

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR T.Y.B.Sc.
BOTANY
(EFFECTIVE FROM JUNE 2008)

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BOTANY PAPER VI
(BOTANY OF CRYPTOGAMES AND FOSSIL BOTANY)

UNIT I : AIGAE

Life histories of the following types on the basis of their Classification with reasons, Occurrence, Thallus Structure, Cell Structure and Reproduction.
(Excluding development).

- (A) Cyanophyceae : (i) *Rivularia*,
(ii) *Tolypothrix*.
- (B) Chlorophyceae : (iii) *Volvox*,
(iv) *Chara*.
- (C) Phaeophyceae : (v) *Sargassum*.
- (D) Rhodophyceae : (vi) *Polysiphonia*.
- (E) Bacillariophyceae : (vii) *Navicula*.

UNIT II : FUNGI

Life histories of the following types on the basis of their Classification with reasons, Occurrence, Vegetative Structure and Reproduction.
(Excluding development).

- (A) Mastigomycotina (i) *Albugo*.
- (B) Ascomycotina (ii) *Penicillium*.
- (C) Basidiomycotina (iii) *Agaricus*.

UNIT III : PLANT DISEASES

Symptoms, causal organism and control of following plant diseases.

- (i) Tikka disease of groundnut
- (ii) Wilt of cotton
- (iii) Leaf curl of papaya
- (iv) Powdery mildew of barley
- (v) Blast disease of rice.

UNIT IV : BRYOPHYTA

Classification and Life histories of the following types.
(Excluding development).

- (A) Hepaticopsida : (i) *Porella*.
(B) Anthocerotopsida : (ii) *Nothothylus*.
(C) Bryopsida : (iii) *Sphagnum*.

UNIT V : PTERIDOPHYTA

Classification and Life histories of the following types.
(Excluding development).

- (A) Psilophytopsida : (i) *Rhynia* (ii) *Psilotum*.
(B) Lycopsidea : (iii) *Lepidodendron* (iv) *Isoetes*.
(C) Sphenopsida : (v) *Sphenophyllum* (vi) *Calamites*.
(D) Pteropsida : (vii) *Ophioglossum* (viii) *Marsilea*
(ix) *Azolla*.

UNIT VI : FOSSIL BOTANY

Nomenclature of Fossils, Geological Time-Table,
Fossilization and types of Fossils - Compression, Petrification,
Incrustation and Impression.

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BOTANY PAPER VII
(BIODIVERSITY AND SYSTEMATIC OF GYMNOSPERMS AND
ANGIOSPERMS - INCLUDING FOSSILS,
PLANTS AND THEIR UTILIZATION)

UNIT I : GYMNOSPERMS

Classification and Life histories of the following types.
(Excluding development).

- (A) Ephedrales : (i) *Ephedra*.
(B) Gnetales : (ii) *Gnetum*.

UNIT II : FOSSIL BOTANY

General account of following types.

- (A) Cycadophyliales : (i) *Lyginopteris* - Stem;
Laginostoma.
(B) Cycadeoidales : (ii) *Cycadeoidea*.
(C) Cordiales : (iii) *Cordaites*.

UNIT III : TAXONOMY

Principles of Taxonomy, Aims and Objective of plant taxonomy, System of classification of Bentham and Hooker and its merits & demerits.

UNIT IV : FAMILIES

Taxonomical studies of the following families with references to their geographical distribution, systematic position, floral variations and economic importance.

- | | |
|----------------------|-------------------------------------|
| (i) Ranunculaceae | (ii) Magnoliaceae (Only for theory) |
| (iii) Menispermaceae | (iv) Papaveraceae |
| (v) Portulacaceae | (vi) Tiliaceae |
| (vii) Rhamnaceae | (vii) Vitaceae |
| (ix) Rutaceae | (x) Sapindaceae |
| (xi) Lythraceae | (xii) Apiaceae |
| (xiii) Sapotaceae | (xiv) Boraginaceae |
| (xv) Acanthaceae | (xvi) Basellaceae |

- (xvii) Polygonaceae (xviii) Loranthaceae
(xix) Casuarinaceae (xx) Hydrocharitaceae
(xxi) Orchidaceae (xxii) Musaceae
(xxiii) Poaceae.

