles in the following genera: Psilotum, Lycopodium, Selaginella, Isoetes, and Equisetum.

Practicals
1. Study of morphology, anatomy and reproductive organs of Lycopodium, Selaginella, Isoetes and  Equisetum.
2. Study of fossil representatives from permanent records.
3. Study of some Pteridophytes in their natural habitats.
Essential Readings


Further Readings


Syllabi for B. Sc. (Hons. School) III Semester Botany

**Paper- II: Plant Anatomy**

**Theory**: 75 (60A+15CA)

**Practical**: 25 (20A+5CA)

**Objective**: To acquaint the students about the detailed anatomical studies of various tissues and plant organs.

**Teaching Methodology**: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

**Instructions for the paper-setter**

Question paper will have *four* units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

1. History, scope and importance of plant anatomy.
2. Tissue Systems
   (a) Epidermal: stomata, trichomes, nectaries, hydathodes;
   (b) Fundamental: parenchyma, collenchyma, and sclerenchyma; distribution of mechanical tissue.

**UNIT-II**

(c) Vascular: Xylem: general structure of primary and secondary xylem, cell types; Phloem: cell types, primary phloem, secondary phloem.

**UNIT-III**

5. The Stem: Primary and secondary state of growth.

**UNIT-IV**

6. Leaf: Basic structure and development of monocot and dicot leaves.
7. Meristems: Shoot apex, root apex and floral apex.

**Practicals**

Practicals based on theory topics.
Essential Readings


Further Readings

5. Mauseth, J.D. *Plant Anatomy*. The Benjamin/Cummings Publisher, USA, 1988

Syllabi for B. Sc. (Hons. School) III Semester Botany

**Paper- III: Ethnobotany**

**Theory:** 75 (60A+15CA)

**Practical:** 25 (20A+5CA)

**Objective:** To acquaint the students about the detailed study of ethnobotanical account of different plant groups.

**Teaching Methodology:** It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

**Instructions for the Paper-setter**

Question paper will have **four** units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

1. Ethnobotany – Introduction, Definition and its scope, interdisciplinary approach and contribution to modern world.
2. Ethnic centres of the world with special reference to India; Major and minor tribes, their lifestyle and conservation practices for biodiversity conservation.

**UNIT-II**

3. Documentation of traditional herbal medicine and history of ethnobotany.
5. A general idea of active principle component of plants; their extraction, preparation and characterization of pharmacological purposes.

**UNIT-III**

6. Study of Ethnobotany – quantitative and qualitative analytical methods; e.g. collecting and identifying plants, herbaria and the curation of plant specimens.
7. Herbalist(s) and herbal vendors – their role in ethnobotanical studies.

**UNIT-IV**

9. Screening and evaluation of local plants of Chandigarh urban region for ethnobotanical and medicinal importance.
10. Study of some important plants in mythologies and religions, for examples: Ashoka (*Saraca asoca*), Banyan (*Ficus benghalensis*), Bael (*Aegle marmelos*), Bamboos spp. Banana (*Musa paradisica*), Bhang (*Canabis sativa*), Coconut (*Cocos nucifera*), Lotus (*Nelumbo nucifera*),
Mango (Mangifera indica), Neem (Azadirachta indica), Peepal (Ficus religiosa), Red Sandalwood (Pterocarpus santalinus), Tulsi (Ocimum sanctum).

Practicals

1. Visit to nearby forest area.
2. Identification and description of some plants in relation to ethnobotany.
3. Field identification of 10 plants used by tribals for household purposes.
4. Quantitative estimation of use values of the local plants.
5. Ecology and distribution of some important medicinal plants locally available in Chandigarh urban environment.

Essential Reading


Further Reading


B.Sc. (Hons. School) IV Semester Botany

Paper–I: Gymnosperms

Objective: To acquaint the students about the latest trends in classification, vegetative morphology, and reproductive biology of various specimens of gymnosperms.

