

# MSEI - Botany

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ગુજરાત યુનિવર્સિટી

ન. એકેડેમિક/બી/ ૧૩૦૧૫/૧૯૯૯ :  
ગુજરાત યુનિવર્સિટી કાર્યાલય,  
અમદાવાદ-૯ તા. ૩-૮-૧૯૯૯ :

પરિપત્ર : ૧૪ :

યુનિવર્સિટી વિજ્ઞાન વિદ્યાલયના અધ્યક્ષાશ્રી તથા પોટાની  
વિભાગ શીખવતા અમુસ્નાતક કેન્દ્રના વડાશ્રીને જણાવવાનું કે, એમ. એસસી. ભાગ-૧  
નો પોટાની વિભાગનો અભ્યાસક્રમ આ સંબંધેના પરિશિષ્ટ મુજબનો સુધારવામાં  
આવ્યો છે, જેનો અમલ જુન-૧૯૯૯થી કરવાનો રહેશે.

*(Signature)*  
કુલસચિવશ્રી

પ્રિઠાણ:- ઉપર મુજબ :

પ્રતિ,

- ૧: યુનિ. વિજ્ઞાન વિદ્યાલય,  
પોટાની વિભાગ વિજ્ઞાન ભવન,  
ગુજરાત યુનિવર્સિટી,  
અમદાવાદ-૯
- ૨: પોટાની વિભાગ શીખવતા અમુસ્નાતક કેન્દ્રના  
વડાશ્રી.
- ૩: પરીક્ષા નિયાંમકશ્રી,  
પરીક્ષા વિભાગ, ગુજરાત યુનિ.  
અમદાવાદ-૯
- ૪: મદદનીશ કુલસચિવશ્રી,  
પરીક્ષા વિભાગ, ગુજરાત યુનિ.  
અમદાવાદ-૯
- ૫: શ્રીમતી પ્રફુલ્લાબેન ત્રિવેદી,  
પરીક્ષા વિભાગ, ગુજરાત યુનિ.  
અમદાવાદ-૯ :

વાઘેલા : ૩.૮.

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GUJARAT UNIVERSITY  
M. SC. PART-I  
B O T A N Y  
(Effective from June, 1999)

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1. There will be one hundred marks for each paper and fifty Marks for each practical.
2. Each practical examination will be of 50 marks and will be of Five hours' duration.
3. There shall be at least one botanical excursion for each year. It will pertain to different botanical regions even outside Gujarat State. The botanical excursion is highly essential for studying vegetation in its natural state.
4. Candidate shall be required to produce at the time of practical examination at the end of each year;
  1. The laboratory journal and diary of field work duly signed by the teachers concerned from time to time.
  2. A set of micro-preparations or materials illustrating the subject -matter for each year.

M. Sc. Part-I

- Paper-I: Atracheophyta-Algae, Mycology (Fungi) Plant pathology & Bryophyta.
- Paper-II: Tracheophyta-Pteridophyta including fossils. Gymnosperms including fossils, Angiosperms and Embryology.
- Paper-III: Cell Biology, Bio-physics, Bio-Chemistry and Physiology.

M. Sc. Part-II

- Paper-IV: Genetics and genetic engineering, Biometrics, Plant breeding, Economic Botany and Ethnobotany.
- Paper-V: Plant Ecology with remote sensing, Plant geography and Anatomy.
- Paper-VI: Special Papers:

Atrachaeophyta - Algae, Mycology (Fungi), Plant Pathology and Bryophyta.

\*\*\* Algae : (2-Units)

- Principles of Classification
- Classification according to Fritsch and Smith.

\* Cyanophyta :

- Classification
- Ultra structure of a cell
- Range of thallus structure and branching
- Ecological distribution
- Reproduction

\* Chlorophyta:

- Classification
- Ultra structure of a cell
- Range of thallus structure
- Types of chloroplasts
- Reproduction and Life-Cycles

\* Phaeophyta:

- Classification
- Range of thallus structure
- Reproduction and life Cycles

\* Rhodophyta :

- Classification
- Range of thallus structure
- Reproduction : Carposporophyte and Tetrasporophyte and Life Cycles.

