

GUJARAT UNIVERSITY

SECOND B.Sc. - BOTANY
NEW SYLLABUS
(Based on UGC model curriculum)
In force from JUNE, 2004

THEORY SYLLABUS
BOTANY – PAPER: III

Biology of Cryptogams

(Algae, Fungi, Plant diseases, Bryophyta and Pteridophyta).

UNIT : I

ALGAE:

- (A) General Characters
- (B) Classification according to **SMITH**.
- (C) Ultra Structure of Algal cells.
 - (i) Prokaryotic cell (Cyanophyceae cell)
 - (ii) Eukaryotic cell (Chlamydomonas cell)
- (D) Typical life histories of Algae belonging to various divisions including morphology and excluding development.
 - Cyanophyta : Nostoc, Oscillatoria
 - Chlorophyta : Oedogonium, Ulothrix
 - Phaeophyta : Ectocarpus
 - Rhodophyta : Polysiphonia

UNIT : II

FUNGI:

- (A) General characters
- (B) Classification according to **G.C.Ainsworth**.
- (C) Ultra structure of fungal cell.
- (D) Life histories of the following excluding development.
 - Mastigomycotina : Albugo
 - Ascomycotina : Claviceps
 - Basidiomycotina : Puccinia
- (E) Lichen : Classification, Structure & Reproduction of Usnea.

UNIT : III

PLANT DISEASES:

Major diseases of plants, their symptoms, causal organism, disease cycle and control.

- (i) Green ear diseases of Bajra
- (ii) White rust of Crucifer

- (iii) Late blight of Potato
- (iv) Tikka disease of Groundnut
- (v) Citrus canker
- (vi) Red rot of Sugar Cane
- (vii) TMV (Tobacco Mosaic virus)
- (viii) Wilt of cotton.

UNIT : IV

BRYOPHYTA:

- (A) General Characters
- (B) Classification according to Rothmaler and Proskauer.
- (C) Life histories of the following with external and internal structure—excluding development.
 - Hepaticopsida : Marchantia.
 - Anthocerotopsida : Anthoceros
 - Bryopsida : Only Characters.
- (D) Ecological aspects of Bryophyta
- (E) Economic importance of Bryophyta.

UNIT : V

PTERIDOPHYTA:

- (A) General Characters
- (B) Classification according to Riemers
- (C) Life histories of the following with morphology and anatomy excluding development.
 - Lycopsidea : Selaginella
 - Pteropsida : Adiantum, Azolla.
- (D) Stele - Types and evolution in Pteridophyta.

BOTANY – PAPER : IV

Development of Plants & their Utilization (Anatomy, Economic Botany & Angiosperms)

UNIT : I

ANATOMY:

- (A) Meristems:

Introduction

- Characteristics of meristems.
- Classification of meristems
- Apical meristems
- Shoot apex
- Theories of apical organization
- Root apex
- (B) Dermal tissue system including Periderm.
- (C) Laticiferous tissue system
- (D) The cambium : Types and functions.

UNIT : II

- (E) Normal secondary growth in :
 - (i) Sunflower root (old)
 - (ii) Sunflower stem (old)
 - (iii) Secondary growth in perennials
 - (iv) Annual rings.
- (F) Anomalous primary structures in:
 - (i) Nyctanthes stem
- (G) Anomalous secondary growth in :
 - (i) Salvadora stem
 - (ii) Tinospora root
 - (iii) Dracaena stem.

UNIT : III

ECONOMIC BOTANY:

- (A) General account, methods of cultivation climate and uses of the following plants:
 - (a) Cereals : Wheat and Rice
 - (b) Pulses (Legumes): Tur and Gram
 - (c) Oil seeds : Ground nut and Mustard.
- (B) Plant Fibers : Cotton, Jute and Coir
- (C) A general account and uses of properties of any ten plants of your region – Gujarat.

Timber species:

- (i) Tectona grandis
- (ii) Dalbergia sissoo
- (iii) Gmelina arborea
- (iv) Madhuca indica
- (v) Azadiruchta indica.

Firewood species:

- (i) Prosopis sp
- (ii) Holoptelia integrifolia.
- (iii) Zizyphus jujuba
- (iv) Acacia nilotica
- (v) Salvadora persica.