UNIT V : PLANTS AND THEIR UTILIZATION

(A) Fibers : Introduction and Classification of fibers.

Plant fibers : Cotton, Jute and Coir.

(B) Timber and firewood species : Define wood;

Properties, Types and Uses of wood.

Distribution, Botanical name, Family and
uses of following :

- (i) *Accacia nilotica* (ii) *Anogeissus latifolia*
(iii) *Azadirachta indica* (iv) *Dalbergia latifolia*
(v) *Gmelina arborea* (vi) *Mitragyna parvifolia*
(vii) *Tectona grandis* (viii) *Terminalia crenulata*.

(C) Medicinal plants : Scientific name, family,
distribution, parts used and medicinal uses of the
following :

- (i) *Abrus precatorius* (ii) *Andrographis paniculata*
(iii) *Aegle marmelos* (iv) *Aristolochia bracteolata*
(v) *Cassia tora* (vi) *Enicostema axillare*
(vii) *Ocimum sanctum* (viii) *Rauwolfia serpentina*
(ix) *Trigonella foenum-graecum* (x) ***Withania somnifera***.

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**BOTANY PAPER VIII
(PHYSIOLOGY, ECOLOGY, ENVIRONMENTAL BIOLOGY AND
BIOCHEMISTRY)**

UNIT I : PHYSIOLOGY

(A) GROWTH

Definition of growth, Kinetics and Measurement of growth, Growth analysis and Factors affecting growth.

(B) TRANSPIRATION

Definition, Classification of stomata, Types of transpiration on the basis of the exist of water, Signification of transpiration in plant's life, Factors affecting transpiration, Measurement of transpiration.

(C) MINERAL NUTRITION

Definition, Study of the mineral composition of plants, Specific role of major and minor elements in plants.

(D) HETEROTROPHIC NUTRITION

Introduction, Parasites, Saprophytes and Insectivorous plants.

(E) PLANT GROWTH SUBSTANCES

(i) Auxins, (ii)Gibberellins, (iii) Cytokinin, (iv) Abscisic Acid.

(F) PHYSIOLOGICAL INSTRUMENTS

(i) Isotopes, (ii) Electron spin rezonns (E.S.R.),
(iii) Colorimeter, (iv) Spectrometer, (v) Ultracentrifuge,
(vi) pH meter.

UNIT II : ECOLOGY

(A) PLANT SUCCESSION

Definition, Causes of succession, process in succession, Kinds of succession, Limiting factors and Trends in succession.

(B) ECOSYSTEMS

Definition; Concept, Types and Components of ecosystems; Ecosystem model; Forest ecosystem, Desert ecosystem, Aquatic ecosystem.

(C) PLANT COMMUNITY

Definition, Characteristics and classification of plant communities, Ecological niche, Methods of studying vegetation - Quadrate - Frequency, Density and Abundance.

(D) ECOLOGICAL INSTRUMENTS

(i) Psychrometer, (ii) Prismatic compass,
(iii) Rain gauge, (iv) Soil thermometer.

UNIT III : ENVIRONMENT BIOLOGY

(A) VEGETATION TYPES

(i) Vegetation types of Himalaya, (ii) Forest vegetation of Gujarat, (iii) Mangrove vegetation, (iv) Desert of Gujarat.

UNIT IV : BIOCHEMISTRY

(A) AMINO ACID

Structure, types and chemical properties of amino acid, Formation of dipeptide and polypeptide.

(B) CARBOHYDRATES

Classification, characteristics and importance of carbohydrates.

