M. Sc. (SECOND YEAR) BOTANY CURRICULUM (SEMESTER PATTERN)

2009
Unit-I: Membrane transport and Amino acids

A. Scope and importance of plant physiology (01 period).

B. Membrane transport and translocation of water and solutes: Plant water relations, mechanism of water transport through xylem, root-microbe interaction in facilitating nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport (07 periods)

C. Amino acids: Structure, classification, characteristics, biosynthesis of amino acids, protein and non protein amino acids (04 periods).

Unit-II: Fruit Seed and stress physiology

A. Fruit and seed physiology: Dormancy, causes and factors affecting seed dormancy, storage and seed germination, fruit ripening and its molecular basis (05 periods).

B. Stress physiology: Plant responses to biotic and abiotic stresses, water deficit and drought resistance, salinity stress, metal toxicity and freezing and heat stress (05 periods).

Unit-III: Enzyme kinetics

A. General aspects (classification and structure): allosteric mechanism, regulatory, and active sites, coenzymes (05 periods).

B. Kinetics of enzyme: V-max and Km and its significance (06 periods).

Unit-IV: Nitrogen fixation & Biosynthesis of proteins

A. Nitrogen fixation: Introduction, biological nitrogen fixation, nodule formation and mechanism of nitrate uptake and reduction, ammonia assimilation (06 periods).

B. Biosynthesis of proteins: Introduction of t-RNA, ribosomes, transcription and translation, regulation of proteins and enzyme synthesis (06 periods).
M.Sc. (SECOND YEAR) BOTANY

SEMESTER-III

THEORY PAPER-VI

(Cytogenetics, Gene regulation and Biotechnology)

Periods - 45  Maximum Marks – 50

Unit-I: Molecular cytogenetics

- Nuclear DNA content, C- value paradox, cot curve and it significance, Basic discoveries in molecular genetics (06 periods).

Unit-II: Genome organization and its replication

- Conjugation, transduction and transformation, gene aping in bacteria; Bacterial and cyanobacterial genomes, replication of bacterial and eukaryotic genomes, control of replication diversity in DNA polymerases, replication of plasmids, control of plasmid copy number (10 periods).

Unit-III: Biotechnology-I

A. Biotechnology: Basic concepts, principles and scope (03 periods).

B. Plant cell and tissue culture: General introduction, history, scope, concept of cellular differentiation, totipotency (05 periods).

C. Organogenesis and adventives embryogenesis: Fundamental aspect of morphogenesis, somatic embryogenesis and organogenesis, mechanisms, technique and utility (07 periods).

Unit-IV: Biotechnology-II

A. Somatic hybridization: Protoplast isolation, fusion and culture, hybrid selection and regeneration, possibilities, achievements and limitations of protoplast research (07 periods).

B. Application of plant tissue culture: Clonal propagation, artificial seed production of hybrids and soma clones, production of secondary metabolites/natural products, cryopreservation and germplasm storage (07 periods).
1. Principles of colorimetry, spectrophotometry and flenorimetry.
2. Effect of time on the rate of reaction of enzyme.
3. Effect of substance concentration on the rate of action of enzyme (acid phosphatase and nitrate reductase)
4. Effect of substance concentration on enzyme activity of (Determination of Km value).
5. Determination of amylolytic enzymes in germinating seeds by colorimeter / spectrophotometer.
6. Determination of lipolytic enzymes in germinating oil seeds by titrimetric method.
7. Determination of osmotic potential by plasmolytic methods.
10. Determination of substrate indeciability of the enzyme nitrate reductase.
11. Determination of water potential of any tuber.
12. Visit to research centers.
M.Sc. (SECOND YEAR) BOTANY

SEMESTER-III

PRACTICAL BASED ON THEORY PAPER-VI

(Cytogenetics, Gene regulation and Biotechnology)

Maximum Marks – 50

1. Study of aseptic techniques, safe handling of microorganisms, storage of culture and sub culturing, establishing pure culture (streak plate method)

2. Study of growth characteristic of *E.coli* using plating and turbidimetric method.

3. Isolation of plasmid from *E. coli* by alkalinelysis method and its quantification spectrophotometrically.

4. Preparation of tissue culture media, sterilization and inoculation of plant material.

5. Demonstration of technique of micro propagation by using different explants (axillary buds and meristem)

6. Isolation of protoplast from different tissues using commercially available enzymes (e.g. Tobacco, Petunia) and estimation of their yield.