Teaching Methodology: It will involve classroom lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:
Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I

1. Developments in classification; criteria, current concepts and characteristics of various groups.

UNIT-II

2. Morphology and life history, including development of gametophyte, sex organs and embryo of Cycas (Cycadales).

UNIT-III

4. Morphology and life history, including development of gametophyte, sex organs and embryo of Pinus (Coniferales).
5. Morphology and life history, including development of gametophyte, sex organs and embryo of Ephedra (Ephedrales).
UNIT-IV
6. Pteridospermic seeds and evolution of seed habit in gymnosperms.
7. Evolutionary status of pteridosperms and their angiospermic affinities.

Practicals
1. Study of morphology, anatomy; and reproductive organs in the available living cycads and taxads.

Essential Reading

Further Reading

B.Sc. (Hons. School) IV Semester Botany

Paper-II : Plant Morphogenesis

Objective: To acquaint the students about the basics of plant morphogenesis, tissue culture techniques and micropropagation of plant specimens.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I
1. Plant Morphogenesis: Definition, Totipotency, Polarity, Regeneration; scope and importance.
2. Plant Tissue and Cell Culture: Introduction, Some commonly used terms, Landmarks on the way, Concept of differentiation, de-differentiation and re-differentiation.

UNIT-II
4. Types of Cultures: Types of cultures, Seed Culture, Embryo culture, Callus culture, Organ culture and Cell culture.
5. Micropropagation: Its definition, introduction, factors affecting different stages of micropropagation i.e. preparative stage, initiation of cultures, multiplication, differentiation, maintenance of plantlets and transfer to green house conditions; its applications.
UNIT-III

6. Callus Cultures: Sources of Material, Isolation of Plant tissues, Preparation of explants, Standard Nutrient media, Basic mineral nutrients, Organic growth factors, Culture techniques, Solid media, Stationary and agitated liquid media, Sub-culture, Organogenesis and differentiation, Preservation of cultures, Histological techniques and Conclusions.

7. Cell Suspension Cultures: Introduction, Culture systems and nutrient media used, Maintenance of stock suspension cultures, Conclusions.

UNIT-IV

8. Protoplast Culture: Isolation, culture and fusion of protoplasts.

Practical

1. General Laboratory, Lay out, equipments used, transfer area, culture facilities, green houses, laboratory and personal safety measures.
2. Requirements of washing area, washing up of glassware and instruments and their sterilization.
3. Requirements of media preparation room, preparation of culture media and sterilization.
4. Steam, dry and ultra violet sterilization, maintenance of aseptic conditions.
6. Requirements of inoculation area, aseptic manipulations
7. Aseptic preparations of different explants and inoculations.
8. Incubation of cultures under different conditions.
9. Observations, data recording; growth measurements
10. To study concept of differentiation, re-differentiation and de-differentiation, under controlled conditions.
11. To study various kinds of callus cultures.

Essential Reading


Further Reading


B.Sc. (Hons. School) IV Semester Botany

Paper-III: Paleobotany

Theory: 75 (60A+15C A)
Practical: 25 (20A+5CA)

Objective: To acquaint the students about the detailed study of fossils bryophytes, pteridophytes and gymnosperms.
**Teaching Methodology:** It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

**Instructions for the paper setter:**

Question paper will have *four* units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

Introduction, Basic principles of paleobotany, Detailed studies on Geologic Time Scale with special reference to the vegetation of each period, Fossilization, Types of Fossils, Techniques to study fossil age. Basic techniques for studying fossil plants.

**UNIT-II**

Fossil Bryophytes

Class Hepaticopsida: Jungermanniales, Metzgeriales, Sphaerocarpales, Marchantiales.

Class Anthoceratopsida: Anthocerotales

Class Bryopsida: Sub-class Sphagnidae-Protophagnales, Sphagnales; Sub-class Andreaeidae – Andreaeales; Sub-class Bryidae – Eubryales.