(C) LIPID METABOLISM

Types of lipids (Simple, Compound & Derived lipids), Synthesis & Oxidation of fatty acids.

(D) CHROMATOGRAPHY

Introduction, Paper chromatography, ascending & descending paper chromatography, separation of chlorophyll pigments and amino acid.

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**BOTANY PAPER IX
(CYTOLOGY, GENETICS, MOLECULAR BIOLOGY,
BIOTECHNOLOGY, ANATOMY AND EMBRYOLOGY OF
ANGIOSPERM)**

UNIT I : CYTOLOGY

(A) ULTRA STRUCTURE AND FUNCTION

(i) Nucleus, (ii) Chromosomes, (iii) Ribosomes,
(iv) Golgicomplex, (v) Lysosomes.

(B) CELL DIVISION

(i) Mitosis.

UNIT II : GENETICS

(A) NUCLEIC ACIDS

Introduction, Structure of nucleic acid, Nucleosides,
Nucleotides, Structure of DNA & RNA.

(B) GENETIC CODE

(C) MUTATIONS

UNIT III : MOLECULAR BIOLOGY

Recombinant DNA technology - Restriction endonucleases,
Cloning vectors, Various techniques of gene mapping and DNA
finger printing.

UNIT IV : BIOTECHNOLOGY

Somatic hybridization, Clonal propagation, Genetic
engineering of plants, Genetic manipulation in plant cell, Uses of
biotechnology in agriculture.

UNIT V : ANATOMY

(A) LATICIFEROUS TISSUE

Introduction, latex cells, articulated laticifers, latex, cell structure and function.

(B) ROOT - STEM TRANSITION

(C) VASCULAR CAMBIUM

General development and structure of the vascular cambium, Types of cambium, Seasonal activity of cambium.

(D) PERIDERM : Origin, structure and function.

(E) LENTICELL

(F) ANAMOLOUS SECONDARY GROWTH

Stem : (i) *Bougainvillea*, (ii) *Mirabilis*, (iii) *Tinospora*,
Root : (i) Radish, (ii) Beet.

(G) LEAF ABSCISSION.

UNIT VI : EMBRYOLOGY

(A) MICROSPORANGIUM

Wall layers and Microsporogenesis.

(B) MEGASPORANGIUM

Structure and types of ovule;

Megasporogenesis - Types of embryo sacs

(i) Monosporic [*Polygonum* - eight nucleated type],

(ii) Bisporic [*Allium* - eight nucleated type],

(iii) Tetrasporic [*Fritillaria* - eight nucleated type].

(C) EMBRYO

Embryogenesis in Dicotyledone [*Nicotiana*] and Monocotyledone [*Poa*].

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**HORTICULTURE
[COURCES OF APPLIED NATURE - (CAN)]**

UNIT I : Definition, Aims, Branches and Importance of Horticulture.

UNIT II : Organic manures and Fertilizer.

UNIT III : Prunning and Framing.

UNIT IV : Principles of land-scaping and garden designs.

UNIT V : Lawn

UNIT VI : Propagation - Different methods of propagation. A detailed study of (i) Grafting, (ii) Layering, (iii) Budding. Vegetative propagation (Root formation).

UNIT VII : Uses of growth hormones in horticulture.

UNIT VIII : Principle of fruit and vegetable preservation. Causes of spoilage of fresh processed fruits & vegetables.

Types of preservation.

Preparation of Jam, Jelly and Sauce.

UNIT IX : Cultivation of following fruit crops with reference to their origin, distribution, climate, soil, propagation, method of cultivation, harvesting and atleast three varieties of each crop.

**(i)Mango, (ii) Banana, (iii) Sapota,
(iv) Papaya, (v) Coconut.**

UNIT X : Cultivation of following vegetable crops with reference to their origin, distribution, climate, soil, propagation, method of

cultivation, harvesting and atleast three varieties of each crop.