\* - General account of Chrysophyta, Euglenophyta and Bacillariophyta.

\* - Pigments of Algae

\* - Coastal Algae of Gujarat

\* - Economics importance of Algae : As food and Fodder, fertilizer, in treatment of sewage, industrial products of Algae, use of Algae in medicine and cosmetics, as tools for physiological investigations.

\* - Interrelationship of major groups of Algae : Cyanophyta, chlorophyta, Phaeophyta & Rhodophyta

FUNGI - (1 - Unit)

A) A general knowledge of classification of Fungi by Aleuxopolous and Ainsworth.

B) Phylogeny and interrelationships of major groups.

- C) Heterothallism
- D) Spore and spore producing organs of Fungi
- E) Para Sexual Cycles in Fungi
- F) Sexuality in Fungi
- G) Development of Ascus & Basidium
- H) Economic importance of Fungi in industries  
medicines agriculture and waste recycling

PLANT PATHOLOGY - (1 - Unit)

- A) Classification of Plant diseases on the basis of causative organisms and symptoms.
- B) Host-parasite interaction : Histological, physiological and Biochemical.
- C) Effect of weather and soil fertility on plant diseases
- D) Koch's postulates
- E) Fungicides
- F) Disease control : Quarantary, Microtoxic and Aphlotoxic.

BRYOPHYTES (1 - Unit)

- A) Recent classification of Bryophytes by Rothmaler and Proskauer
- B) Origin of Bryophytes
- C) Evolution of gametophytes
- D) <sup>Origin and</sup> Evolution of sporophytes
- E) Alternation of generations.
- F) Reproduction : (1) Vegetative  
(2) Sexual
- G) Fossil Bryophytes
- H) Experimental studies in Bryophytes

SYLLABUS OF M.SC.I PAPER - II

(Pteridophytes, Gymnosperms, Angiosperms and Embryology)

Tracheophyta :

(Pteridophytes including fossils, Gymnosperms including fossils.  
Angiosperms and Embryology )

Pteridophytes (1-Unit)

1. Classification of pteridophytes by Smith.
2. Interrelationships of the different groups of pteridophytes.
3. Evolutionary tendencies in ferns and classification of ferns.
4. Spore bearing organs in Pteridophytes.
5. Telome theory.
6. Patterns of Gametophyte development, and sex organs.
7. Asteroxylon, Miadessmia, Sigillaria<sup>na</sup> Calamophyton.

Gymnosperms, (1-Unit)

1. Different types of classification of Gymnosperms.
2. Comparative account and interrelationships of the groups of Gymnosperms.
3. Evolutionary tendencies in Gymnosperms.
4. General account of Male and Female gametophyte<sup>phyte</sup> of gymnosperms.
5. Origin, rise and fall of Gymnosperms.
6. Fossil Gymnosperms:
  - i) Cycadofilicales
  - (ii) Bennittitales
  - iii) Cordaitales
  - (iv) Caytoniales
7. General Account of Pentoxylales

Angiosperms ( 2 Units)

A) Classification Systems :

- 1) Bentham and Hooker System of Classification in detail with merits & demerits.
- 2) Phylogenetic Systems of classification of Hutchinson, Bessey, Rendle (Outline only)
- 3) Modern Systems of classification Takhtajan, Dhalgren, Cronquist (Outline only)

B) Classification Interrelationship, Systematic position of the following groups.

- -

C) Origin of Angiosperms.

Different theories showing origin of Angiosperms

1. Ranales                      2. Sympetalae                      3. Helobial..

D) Modern trends in Angiosperms.

Chemotaxonomy; Seruntaxonomy; ICBN, and Numerical taxonomy.

E) Flora of Gujarat State :- Land flora including hill flora and forest flora and flora of plane, Desert and Semidesert Flora; Aquatic flora (Fresh water and Marine)

Embryology : (1 Unit)

- (A) - Reproductive cycles in Angiosperms
- (B) - Evolutionary tendencies in female gametophyte
- (C) - E.M. Structure of Male and Female gametophyte
- (D) - Haustorial behaviour of Embryosac, Endosperms and Embryo.
- (E) - Behaviour of Embryosac during fertilization.
- (F) - Role of Synergids and Polar nuclei during fertilization
- (G) - Classification of Embryo in Angiosperms. (Scheme only)
- (H) - Application of palynology.
- (I) - Apomixis - Apospory.                      (J) Experimental Embryology
- (K) - Application in different field (tissue culture) and its significance.