Origin of Bryophyta (Fossil evidence)

**UNIT-III**

First Vascular Plants - Rhyniales, Zosterophyllales, Trimerophytales, Earliest Lycopods Protopsidendrales, Lepidodendrales, Calamitales, Sphenophyllales, Fossil ferns.

**UNIT-IV**

Fossil Gymnosperms:

- Progymnospermopsida – Pityales, Protopityales, Aneurophytales.
- Cycadopsida – Pteridospermales, Bennettitales, Cycadales, Pentoxyles.
- Coniferopsida – cordiatales, Voltziales, Trichopityales

Fossil Angiosperms: Paleontological study of Angiospermous plants

**Practicals**

Based on theory contents of each unit.

**Essential Reading**


**Further Reading**

B.Sc. (Hons. School) V Semester Botany

Paper–I: Taxonomy of Angiosperms

Theory : 75 (60A+15CA)
Practical:25 (20A+5CA)

Objective: To acquaint the students about the detailed taxonomic study of various angiosperms families and their economic importance.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:
Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I
1. Some relevant information about angiosperms; Artificial, natural and phylogenetic systems of classification; Summary of systems of classification proposed by Bessey, Engler and Prantl, Hutchinson, Takhtajan, Cronquist and Dahlgren. Details of Bentham and Hooker’s system of classification.

UNIT-II
2. Criteria for primitive and advanced nature of families and flowers.
3. Taxonomic literature i.e. manuals, floras etc.

UNIT-III
4. Salient Features and Economic Importance of the Following Dicot Families: Ranunculaceae, Magnoliaceae, Malvaceae, Brassicaceae, Rutaceae, Leguminosae (Fabaceae), Rosaceae, Cucurbitaceae, Apiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Solanaceae, Scrophulariaceae, Bignoniaceae, Polygonaceae, Chenopodiaceae, Acanthaceae, Lamiaceae, Verbenaceae, Nyctaginaceae, Amaranthaceae.

UNIT-IV
5. Salient Features and Economic Importance of the Following Monocot Families; Orchidaceae, Musaceae, Cannaceae, Liliaceae, Amaryllidaceae, Commelinaceae, Cyperaceae, and Poaceae.

Practicals
Study of cultivated and wild representatives of various families for their morphology and primitive and advanced characters; Study of basic structure of flower, variations; Floral parts in detail, floral symmetry, Insertion of floral parts, connation and adnation amongst the floral parts.

Essential Reading

Further Reading
Instructions for the paper setter:
Question paper will have **four** units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

1. **Introduction**: Physical environment; Biotic environment, Biotic and abiotic interactions
2. **Habitat and Niche**: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
3. **Ecosystem Ecology**: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); structure and function of some Indian ecosystems: terrestrial (forest) and aquatic (Pond or Lake).

**UNIT-II**

4. **Population Ecology**: Concept, characteristics of a population, population growth curves and population regulation, Life history strategies (r and k selection).
5. **Community Ecology**: Nature of communities, community structure and attributes, levels of species diversity and its measurement, edges and ecotones.
6. **Synchorology and Synecology**: Distribution of plants, spatial distribution, Relationship between area and species; Interactions between plants and animals; Interactions between plants.

**UNIT-III**

7. **Ecological Succession**: Types, mechanisms, changes involved during succession concept of climax.
8. **Ecological Adaptations**: Concept of ecads, ecotypes; coeno species; species adaptations in relation to soil and water.
9. **Ecosystem Development**: Plant and soil development – concept and strategy.

**UNIT-IV**

10. **Major Terrestrial Biomes**: Tropical, temperate, alpine biomes, Tundra biomes.
11. **Major Aquatic Biomes**: Fresh water and marine biomes.
12. **Biogeography**: Introduction, Biogeographical zones of India, Theory of Island Biogeography

**Practicals**
- Determination of minimum quadrat size and number required to study a plant community.
- Phytosociological analysis of grass land vegetation by quadrat method.
- Evaluation of dominance and importance value index.
- Study of similarity and dissimilarity index between two communities.
- Evaluation of the degree of association between biota of a given environment.
- Determination of physical characteristics of soil like pH, temperature, moisture content, conductivity under different vegetation.
- To study ecological adaptations in hydrophytes and xerophytes.