**(i) Carrot, (ii) Potato, (iii) Brinjal,
(iv) Lady's finger, (v) Cucumber,
(vi) Cabbage, (vii) Methi.**

UNIT XI : Cultivation of following ornamental plants

(i) Rose, (ii) Bougainvillea, (iii) Marigold.

PRACTICAL

The practical examination shall include detailed Botanical description of plants, identification of natural orders and cryptogamic plants as well as preparation of material for microscopic examination. Candidates are expected to visit compulsorily local and zonal botanical areas for collection of plants; their collections and micro slides shall be presented at the time of examination, along with practical records.

Every candidate shall record their observation directly in the laboratory journal. Every journal signed periodically by the teacher in charge and certified by the head of the department at the end of the year.

Candidate shall produce their certified journal, collection of plants and prepared micro slides at the practical examination. It shall be taken into account by the examiners in assigning marks.

PRACTICAL I (BASED ON PAPER VI)

(A) ALAGE :

(1) *Rivularia* :

To study the thallus structure and heterocyst.

(2) *Tolypothrix* :

To study the thallus structure.

(3) *Volvox* :

To study the Volvox colony.

(4) *Chara* :

To study the specimen of Chara, T.S. of the main axis and Sex organs.

(5) *Sargassum* :

To study the plants of Sargassum, Anatomy of main axis, leaf and air bladder.

(6) *Polysiphonia* :

To study the thallus structure and cystocarp.
(To study the permanent slides of the above types.)

(B) FUNGI :

(1) *Albugo* :

To study vegetative structure.

(Permanent slide of Albugo conidia,

Reproductive organs and Oospores.)

(2) *Penicillium* :

To study the vegetative structure and Conidiophores.

(Permanent slide of *Penicillium* vegetative Conidiophores with conidia.)

(3) *Agaricus* :

To study the Basidiocarp.

(Permanent slide of T.S. of Stipe, T.S. of Pileus, Button stage v.s. of *Agaricus*.)

(C) PLANT DISEASES :

Casual organism and Symptoms of following plant diseases.

(1) Tikka disease of groundnut

(2) Wilt of cotton

(3) Leaf curl of papaya

(4) Powdery mildew of barley

(5) Blast disease of rice.

(D) BRYOPHYTA :

(1) *Porella* :

To study the external morphology of *Porella* plant.
(Permanent slide of *Porella* veg. W.M. and L.S. of sporophyte.)

(2) *Nothothylus* :

To study the external morphology of *Nothothylus* plant.

(Permanent slide of *Nothothylus* W.M. and L.S. of sporophyte.)

(3) *Sphagnum* :

To study the external morphology of *Sphagnum*.
(Permanent slide of *Sphagnum* W.M. and L.S. of sporophyte.)

(E) PTERIDOPHYTA :

(1) *Isoetes* :

To study the external morphology of *Isoetes* and anatomical characters of *Isoetes* stem, root and leaf.

(Permanent slide of *Isoetes* stem T.S., Leaf T.S., Microsporophyll and Megasporophyll T.S.)

(2) *Ophioglossum* :

To study the external morphology of *Ophioglossum*, anatomical characters of *Ophioglossum* stem, root and leaf and Fertile Spike of *Ophioglossum*.
(Permanent slide of *Ophioglossum* stem T.S., *Ophioglossum* Spike L.S.)

(3) *Marsilea* :

To study the external morphology of *Marsilea* plant with spore producing organs, anatomy of stem and sporocarp.
(Permanent slide of *Marsilea* stem T.S., petiole T.S., sporocarp T.S. & L.S.)

(4) *Azolla* :

To study the external morphology of *Azolla* plant with spore producing organs, anatomy of stem and sporocarp.
(Permanent slide of *Azolla* stem T.S., sporocarp T.S. & L.S.)

(F) LIST OF FOSSIL SLIDES :

(1) *Rhynia* : T.S. of Stem.