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PAPER - III

Cell Biology, Bio.Chemistry, Biophysics & Plant Physiology

(1.5)Unit)

1) The ultra structure of the cytoplasm

Cell Biology

- (a) Cytoskeleton
- (b) Endomembrane system
- (c) Membrane organelles
- (d) Plant Cell Cytoplasm

2) Techniques in cell biology

(a) Microscopy

- (i) Light microscopy
- (ii) Electron microscopy

(3) Microtubules and microtubular organelles  
(Cilia, Flagella, Centriole)

(4) Cytochemistry and functions of Golgi complex.

(5) Molecular organization and functions of Mitochondria

(6) Molecular organization of chloroplast with  
special reference to thylakoids.

(7) Cell-cycle.

(8) Chromosomes :-

- (a) Ultra structure of chromosome-Variou models for structure
- (b) Sathromosome
- (c) Heterochromatine
- (d) Chromosomal movements
- (e) Cell division
- (f) Mitotic apparatus

(9) Microbodies :-

- (a) Peroxisomes
  - (1) Morphology of peroxisomes
  - (2) Biogenesis of peroxisomes
  - (3) Function of microperoxisomes
- (b) Glyoxesmes.

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BIOPHYSICS : ( 0.5 Unit)

- (a) Bonds
- (b) Free radicals and charge transfer complex, measurement & role in plant processes.
- (c) Oxidation reduction potential
- (d) Nature of energy and its measurement.
  - Chemical energy
  - Free energy
- (e) Radio isotopes
  - measurement and role in plant processes.

BIOCHEMISTRY : (1 Unit)

1. Lipids - Metabolism including & Oxidation
2. Amino acids - structure and function
3. Enzymes- Classification, mode of action and Km value.
4. Nucleic acid : structure and function of different kinds of DNA & RNA, Their role in protein synthesis and reverse transcription.
5. Nitrogen metabolism, Nitrogen fixation.
6. Structure and functions of Vitamins and alkaloids.

PLANT PHYSIOLOGY (2 Units)

1. Water relation in plants
  - (a) Water potential - measurement and significance
  - (b) Transpiration
    - (i) Recent theories of mechanism of stomatal movement.
    - (ii) Law of perimeter
    - (iii) Antitranspirant
2. Mineral nutrition
  - (a) Methods for studying mineral nutrition.
  - (b) Micro-nutrients, role and deficiency symptoms
  - (c) Beneficial and toxic elements
  - (d) Uptake and translocation of mineral ions



- 3) Translocation  
Detailed account including all theories.
- 4) Photosynthesis
- (a) Photosystem I & II, Composition, Function and location in thylakoids
  - (b)  $C_3$  cycle
  - (c) Different kinds of  $C_4$  pathways
  - (d) CAM
  - (e) Photorespiration, its Ecological and Biochemical adaptations.
  - (f) Link between respiration and other metabolic reactions, Anaplenatic sequence.
- 5) Stress Physiology
- (a) Physiology of water stress development of internal water deficit in plants, physiological response of crop plants to water stress and drought resistance.
  - (b) Salt stress; Salt resistance, ion stress, mechanism of stress injury and resistance.
- 6) Growth development and differentiation
- (a) Pattern of growth, development and differentiation.
  - (b) Growth indices
  - (c) Kinds of developmental control
  - (d) Vernalization and photoperiodism
  - (e) Detailed account of Phytochromes.
- 7) Hormones (Auxin, GA, Cytokinin ethylene and abscisic acid)
- (a) Biosynthesis - translocation.
  - (b) Bioassay
  - (c) Mechanism of action
  - (d) General account of plant growth inhibitors

- 8) Biological clock
- 9) Senescence abscission general account of circadian rhythm.
- 10) Dormancy
  - Environmental and Hormonal
  - Regulation of seed dormancy
- 11) Germination
  - Biochemical and Hormonal aspects of seed germination.
- 12) Applications of plant physiology in crop improvement in agriculture, forestry and horticulture including role of plant tissue culture & Biotechnology.