7. Demonstration of root and shoot from the apical and basal portion of stem segments in liquid containing different hormones

8. Demonstration of technique of anther culture (e.g. Datura)

9. Study of effect of temperature (physical factor ) on protoplast yield

10. Effect of nanoparticals on growth of onion root tips

11. Visit to plant tissue culture laboratory.

SKELETON QUESTION PAPER

M.Sc. (SECOND YEAR) BOTANY

SEMESTER-III

THEORY PAPER-V

(Plant Physiology and Metabolism-I)

Time: Three hours  Maximum Marks: 50

Note: -
   (i) Attempt all questions
   (ii) All questions carry equal marks
   (iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I)  Long Answer type OR  10
   a. Short answer type  05
   b. Short answer type  05

Q.2. (Unit –II)  Long Answer type OR  10
   a. Short answer type  05
   b. Short answer type  05

Q.3. (Unit –III)  Long Answer type OR  10
   a. Short answer type  05
   b. Short answer type  05

Q.4. (Unit –IV)  Long Answer type OR  10
   a. Short answer type  05
   b. Short answer type  05

Q.5. Short notes of the following  (any four)  10
   1. Unit-I
   2. Unit-I
   3. Unit-II
   4. Unit-II
   5. Unit-III
   6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY
SEMESTER-III
THEORY PAPER-VI
(Cytogenetics, Gene regulation and Biotechnology)

Time: Three hours
Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

---

Q.1. (Unit –I)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.2. (Unit –II)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.3. (Unit –III)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.4. (Unit –IV)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.5. Short notes of the following  (any four)  10
1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-II
5. Unit-III
6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY
SEMESTER-III
PRACTICAL BASED ON THEORY PAPER-V & VI

<table>
<thead>
<tr>
<th>Centre:</th>
<th>Batch No.:</th>
<th>Date:</th>
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*Time: Six hours  Maximum Marks: 50*

Q1. Any one experiment
   (From experiment No. 1 to 6 based on paper-V)  10

Q2. Any one experiment
   (From experiment No. 7 to 11 based on paper-V) 10

Q3. Any one experiment
   (From experiment No. 1 to 6 based on paper-VI) 10

Q4. Any one experiment
   (From experiment No. 7 to 10 based on paper-VI) 10

Q5. Record book  05
    Viva voce  05
Unit-I: Historical account and process of infection (10 periods).


- **Process of infection**: Pre penetration activity of the pathogen on the host surface, penetration-direct, through stomata, lenticels, hydathodes, wounds, buds and hairs, factors influencing infection.

Unit-II: Epidemiology and disease forecasting (13 periods).

- **Aerobiology**: Airborne pathogens, scope and applications of aerobiological studies in disease forecasting

- **Epidemiology**: Slow and rapid epidemics, favorable factors for development of epidemics, conditions for decline of epidemics

- **Disease forecasting**: general account with suitable examples

- **Dissemination of plant pathogens**: by air, water, insects, animals and man

Unit-III: Defense mechanism in plant (12 periods).

- **Structural defense**: pre existing, post infectional

- **Biochemical defense**: pre existing, post infectional, defense through detoxification of pathogen toxins, hypersensitivity

- **Phytoalexins**: Characters and role, elicitors of phytoalexins.

Unit-IV: Seed pathology (10 periods).

- Seed borne pathogens, methods for detection of fungi, bacteria and viruses, transmission of seed borne pathogens, biochemical changes in seeds, spoilage of grains in storage, control of seed borne diseases, seed treatments, seed certification
Unit-I: Introduction (10 periods).

- What is plant disease? Nature and concept of plant disease stages in disease development of plant diseases, effect of plant diseases on human affairs

- Classification of plant diseases: Criteria used in classification, origin (soil, air, seed), symptoms, causal organism, categorization of plant diseases, diagnosis of plant diseases, trends in teaching and research in plant pathology

Unit-II: Nutritional and abiotic stress factors (12 periods).

- Nutrition of plant pathogens: Utilization of carbon, nitrogen and micronutrients

- Abiotic stress factors: Pollutants in the air, mineral deficiencies, temperature, moisture, light, soil pH and structure, oxygen, carbon dioxide concentration, herbicides and insecticides

Unit-III: Disease management-Principles (10 periods).