(2) *Lepidodendron* : T.S. of *Lepidodendron* stem,
T.S. of *Lepidophyllum*,
L.S. of *Lepidostrobus*,
T.S. of *Stigmaria* rootlet,
T.S. of *Stigmaria* rootlet with sec. xy.

(3) *Sphenophyllum* : T.S. of *Sphenophyllum* Stem,
T.S. of Bowmanites.

(4) *Calamites* : T.S. of *Calamites* stem.

(G) LIST OF FOSSIL STONE :

Calamites stem and *Annularia*.

PRACTICAL II (BASED ON PAPER VII)

(A) GYMNOSPERMS :

(1) *Ephedra* :

To study the external morphology of *Ephedra* twig and male & female reproductive organs, provided to you.

(Permanent slide of *Ephedra* stem & root T.S., male & female cone L.S.)

(2) *Gnetum* :

To study the external morphology of *Gnetum* twig and male & female reproductive organs, provided to you.

(Permanent slide of *Gnetum* young & old stem T.S., leaf T.S., male cone T.S. & L.S., female cone T.S. & L.S., ovule L.S.)

(B) LIST OF FOSSIL SLIDES :

- (1) *Lyginopteris* - Stem T.S.
- (2) *Laginostoma* L.S.
- (3) *Cordaites* root T.S.
- (4) *Cordaites* leaf T.S.

(C) LIST OF FOSSIL STONE :

- (1) *Cordaites* leaf
- (2) *Pterophyllum*

(D) ANGIOSPERMS :

In taxonomic studies of angiosperms, plants available in the local area should be given.

- | | |
|------------------------|-----------------------|
| (i) Ranunculaceae | (ii) Menispermaceae |
| (iii) Papaveraceae | (iv) Portulacaceae |
| (v) Tiliaceae | (vi) Rhamnaceae |
| (vii) Vitaceae | (viii) Rutaceae |
| (ix) Sapindaceae | (x) Lythraceae |
| (xi) Apiaceae | (xii) Sapotaceae |
| (xiii) Boraginaceae | (xiv) Acanthaceae |
| (xv) Basellaceae | (xvi) Polygonaceae |
| (xvii) Loranthaceae | (xviii) Casuarinaceae |
| (xix) Hydrocharitaceae | (xx) Orchidaceae |
| (xxi) Musaceae | (xxii) Poaceae. |

(E) FIBERS :

Distribution, Botanical name, Family and uses of following.

- (1) Cotton
- (2) Jute
- (3) Coir

(F) TIMBER :

Botanical name, Family and uses of following :

- | | |
|---------------------------------|--------------------------------------|
| (i) <i>Accacia nilotica</i> | (ii) <i>Anogeissus latifolia</i> |
| (iii) <i>Azadirachta indica</i> | (iv) <i>Dalbergia latifolia</i> |
| (v) <i>Gmelina arborea</i> | (vi) <i>Mitragyna parvifolia</i> |
| (vii) <i>Tectona grandis</i> | (viii) <i>Terminalia crenulata</i> . |

(G) MEDICINAL PLANTS :

Scientific name, family and medicinal uses of the following :

- (i) *Abrus precatorius*
- (ii) *Andrographis paniculata*
- (iii) *Aegle marmelos*
- (iv) *Aristolochia bracteolata*
- (v) *Cassia tora*
- (vi) *Enicostema axillare*
- (vii) *Ocimum sanctum*
- (viii) *Rauwolfia serpentina*
- (ix) *Trigonella foenum-graecum*
- (x) *Withania somnifera*

PRACTICAL III (BASED ON PAPER VIII)

(A) PHYSIOLOGY :

Following physiological experiments are to be set up by the student. (Requirements to be submitted by the students.)