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M.Sc. PART : I

BOTANY PRACTICALS IN FORCE FROM JUNE, 1999

Each practical is based on theory paper and in addition to this types studied at T.Y.B.Sc. are also included.

A batch of 15 (fifteen) students is strongly recommended for practicals so that due attention can be given to the students.

PRACTICAL - I (Based on Paper-I)

(Archaephyta : Algae, Mycology (Fungi), Plant Pathology and Bryophyta.)

The following types are prescribed for practical-I.

ALGAE

Cyanophyta :

Chroococcus, Microcystis, Nostoc, Anabaena, Gloeotrichia, Lyngbya, Spirulina, Arthrospira, Tolypothrix.

Chlorophyta :

Chlamydomonas, Pandorina, Gonium, Scenedesmus, Hydrodictyon, Chaetophora, Cladophora, Bulbochaetae, ULVA, Pithophora, Zygnema, Cosmarium and Closterium.

Phaeophyta :

Dictyota and Padina.

Rhodophyta :

Nemalion, Gelidium, Gracilaria, Champia, Ceramium.

Charophyta :

Chara and Nitella.

: :  
F U N G I

\* Mastigomycotina

Peronospora , Albugo.

\* Zygomycotina .

Rhizopus.

\* Ascomycotina :

Taphrina, Aspergillus, Erysiphe, Uncinula, Neurospora.

Basidiomycotina :

Ustilago, Polyporus, Lycoperdon.

\* Deuteromycotina :

Alternaria, Cercospora, Fusarium.

PLANT PATHOLOGY

1. Smut of Sugarcane.
2. Early blight of Potato.
3. Red rot of Sugarcane.
4. Rusts of wheat.
5. Blight of Jeera and Isaphgul.
6. Bunt of Rice.
7. Downy mildew of grapes and Pea.
8. Powdery mildew of grapes and Pea.
9. Soft rot of ginger.

BRYOPHYTA

HEPATICOPSIDA :

Lunularia, Targionia, Dumortiera, Pellia, Fossombronia,  
Porella ( Madotheca), Fimbriaria, Pallavicinia.

\* ANTHOCEROTOPSIDA :

Anthoceros, Notothylas.

\* BRYOPSISIDA :

Sphagnum, Pogonatum.

PRACTICAL SYLLABUS OF  
M. SC. P. I (PAPER. II)

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Pteridophyta :- (Over and above the types taught at Graduate level, the following types should be taught  
Ophioglossum, Botrychium, Azolla, Lycopodium.

Ferns : Angiopteris, Gleichenia, Pteris, Lygodium Cheilanthes and Blechnum

Permanent slides of the following types to study  
Indusium, Position of Sori and group of Sporangia.

Woodsia, Woodwardia, Cyathea Hymenophyllum .

Asplenium and Dryopteris.

Fossil : Rhynia, Lepidodendron, Lepidocarpon Lepidostrobus, Lepidophyllum, Stigmaria, Sphenophyllum, Annularia, Calamites

The permanent slides of types prescribed for anatomy, reproductive structures etc should also be studied.

Gymnosperms :-

Cupressus, Thuja, Podocarpus, Araucaria, and Cedrus

Fossils Gymnosperms : Lyginopteris, Lagenostoma Williamsonia and its fructification, Pentoxylon , Cordaites, Cordaitanthus, Cardiocarpus,

Embryology : Dissection of Shoot:apex: Hydrilla, Grass Ceratophyllum.  
Dissection of : Embryo, Endosperm Endospermhaustoria

Material :- Cucumber, Cucurbita, Raphanus,

Pollen tube germination, Pollen grain Exine of different plants; use of Camera lucida though : P.S. of Emb slides

Angiosperms (Families) Flowering plants of Local Flora and to find out genus species with the help of cook's flora.