**Essential Reading**
Further Reading


B.Sc. (Hons. School) V Semester Botany

Paper–III: Genetics

**Theory : 75 (60A+15CA)**

**Practical: 25 (20A+5CA)**

**Objective:** Introduction to basic principles and methodology involved in genetics and cytology and its applications

**Teaching Methodology:** It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

**Instructions for the paper setter:**

Question paper will have *four* units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

1. Elements of heredity and variation: Mendel and his experiments, principles of segregation and independent assortment, test cross and back cross.

**UNIT-II**


**UNIT-III**

5. Quantitative genetics: Quantitative traits and quantitative genetics; the multiple factor hypothesis; descriptive statistics.

**UNIT-IV**

7. Nucleic acids: Structure and biosynthesis of RNA and DNA; DNA as genetic material; transformation, transduction.

**Practicals**

1. Experiments in monohybrid and dihybrid ratios, gene interaction and modified dihybrid ratios.
2. Problems of gene mapping, interference and co-efficient of coincidence.

**Essential Reading**

Further Reading


B.Sc. (Hons. School) V Semester Botany

Paper–IV: Plant Breeding

Objective: Introduction to basic principles and different methods of plant breeding, and their applications.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I
1. Introduction to plant breeding: History, objectives and achievements.
2. Types of plant reproduction; Vegetative, sexual and apomixis; modes of pollination.

UNIT-II
4. Methods of plant improvement: Pure line and mass selection; hybridization in self and cross pollinated crops; introduction and acclimatization; hybrid vigour.

UNIT-III

UNIT-IV

Practicals
1. Hybridization experiments: F₁ and available F₂ material analysis for specific characters.
2. Based on theory contents of each unit.
3. Life cycles: self- and cross- pollinated crops such as rice, wheat and maize.

Essential Reading

Further Reading


B.Sc. (Hons. School) V Semester Botany

Paper-V: Molecular Biology

Theory : 75 (60A+15CA)
Practical: 25 (20A+5CA)

Objective: Objective of this course is to expose students to current knowledge of plant molecular biology and the experimental basis of that knowledge.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I


UNIT-II

3. DNA: detailed structure, DNA as genetic material
4. DNA replication, transcription and translation.
5. Genetic Code: Salient features, wobble hypothesis, deciphering of genetic code, variations in genetic code.

UNIT-III

6. Transposable elements in bacteria, maize and drosophila.
7. Molecular markers: brief account

UNIT-IV

8. Types of microscopes, principles and applications.
9. Regulation of gene expression in prokaryotes.

Practicals

1. Study of various tools used for molecular biology
2. Study of different microscopes and their working.
3. PCR Technique: working and application

Essential Readings

Further Readings


B.Sc. (Hons. School) VI Semester Botany

Paper–I: Mycology & Lichenology

Theory : 75 (60A+15CA)
Practical: 25 (20A+5CA)

Objective: To acquaint the students about the morphology, biology and importance of fungal organisms.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I

1. Characteristic features and classification of fungi.
2. Economic importance of fungi.
3. General account of the following groups of fungi with the help of genera mentioned against each group:
   MYXOMYCOTA : Ceratiomyxa, Physarum, Stemonitis.
   OOMYCOTA : Saprolegnia, Achlya, Pythium, Phytophthora, Peronospora, Albugo.

UNIT-II

4. General account of the following groups of fungi with the help of genera mentioned against each group:
   CHYTRIDIOMYCOTA : Synchytrium, Allomyces
   ZYGOMYCOTA : Rhizopus, Mucor
   ASCOMYCOTA : Saccharomyces, Taphrina, Erysiphe, Phyllactinia, Aspergillus, Penicillium, Xylaria, Pyronema, Ascomobolus, Peziza
   BASIDIOMYCOTA : Agaricus, Hydnum, Clavaria, Polyporus, Lycoperdon, Geastrum, Calvatia, Cyathus, Puccinia
   and Ustilago
   MITOSPORIC FUNGI : Helminthosporium, Cercospora, Pyricularia, Colletotorichum, Alternaria.