UNIT : IV (1/2) ECONOMIC BOTANY

- (D) A brief account of ten important plant drugs and their chief constituents:
 - Roots: (1) Rauwolfia, Withania.
 - Underground stems: (1) Tumeric, Ginger
 - Aerial stems: (1) Ephedra
 - Leaves: (1) Adhatoda, Aloe
 - Fruits: (1) Terminalia chebula
 - Seeds: (1) Trigonella, Isafgul
- (E) A concise account of Tobacco and Sugar cane.

UNIT : IV (1/2) MORPHOLOGY:

ANGIOSPERMS : MORPHOLOGY

- (A) Structure of ovule and its Types.
- (B) Special types of inflorescences
 - (i) Hypanthodium
 - (ii) Cyathium
 - (iii) Verticillaster
- (C) Pollination:
 - Definition
 - Self-pollination & Cross pollination – Definition.
 - Pollination in Salvia, Ficus, Orchids and Calotropis.
- (D) Fruits:
 - (i) Simple dehiscent fruits : Legume, Follicle, Siliqua, Capsules.
 - (ii) Simple indehiscent fruits : Caryopsis, Cypsella, Nut.
 - (iii) Fleshy fruits : Drupes
 - (iv) Fleshy fruits : Berry – Pepo, Hesperidium, Pome.

AGGREGATE FRUITS :

- (i) Anetaerio of Follicles
- (ii) Anetaerio of Berries:

COMPOSITE FRUITS :

- (i) Sorosis
- (ii) Syconus

UNIT : V

TAXONOMY:

- (A) Principles of taxonomy and the merits and demerits of system of classification of Bentham and Hooker and Englar and Prantl.
- (B) Classification of the following families as per Bentham and Hooker's system of Classification including examples of economic importance.
 - (a) **DICOTYLEDONS:**
 - Polypetalae:** Anonaceae, Cruciferae, Leguminosae (Papilionaceae & Mimoseae), Rutaceae
 - Gamopetalae:** Compositae, Rubiaceae, Apocynaceae, Convolvulaceae, Labiatae.
 - Apetalae:** Euphorbiaceae
 - (b) **MONOCOTYLEDONS:** Palmae and Graminae

BOTANY – PAPER : V

(Biochemistry, Biophysics, Plant Physiology & Ecology)

UNIT : I

BIOCHEMISTRY & BIOPHYSICS:

- (A) pH & Buffer
- (B) Free radicals and bond
- (C) Isotopes and their uses in Biology
- (D) Solutions and colloidal systems

- (E) Protoplasm as a colloidal system
- (F) Enzymes :
 - a. Definition
 - b. Nomenclature and classification of enzymes
 - c. Chemical nature of enzymes
 - d. Properties of enzymes
 - e. Mechanism of enzyme action
 - f. Factors affecting enzyme activity
- (G) Structure and classification of :
 - a. Carbohydrates
 - b. Lipids

UNIT : II

PLANT PHYSIOLOGY:

- (A) Plant water relations :
 - a. Diffusion
 - b. Imbibition
 - c. Osmosis
 - d. Plasmolysis
- (B) Absorption of water :
 - a. Properties of water
 - b. Mechanism of water absorption
 - c. Factors affecting absorption of water
- (C) Transpiration :
 - a. Definition
 - b. Kinds of Transpiration
 - c. Structure of stomata
 - d. Mechanism of opening and closing of stomata
 - e. Factors affecting transpiration
 - f. Significance of transpiration
 - g. Guttation
- (D) Mineral Nutrition :
 - a. Introduction of Mineral nutrition
 - b. Role of essential (Macronutrients) elements :- Ca, P, K & Mg.
 - c. Role of non-essential (Micronutrients) elements :- Fe, Cu, Mn & Zn.
 - d. General Account of Hydroponics

UNIT : III

- (E) Photosynthesis:
 - a. Mechanism of Photosynthesis
 - Light reaction (P_sI & P_sII)
 - Dark reaction (C₃ Cycle).
 - b. Factors affecting photosynthesis.
- (F) Respiration:
 - a. Glycolysis
 - b. Krebs' s cycle

- c. Electron transport in Mitochondria.
- (G) Growth & development:
 - a. Definition
 - b. Phases of Growth
 - c. Factors affecting growth
 - d. General account of Flowering : Effect of light & temperature

Growth Hormones:

Physiological effects and practical applications of Auxins, GA, Cytokinins, Ethylene and Abscissic Acid.

- (H) Heterotrophic Nutrition in plants.