- (1) To find out rate of photosynthesis by bubble counting method.
- (2) To find out effect of CO₂ concentration on rate of Photosynthesis.
- (3) To find out effect of light intensity on the rate of Photosynthesis.
- (4) Experiments on enzyme action :
(i) Amylase (ii) Invertase.
- (5) To study the activity of enzyme Urease and the factors effecting the activity. (Concentration and Time)
- (6) Estimation of total sugar and reducible sugar.
- (7) Separation of amino acids by paper chromatography.
- (8) Uses of colorimeter and PH meter.

Following physiological experiments are for demonstration only.

- (1) Experiment to demonstrate the process of transpiration.
- (2) Demonstration of the stomatal transpiration by four leaves method.
- (3) To demonstrate that oxygen is used during respiration.
- (4) To measure the growth rate by lever auxanometer.
- (5) To demonstrate that separation of chloroplast pigments by thin layer chromatography.

(B) PHYSIOLOGICAL INSTRUMENTS :

Study of physiological instruments :

- | | |
|-----------------------|-------------------|
| (i) Colorimeter | (ii) Spectrometer |
| (iii) Ultracentrifuge | (iv) pH meter. |

(C) ECOLOGY :

- (1) To study communities by quadrat method and to

- determine % Frequency, Density and Abundance.
- (2) To study the biotic components of a pond ecosystem.
 - (3) To determine the amount of dissolved oxygen in the pond water.
 - (4) To determine the total dissolved solids (TDS) in water.
 - (5) To determine the amount of chlorides in the water.
 - (6) To find out the moisture percentage of the soil.
 - (7) To find out the total hardness of the water.
 - (8) To determine the amount of calcium in the water.
 - (9) To determine the amount of magnesium in the water.
 - (10) To determine the amount of total alkalinity in the water.

(D) Study of ecological instruments :

- | | |
|------------------|------------------------|
| (i) Psychrometer | (ii) Prismatic compass |
| (iii) Rain gauge | (iv) Soil thermometer. |

PRACTICAL IV (BASED ON PAPER IX)

(A) CYTOLOGY :

- (1) To study the mitosis by preparing squash of onion root tip.

(B) ANATOMY :

- (1) T.S. of the following stem for anomalous secondary growth.
(i) *Bougainvillea*, (ii) *Mirabilis*, (iii) *Tinospora*.
- (2) T.S. of the following root for anomalous secondary growth.
(i) Beet (ii) Radish (iii) Carrot
- (3) Preparation of permanent slide. (Safranin - Fast Green Combination)
- (4) To measure the dimensions of common microorganisms by calibration and standardization of microscope using stage micrometer and ocular micrometer.
- (5) Measurement of microscopic structure and sketching with camera lucida.
- (6) Permanent slide of the following :
 - (i) Laticiferous tissue
 - (ii) Periderm
 - (iii) Lenticell
 - (iv) Leaf fall
 - (v) Latex cell.
- (7) Preparation of slides for nodal anatomy.
 - (i) Unilacunar
 - (ii) Trilocular.

(C) EMBRYOLOGY :

- (1) Permanent slide of the following :
 - (a) EMBRYOLOGICAL STAGES :
 - (i) T.S. of Young Anther
 - (ii) T.S. of Anther Showing Four Mature Pollen Sacs
 - (iii) T.S. of Mature Anther Showing Dehiscence
 - (iv) Pollen Tetrads
 - (v) Pollinia
 - (vi) Germination of Pollengrain.

- (b) Types of Ovules :
 - (i) Orthotropous
 - (ii) Anatropous
 - (iii) Hemitropous
 - (iv) Campylotropous
 - (v) Amphitropous
 - (vi) Circinotropous.
 - (c) Megasporangium :
 - (i) Two celled stage of Megaspore Mother Cell
 - (ii) Ovule with Binucleate Embryo-sac
 - (iii) Ovule with 4-nucleate Embryo-sac
 - (iv) Ovule with 8-nucleate Embryo-sac
 - (d) Embryo :
 - (i) Globular embryo
 - (ii) Heart-shaped embryo
 - (iii) Mature embryo
- (2) Embryo mounting in Cucurbita.

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