- Management planning against a disease or for a crop, disease cycle-disease control relationship, bases of disease management principles, exclusion of the pathogen-plant quarantines, avoidance of the pathogen, eradication of the pathogen, protective measures, development of resistance in hosts, therapy of diseased plant

Unit-IV: Disease management –The practices (13 periods).

- Cultural practices, for disease management, production and use of disease free propagating material, adjustment of plant culture of minimize disease incidence, field and plant sanitation

- Microbial pesticides, botanicals, fungicides, nematicides and antibiotics in use, sulphur fungicides, copper fungicides, systemic fungicides, antibiotics, nematicides, mode of action, non conventional chemical in disease control, application of fungicides, biological control, biopesticides
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

PLANT PATHOLOGY

PRACTICAL BASED ON THEORY PAPER-VIIA

(Principles of plant pathology)

Maximum Marks – 50

1. Isolation of fungal pathogens from diseased plant parts (by leaf segment method)
2. Isolation of bacterial pathogens from diseased plant parts
3. Isolation and identification of any two plant pathogens from air
4. Isolation and identification of seed mycoflora by blotter and agar plate method
5. Estimation of carbohydrates from infected seeds
6. Estimation of proteins from infected seeds
7. Bioassy of phytoalexins
8. Effect of temperature on growth of fungal plant pathogens
9. Effect of pH on growth of fungal plant pathogens
10. Examination of host parasite relationship by using light microscopy
11. Estimation of aerospora by air sampler
12. Visit to research centers, plant pathology laboratories, agriculture universities, two short and one long excursions
1. Isolation of soil-borne pathogens
2. Study of common effect of pollutants-SO₂, NO₂, and NH₃ on the leaves of common crop plants
3. Study of mineral deficiency symptoms of important micro / macronutrients
4. Study of leaf area affected due to infection in leaf spot and leaf blight diseases
5. Calibration of microscope and measurement of fungal spores
6. Laboratory screening of systemic/contact fungicides (any two) against a pathogenic fungus (inhibition of spore germination)
7. Effect of carbon sources on growth of plant pathogens
8. Effect of nitrogen sources on growth of plant pathogens
9. Study on antagonism between isolate antagonists and plant pathogens
10. Evaluation of biopesticides (neem, turmeric and garlic) against some plant pathogens
11. Collection and preservation of diseased specimens and plant pathogens
12. Visit to at least two plant protection research stations and three short excursions for collection of diseased specimens and at least one long excursion
SKELETON QUESTION PAPER

M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

PLANT PATHOLOGY

THEORY PAPER-VIIA (Elective paper-I)

(Principle of plant pathology)

Time: Three hours  Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.2. (Unit –II)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.3. (Unit –III)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.4. (Unit –IV)  Long Answer type OR  10
a. Short answer type  05
b. Short answer type  05

Q.5. Short notes of the following (any four)  10
1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-II
5. Unit-III
6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III
PLANT PATHOLOGY
THEORY PAPER-VIII A (Elective paper-II)
(Basic plant pathology and management of plant diseases)

Time: Three hours
Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit – I) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.2. (Unit – II) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.3. (Unit – III) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.4. (Unit – IV) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.5. Short notes of the following (any four) 10
  1. Unit-I
  2. Unit-I
  3. Unit-II
  4. Unit-II
  5. Unit-III
  6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III
PLANT PATHOLOGY
PRACTICAL BASED ON THEORY PAPER-VIIA&VIII

<table>
<thead>
<tr>
<th>Q1.</th>
<th>Scan the given slide A and calculate percentage of airspora</th>
<th>10</th>
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<tr>
<td>OR</td>
<td>Identify and describe any two airborne pathogens from a given plate A</td>
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<tr>
<td>Q2.</td>
<td>Estimate carbohydrates / proteins from infected seed sample B</td>
<td>06</td>
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<tr>
<td>Q3.</td>
<td>Record the effect of given fungicides C &amp; D on spore germination of plant pathogen</td>
<td>10</td>
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<tr>
<td>OR</td>
<td>Record the effect of plant extract C&amp;D on spore germination of plant pathogen</td>
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<tr>
<td>Q4.</td>
<td>Determine the leaf area affected due to infection in the given specimen E</td>
<td>06</td>
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<tr>
<td>OR</td>
<td>Comment on mineral deficiency symptoms / effect of pollutants on given specimen E</td>
<td></td>
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<tr>
<td>Q5.</td>
<td>Comment on spots F, G, H &amp; I</td>
<td>08</td>
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<tr>
<td>Q6.</td>
<td>Record book</td>
<td>05</td>
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<td>Viva voce</td>
<td>05</td>
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Time: Six hours
Maximum Marks: 50

Centre: Batch No.: Date:
Unit-I: Taxonomy-I (10 periods).