PRACTICAL PAPER-III Cell Biology, Biophysics, Biochemistry  
and Plant Physiology

CELL BIOLOGY

1. Study of different stages of mitosis and meiosis.
2. Study of cell organelles- Nucleus, chloroplast and mitochondria.
3. Localization of the enzyme peroxidase.
4. Electron micrographs of cell organelles.

BIOCHEMISTRY:

5. Standard curves of glucose, starch, protein and RNA
6. Determination of amylase activity.
7. Determination of acid number and iodine number of lipids.
8. Absorption spectra of chlorophylls.

PLANT PHYSIOLOGY (MAJOR EXPERIMENTS)

9. Determination of osmotic pressure by plasmolytic method.
10. Determination of diffusion pressure deficit of potato tuber.
11. Estimation of Chlorophyll 'a' and 'b' total chlorophyll and carotenoids.
12. Separation of chloroplastic pigments by the chemical method.
13. Separation of amino acids by the paper chromatography.
14. Determination of organic acids.
15. Calculations of Growth indices.

(Minor experiments - demonstration type)

16. Demonstration of opening and closing of stomata by PGRs.
17. Tetrazolium tests for dormant, dead and viable seeds.
18. Bioassays of auxins, gibberellins and cytokinins.
19. Study of photoperiodic and vernalization effects.
20. Study of Red-far-red system.

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PRACTICAL EXAMINATION IN BOTANY

M.Sc. - Part-I

PRACTICAL : I (Based on Paper- I)

(Atracheophyta : Algae, Mycology (Fungi),  
Plant Pathology and Bryophyta) .

DATE : MARKS : 50 TIME : 5 Hours.

- Q.1 Identify and classify giving reasons. Draw the labelled diagrams of the structures observed in Specimens, A, B, C and D. (12)
- Q.2 Describe the structural peculiarities with labelled diagrams as observed in specimens E, F and G... (9)
- Q.3 Expose the pathogens from the given material H and I. Make a labelled sketch and show your preparation to the Examiner. (10)
- Q.4 Identify and describe briefly the slides J, K and L. (9)
- Q.5 (a) Journal ... (2)  
(b) Submission and Viva-Voce. (8)

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PRACTICAL EXAMINATION IN BOTANY

M.Sc. : PART - I

Practical : II ( Based on Paper-II)

(Tracheophyta : Pteridophyta, Gymnosperms,  
Fossils Angiosperms and Embryology ).

DATE :

MARKS : 50

TIME : 5 Hours

- Q.1 Identify and classify giving reasons draw the labelled diagrams of the peculiarities observed in specimens A. and B. (8)
- Q.2 Describe the morphological peculiarities observed in the specimens C and D. (8)
- Q.3 Expose and dissect out the \_\_\_\_\_ from the given material 'E'. (4)
- Q.4 Dissect out shoot apex from given material 'F' and by the help of Camera lucida calculate the cell area. (4)
- Q.5 Refer the specimens G and H to their respective families giving reasons including floral formula and floral diagram. Draw labelled diagrams.... (8)
- Q.6 Find out the genus and species of the given specimen - 'I' by the help of Cook's flora. (4)
- Q.7 Identify and describe the slides 'J' and 'K' (4)
- Q.8 (a) Submission/Herbaria/Tour report. (5)  
(b) Journal and Viva-Voce. (5)



PRACTICAL III -

- Q.1 A Prepare a slide from the given material 'A' showing two stages of cell division, Draw a labelled diagram. Show your preparation to the examiner. 6
- B Prepare a slide from given material 'B' showing the presence of nucleus/chloroplast/ mitochondria 4
- Q.2 Prepare a standard curve of glucose/starch/protein/RNA 8
- Q.3 A. Perform the experiment as per given slip. Calculate your results. 10
- B Determine iodine number/acid number/amylase activity/absorption spectra of chlorophylls
- O R
- Separate amino acids by paper Chromatography.  
Calculate R<sub>F</sub>R / N<sub>A</sub>R / L<sub>W</sub>R 6
- Q.4 Comment upon 'C' and 'D' 6
- Q.5 Viva and Journal. 10