UNIT-III

Lichens

5. General account and classification.
6. Thallus organization and reproduction with a particular reference to Parmelia and Usnea.
7. Physiology and nutrition. UNIT-IV

Lichens
8. Symbiosis and synthesis
11. Economic Importance.

Practical
1. To work out the histopathology of the following:
   (a) White rust of Crucifers
   (b) Peach leaf curl
   (c) Wheat rust
   (d) Linseed rust
   (e) Late blight of potato
   (f) Smut diseases of wheat and barley
   (g) Red rot of sugarcane
2. To make permanent preparations:
   (a) V.S. of an apothecium - *Peziza*
   (b) V.S. Gill of mushroom
   (c) V.S. of Lichen - *Usnea*
   (d) V.S. of an inoperculate fungus (*Hymenoscyphus*).
3. (a) Work out the hyphal system in higher fungi with examples from Aphylllophorales.
   (b) To study the tissue types in higher fungi—the Pezizales and Leotiales.
4. General survey (Morphology) of:
   *Myxomycota*, *Zygomyccota*, *Ascomycota* and *Basidiomycota*.
5. To make temporary mount: A study of the fungi imperfecti viz. *Helminthosporium, Cercospora, Alternaria* and *Pyricularia*.

Essential Reading

Further Reading

B.Sc. (Hons. School) VI Semester

Paper–II: Plant Physiology

Objective: The course would deal with the subject by describing its relevance for Botany from academic and practical point of view. Initiating with basic concepts and definitions, the course would traverse through various processes such as photosynthesis, respiration, nitrogen metabolism, light and temperature dependent events and end up with growth control by hormones.
Teaching Methodology: The teaching methodology would involve elaborative description of the various topics on board along with demonstration through models and practicals.

Instructions for the paper setter:

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I

1. **Plant-Water Relations**: Water transport processes; diffusion and osmosis; water potential and chemical potential; absorption of water, water transport through tracheids and xylem; transpiration and its significance; factors affecting transpiration; mechanism of stomatal movement.

2. **Mineral Nutrition**: Criteria of essentiality of elements; macro- and micronutrients; role of essential elements; mineral deficiency symptoms and plant disorders; nutrient uptake and transport mechanisms.

UNIT-II

3. **Photosynthesis**: Historical background and significance; structure and photosynthetic apparatus; photosynthetic pigments; accessory pigments and the photoprotective carotenoids; reaction center complexes; photochemical reactions; electron transport pathways in chloroplast membranes; photophosphorylation; the Calvin cycle; the C4 carbon cycle; crassulacean acid metabolism; photorespiration, factors affecting photosynthesis, Blackman’s Law of limiting factors.

4. **Transport of Organic Substances**: Transport of photosynthates; source-sink relationship; the mechanism of translocation in the phloem; assimilate partitioning.

UNIT-III

5. **Respiration**: Glycolysis; the TCA cycle and its regulation; electron transport in mitochondria; oxidative phosphorylation; pentose phosphate pathway; cyanide-resistant respiration.

6. **Nitrogen Metabolism**: Biological nitrogen fixation; nitrate and ammonium assimilation, role of leghaemoglobin.

UNIT-IV

7. **Growth and Development**: General aspects – definitions, phases of growth; kinetics of growth; physiology of seed dormancy and seed germination; concept of photoperiodism; vernalization; Functions of Phytohormones – auxins, cytokinins, gibberellins, abscisic acid and ethylene; Plant movements – tropic and nastic.