- Trends of evolution of characters in following plants, age and place of origin of angiosperms. Concept of primitive flowers, Primitive stamen and primitive carpel. Takhtagan’s and Thorne’s Principles of plant classification

Unit-II: Taxonomy-II (10 periods).

- Taxonomic evidences: Genome analysis and nucleic acid hybridization
- Taxonomic Tools: Phytochemical, serological, Biochemical and molecular techniques, computer GIS

Unit-II: Systematics-III (13 periods).

- Comparative account of floral morphology, interrelationship and distribution of plant families belonging to orders Rhocadales, Malvales, contortae and Amentiferae as per Engler and Prantle’s system of classification.

Unit-II: Systematics-IV (12 periods).

- Comparative account of floral morphology, interrelationship and distribution of plant families belonging to orders Pandanales, Microspermae, Salicales and liliflorae as per Engler and Prantle’s system of classification.
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

ANGIOSPERMS

THEORY PAPER-VIII B (Elective paper-II)

(Plant Anatomy and Pharmacognosy)

Perioids - 45

Maximum Marks - 50

Unit-I: Plant Anatomy-I (10 periods).

- Root apex organization: Quiescent theory, Korper Kappe concept
- Root development: Cell fates and lineages
- Development of adventitious roots

Unit-II: Plant Anatomy-II (10 periods).

- Leaf venation pattern
- Anatomy of node and its significance
- Wood Anatomy: Hard wood and sap wood, porous and non porous wood, wood parenchyma distribution and its types

Unit-III: Pharmacognosy-I (13 periods).

- Floristic diversity and medicinal plant research scenario in Maharashtra
- Definition and scope of pharmacognosy
- Classification of drugs (Taxonomical and morphological)
- Chemical nature of crude drugs

Unit-IV: Pharmacognosy-II (12 periods).

Morphology, distribution, characteristics of order constituents, chemical tests, and uses of following drugs,

- Root drugs: Asparagus, Withania
- Rhizome drugs: Zingiber, curcuma
- Bark drugs: Acacia, Cassia
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III
ANGIOSPERMS
PRACTICAL BASED ON THEORY PAPER-VIIIB
(Taxonomy and systematic)

Maximum Marks - 50

1-12. Descriptions and Identification of flowering plants up to genus and species level with their sketches and floral diagrams belonging to different families of respective orders prescribed in theory paper, Unit III and IV (at least 25 plants.)

13-15. Preparation of keys of locally available plants

16-20. Botanical excursions to the forest (at least two) Preparation of collected plants with their field notes

Note: Student must attend at least one long and one short botanical excursion arranged by the department and must submit report on plant diversity at the time of practical examination.
### M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

**ANGIOSPERMS**

**PRACTICAL BASED ON THEORY PAPER-VIIIIB**

*(Plant Anatomy and Pharmacognosy)*

Maximum Marks - 50

<table>
<thead>
<tr>
<th>1-4.</th>
<th>Study of vessel elements of roots and stem (at least five plants)</th>
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<tr>
<td>5-7.</td>
<td>Study of dermal structures, stomata and trichomes</td>
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<tr>
<td>8-9.</td>
<td>Study of nodal anatomy (at least five plants)</td>
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<tr>
<td>10-14.</td>
<td>Study venation pattern from dicot and monocot plants (at least five plants from each group)</td>
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<tr>
<td>15-20.</td>
<td>Study of morphology, anatomy, medicinal properties and uses of plants <em>(Asperagus, Withania, Curcuma, Zingiber, Cassia and Acacia)</em></td>
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</table>
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