UNIT : IV

ECOLOGY:

- (A) Ecological Factors:
 - (a) Climatic factors : Light & Temperature.
- (B) Ecosystem:
 - (a) Components of ecosystem
 - (b) Food chain and Food-web.
 - (c) Ecological pyramids
 - (d) Energy flow in ecosystem
 - (a) Single channel energy models.
 - (e) Biogeochemical cycles: Nitrogen cycle & Carbon cycle.
- (C) Characters of plant community
 - (a) Analytical characters
 - (b) Synthetic characters.

UNIT : V

- (D) Plant adaptations:
 - (1) Morphological and anatomical adaptations in:
 - (a) Hydrophytes
 - (b) Xerophytes &
 - (c) Halophytes.
 - (2) Ecological anatomical structures in the following specimens:
 - (a) Hydrilla stem
 - (b) Vallisneria leaf
 - (c) Nymphaea leaf
 - (d) Casuarina stem
 - (e) Nerium leaf
 - (f) Agave leaf
- (E) Pollution:
 - Causes and controls of Air & Water pollution.

SECOND B.Sc. - BOTANY PRATICALS

NEW SYLLABUS

In force from JUNE, 2004

PRATICAL I

(Based on PAPER III)

- (A) Study of types as per theory syllabus – through fresh, preserved materials and permanent slides.
- (B) Study of plant diseases as per theory syllabus except [TMV].
- (C) The anatomy of the root, stem, rhizophore and leaf of selaginella and the root, rhizome, petiole & leaf of Adiantum and root, rhizome and leaf of Azolla through permanent slides.
- (D) Dissection of cone – **Selaginella**, Section passing through sori – **Adiantum** & dissection of Sporocarps – **Azolla** is expected.
- (E) Students are expected to submit their collection on this paper.

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PRACTICAL II (Based on Paper IV)

(A) ANATOMY : Meristems

1.

- 1. Study of root apex – Onion
- 2. Study of shoot apex – Hydrilla
- 3. Study of Apical cells – Chara, Dictyota
Through either permanent slides or in whole mount.

2. Dermal Tissue System:

(a) Types of epidermis:

- (i) Uniseriate – Cucurbita / Sunflower stem
- (ii) Multiseriate – Ficus & Nerium leaf and orchid root.

(b) Epidermal outgrowths:

- (i) Stellate hairs : Gossypium leaf
- (ii) Stinging hairs : Urtica leaf
- (iii) Peltate glands : Avicennia leaf
- (iv) Peltate hairs : Fern Rachis. (Ramenta)

(c) Stomata

- (i) Dicotyledons : Any leaf
- (ii) Monocotyledon : Maize leaf

(d) Lenticel and Periderm through permanent slides

3. Laticiferous tissue System:

- Latex cells – Euphorbia tiruculii
- Latex vessels – Argemone stem
- Launea root.

4. Study of Normal secondary growth in:

- (i) Sunflower old root (ii) Sunflower old stem.

5. Study of anomalous primary structure in:

- (i) Nyctanthes stem

6. Study of Anomalous secondary growth in:

- (i) Salvadora stem (ii) Tinospora root (iii) Dracaena stem.

Double stained (Fast green and safranin only) temporary preparations should be prepared. (Passing of section through Alcohol series is not required.)

(B) ECONOMIC BOTANY

1. Specimens and their products to be demonstrated as per theory syllabus.
2. Students are expected to submit a minimum of 5 (Five) mounted herbarium sheets of economically important plants.

(C) ANGIOSPERMS:

- Study of families as per theory syllabus with locally available plants. Floral diagram and floral formula is expected.
- Students are expected to submit a minimum of 10 (ten) herbarium sheets of standard size.
- Students should prepare a list of plants used as ornamentals along with their popular and scientific names. Seasons of flowering and brief description. (Morphology is not expected)

This may be illustrated and presented as a term paper at the time of examination.

MORPHOLOGY:

(i) Ovule and its types through permanent slides.

(ii) Study of inflorescences

Hypanthodium – Banyan (Ficus)

Cyathium – Euphorbia pulcherrima

Verticillaster – Ocimum sp / Coleus

(iii) Study of Fruits:

■ Simple dehiscent fruits

Legume : Bean, Pea

Follicle : Calotropis

Siliqua : Mustard

Capsule : Cotton, Ladies finger.