Practicals

1. Demonstrate phenomenon of osmosis by potato osmroscope.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature on permeability of plasma membrane.
4. Comparative study of rate of respiration of various plant parts.
5. To extract and separate chloroplast pigments by solvent method.
6. To determine the osmotic potential of vascular sap by plasmolytic method.
7. To determine the water potential of given tissue (any tuber)
9. To determine stomatal index, stomatal frequency and percentage of open stomata. Also to study the effect of ABA on stomatal closure.
11. Effect of light intensity, temperature and CO₂ on rate of photosynthesis.

**Essential Reading**


**Further Reading**


**B.Sc. (Hons. School) VI Semester**

**Paper–III: Plant Biochemistry**

**Theory : 75 (60A+15CA)**

**Practical: 25 (20A+5CA)**

**Objective:** To acquaint the students about the various aspects of plant biochemistry including composition, structure and functions of bio-molecules.

**Teaching Methodology:** The teaching methodology would involve elaborative description of the various topics on board along with demonstration through models and practicals.

**Instructions for the paper setter :**

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

1. **Introduction to Biochemistry:** Characteristics of living matter, Exchange of energy and matter, enzymes as the catalysts of living cells, transmission of energy in a chemical form, regulation of cell metabolism.
2. **Composition of Biomolecules:** Chemical properties, major classes of macromolecules and building-block molecules.

**UNIT-II**

3. **Carbohydrates – Structure and Biological Function:** Chemistry and classification of monosaccharides – aldoses & ketoses, di- and polysaccharide units, glycogen, cellulose and glycoproteins, significance of carbohydrates.
4. **Lipids and Membranes:** Classification and importance of lipids, properties of fatty acids and fats, phospholipids, lipoproteins.

**UNIT-III**

5. **Proteins - Structure and Properties:** Cassification, structure, properties and functions.
6. **Amino acids and Peptides:** Structure, classification, properties, peptides.
UNIT-IV

7. **Vitamins:** General characteristics, nomenclature and classification, essential organic, biochemical functions.
8. **Enzymes:** History, classification, chemical nature, properties, mode of action, optimum pH, substrate specificity, enzyme inhibition, allosteric enzymes, coenzymes- action and types.

**Practicals**

1. To prepare the standard curve of protein, carbohydrates and amino acids.
2. To study the enzyme activity of catalase and peroxidase.
3. Separation of amino acids in a mixture by paper chromatography.

**Essential Readings**


*B.Sc. (Hons. School) VI Semester*

**Paper-IV: Microbiology: Viruses, Bacteria, Mycoplasma**

**Theory:** 75 (60A+15CA)
**Practical:** 25 (20A+5CA)

**Objective:** To acquaint the students about the morphology, biology and importance of fungal organisms.

**Teaching Methodology:** It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

**Instructions for the Paper-setter**

Question paper will have *four* units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

1. **Viruses, viroids and their diseases:** Symptoms, transmission, structure, physical and chemical properties infection, multiplication and movement.

**UNIT-II**

2. **Bacteria and bacterial diseases:** Structural, reproduction and classification of bacteria, growth and reproduction in bacteria, classification, plant pathogenic bacteria.

**UNIT-III**

3. **Mycoplasma and Plant diseases:** Introduction, morphological features, diseases caused by mycoplasmas: Sandal spike, sesamum phyllody, grassy shoot disease of sugarcane, little leaf of Brinjal, coconut wilt.

**UNIT-IV**

4. Symptoms of bacterial plant diseases and important bacterial plants diseases, diseases of vegetables, fruits and crops and their control.

**Practicals**

Study of symptoms and characteristic features of plant diseases caused by Viruses, Bacteria and Mycoplasmas.
Essential Reading


Further Reading


B.Sc. (Hons. School) VI Semester

Paper–V: Embryology of Angiosperms

Objective: To acquaint the students about the structure of various parts of flowers and pollination mechanisms.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper setter:

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I

1. Historical account of embryology of angiosperms.
2. Flower: Structure, development from a primordium; variations, Placentation and inflorescence types.

UNIT-II

3. Stamen: Morphology, evolutionary trends, structure and development of anther tapetum; Microsporogenesis, structure and development of male gametophyte and aberrations.
4. Pollen: Structural organization, germinal furrows, wall development and ornamentation, role of callose and tapetum in pollen development; pollen agglutinations, germination and storage, and allergenic aspects.
5. Carpels: Morphology, evolutionary trends; Structure, development and types of ovules; Archesporium; Megasporogenesis and embryo sac ontogenies.

UNIT-III

7. Fertilization: Structure of stigma and style, stigma receptivity, post-pollination events leading to fertilization, syngamy and triple fusion.

UNIT-IV

8. Endosperm: Types of development, cytology, historical structures and functions.
9. Embryogeny: Zygote, its structural organization, proembryo types, embryo development in monocots and dicots, nutrition of embryo.

Practicals

Study of different flowers: basic structure of flowers; study of pollen grains and various pollen agglutinations; Study of various developmental stages; microsporogenesis, Megasporogenesis and embryo development.

Essential Reading


**Further Reading**


**B.Sc. (Hons. School) III Semester Botany (Subsidiary)**

**Plant Diversity –III (Plant Anatomy, Applied Botany & Cytogenetics)**

**Theory : 75 (60A+15CA)**

**Practical:25 (20A+5CA)**

**Objective:** To acquaint the students about the anatomical and cytological studies of various plant groups and their applications.

**Teaching Methodology:** It will involve classroom lectures, power point presentations, charts, models, practicals and field visits etc.

**Instructions for the paper setter :**

Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

**UNIT-I**

2. Tissue systems (including vascular elements)
3. The Root: General anatomical characteristics, dicot and monocot root anatomy, secondary growth in dicot root.

**UNIT-II**

5. Tissue Culture: Basic techniques, achievements, practicals applications of tissue culture, organ culture, somatic hybridization, and their role in crop improvement.

6. Utilization of Plants: Elementary knowledge of some of economically important plants used as source of:
   
   (a) Food : Wheat, rice, potato, sugarcane.
   (b) Timber : Tectona, Dalbergia, Shorea, Cedrus.
   (c) Fibres : Cotton, Jute, Coir.
   (d) Beverages : Tea, Coffee.
   (e) Spices : Ginger, Turmeric, Coriander.
   (f) Medicinal Plants : *Ephedra, Cinchona, Atropa, Digitalis, Rauwolfia*.

**UNIT-III**

8. Mushroom Cultivation: Species cultivated, their nutritional value, methods of cultivation, future prospects.

UNIT-IV

10. DNA the Genetic Material: DNA structure, replication and geneti code.
12. Chromosomes: Physical and chemical structure; Dupraw's model and nucleosomes.
13. Linkage, linear arrangement of genes and genetic maps.

Practicals
Practicals will pertain to the syllabus of the theory paper.

Essential Readings

Further Readings

B.Sc. (Hons. School) IV Semester Botany (Subsidiary)

Paper: Plant Diversity –IV (Plant Ecology & Physiology)

Objective: The course is so designed to familiarize the students with the basics of ecology and plant physiology and their relevance to the various ecological processes, ecosystem and metabolism.

Teaching Methodology: It will involve class room lectures, power point presentations, charts, models, practicals and field visits etc.

Instructions for the paper-setter:
Question paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

UNIT-I

1. Plants and Environment: Atmosphere, water, light, temperature, soil and biota.
2. Ecosystem: Structure, abiotic and biotic component, ecological pyramids of energy, number and biomass energy flow.
UNIT-II
3. Community Ecology: Main types, characteristics, frequency, density, ecological succession, account of hydrosere and xerosere.

UNIT-III
5. Relevance of different cell organelles in relation to physiological functions.

UNIT-IV
8. Respiration: Respiratory substrates and pathways, energy release, ATP synthesis and utilization, chemiosmotic regeneration of ATP.

Practicals
Practicals will pertain to the syllabus of the theory paper.

Essential Reading

Further Reading

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