■ Simple Indehiscent fruits

Caryopsis : Wheat Maize

Cypsella : Sunflower

Nut : Cashew nut, Trapa

■ Fleshy fruits:

Drupe : Mango, Coconut

Berry : Tomato
Pepo : Cucumber
Hesperidium : Orange
Pome : Apple

- Aggregate fruits:
An etaerio of follicles – Calotropis
An etaerio of Berries – Custard apple.
- Composite fruits:
Sorosis – Pineapple,
Syconus – Ficus.

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PRACTICAL – III

(Based on Paper V)

BIOCHEMISTRY & BIOPHYSICS:

- I. pH : Soil, Lemon juice, KOH, Soln..
- II. Sulphur and agar – agar collidal system,
- III. Demonstration of mechanical and chemical adsorption.
- IV. Histochemical Tests for,
 - (1) Glucose
 - (2) Starch
 - (3) Lignin
 - (4) Fat
- V. To test the activity of enzyme amylase in plant tissues.
- VI. To test the activity of enzyme Catalase in plant tissues.

PHYSIOLOGY:

- (A) The following experiments are to be set up by the students and the results are expected.
- (i) To demonstrate the phenomenon of osmosis by:
 - (a) Potato, Osmoscope
 - (b) Exosmosis and Endosmosis in grapes/Colocasia petiole.
 - (ii) Plasmolysis experiment in Tradescantia leaf/Croton bicolour leaf.
 - (iii) To study the effect of temperature on permeability of plasma-membrane.

Transpiration:

- (iv) To compare the rate of stomatal transpiration by four leaves experiment.
- (v) To compare the rate of transpiration from leaf surfaces by Cobalt chloride method.

Photosynthesis :

- (vi) To demonstrate that O₂ is evolved during photosynthesis.
 - (vii) Extraction and separation of plant pigments (Chlorophylls and Carotensids) by paper chromatography.
- (B) Demonstration Experiments:
- (i) Imbibition expt.
 - (ii) Physical demonstration of Osmosis (Thistle funnel expt.)
 - (iii) Brownian movement in Indian ink or Curd.
 - (iv) Conduction of water thro xylem.

- (v) Relation between absorption and transpiration by absorbo-transpirometer.
- (vi) To demonstrate anaerobic respiration in germinated seeds.
- (vii) To demonstrate fermentation by Kuhne's tube.
- (viii) Heterotrophic Nutrition:

The specimens showing heterotrophic nutrition to be demonstrated.

Stem Parasites:

Total parasite : Cuscuta

Partial parasite : Loranthes.

Saprophytes: Agaricus, Mucor.

Symbionts: Lichens, & Root nodules.

Insectivorous Plants: Utricularia, Drosera, Nepenthes.

ECOLOGY

- (A) To determine the requisite size of the quadrat by species area curve method.
- (B) To study selected soil properties by spot test:
 - (i) pH
 - (ii) Carbonate
 - (iii) Nitrate
- (C) To demonstrate the working and uses of the following ecological instruments.
 - (i) Soil Thermometer
 - (ii) Dry and wet thermometer
 - (iii) Maximum and minimum thermometer
- (D) To study ecological adaptations (Morphological and anatomical) in plants.

Hydrophytes:

■ Submerged:

- Hydrilla : Stem, leaf
- Vallisneria : Leaf

■ Free floating:

- Eichornia - Petiole, leaf

■ Floating but rooted:

- Nymphaea - Petiole, leaf

Xerophytes:

- Casuarina-stem
- Nerium-leaf
- Agave-leaf
- Opuntia-stem

Halophytes:

- Avicennia – Leaf

- There will be THREE PRACTICALS each of FIVE HOURS DURATION at annual Examination.
- The Botanical Excursion is highly essential for studying vegetation in its natural state. There shall be at least one Botanical excursion in side Gujarat State.

Excursion Report and submission of specimens will be given due weightage.

- The students are expected to record the work done in laboratory in Journal.
- The journal is to be certified by incharge concerned & Head of the Dept.
- Certified journal have to be produced while appearing at the time of Examination.

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Paper IV **(Anatomy & Economic Botany)**

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Paper V **(Physiology)**

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2. A Text Book of Plant Physiology & Priochemistry By S. K. Verma. S. Chand & Co. Ltd. – Ramnagar New Delhi – 110 055.

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(For Laboratory Exercises)

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