ANGIOSPERMS
THEORY PAPER-VIIB (Elective paper-I)
(Taxonomy and systematic)

| Time: Three hours | Maximum Marks: 50 |

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

<table>
<thead>
<tr>
<th>Q.1. (Unit –I)</th>
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<td>Q.2. (Unit –II)</td>
<td>Long Answer type OR 10</td>
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<td>a. Short answer type 05</td>
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<td>b. Short answer type 05</td>
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<td>Q.3. (Unit –III)</td>
<td>Long Answer type OR 10</td>
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<td>a. Short answer type 05</td>
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<td>b. Short answer type 05</td>
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<td>Q.4. (Unit –IV)</td>
<td>Long Answer type OR 10</td>
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<td>a. Short answer type 05</td>
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<td>b. Short answer type 05</td>
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<tr>
<td>Q.5. Short notes of the following (any four)</td>
<td>10</td>
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<tr>
<td>1. Unit-I</td>
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<td>2. Unit-I</td>
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<td>3. Unit-II</td>
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<td>4. Unit-II</td>
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<td>5. Unit-III</td>
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<td>6. Unit-IV</td>
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</table>
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III
ANGIOSPERMS
THEORY PAPER-VIIIIB (Elective paper-II)
(Plant Anatomy and Pharmacognosy)

Time: Three hours  Maximum Marks: 50

Note: -  
(i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I)  Long Answer type OR  10  
a. Short answer type  05  
b. Short answer type  05

Q.2. (Unit –II)  Long Answer type OR  10  
a. Short answer type  05  
b. Short answer type  05

Q.3. (Unit –III)  Long Answer type OR  10  
a. Short answer type  05  
b. Short answer type  05

Q.4. (Unit –IV)  Long Answer type OR  10  
a. Short answer type  05  
b. Short answer type  05

Q.5. Short notes of the following (any four)  10  
1. Unit-I  
2. Unit-I  
3. Unit-II  
4. Unit-II  
5. Unit-III  
6. Unit-IV
Q1. Describe, identify and classify the given specimen A&B with their floral formula and floral diagram 08

Q2. Identify genus and species of the given specimen C&D with the help of flora 08

Q3. Identify and describe morphological characteristics of powder constituents
Perform chemical tests and comment on uses of given specimen E (plant drug) 08

Q4. Macerate the given specimen F, identify and describe vessel elements 08

OR

Peel of the given plant material G, prepare temporary and describe types of stomata / trichomes with diagrams

Q5. Spotting (Six spots) (Morphology-1, economic importance-1, node / venation-1, medicinal uses-1) 08

Q6. Record book 05
Viva voce 02
Submission and field report 03
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

SEED TECHNOLOGY

THEORY PAPER-VIIC (Elective paper-I)

(Seed science and general seed technology)

Periods – 45  Maximum Marks – 50

Unit-I: (10 periods).

- **Introduction:** History and development of seed technology, seed testing in India and its importance to agriculture

- **Morphology and anatomy of seeds:** Exomorphic characters, gross internal structure, seed development, seed physiology and composition during maturation, structure of main groups of angiosperms, identification and structure of seeds of main field crops, identification and characterization of common weed seeds

Unit-II: Physiology of seed germination (10 periods).

- Biochemistry and physiology of seed germination, water uptake (imbibitions), mobilization of food reserves, germination and growth regulators, factors affecting germination

Unit-III: Seed production (13 periods).

- General principles, seed production in self, cross and vegetatively propagated crops, hybrid seed production, mutation in crops improvement, seed production of foundation / certified seeds in cereal crops (jowar, wheat and rice), pulses (cajun, gram, green and black gram) and cash crops (cotton, groundnut, soyabean), maintenance of inbred lines and breeders, life span of vegetarian and factors responsible for their deterioration, seed germplasm banks

Unit-IV: Seed testing procedures (12 periods).

- Objectives, ISTA Laboratories, prescriptions and recommendations, seed samples and sampling types, seed purity and analysis, genetic purity and determination (lab and field tests), seed moisture content and its effects, methods to determine seed moisture content, seed viability tests, seed and seedling vigour, seedling evaluation
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

SEED TECHNOLOGY

THEORY PAPER-VIIIIC (Elective paper-II)

(Seed pathology and seed health management)

Periods – 45

Maximum Marks – 50

Unit-I: History (13 periods).

- **History of seed pathology:** Early work on seed borne nature of pathogens, development of seed dressing chemicals, development of seed testing institutes, recent seed pathology work in India, contribution of seed pathologists-Paul Neergaard, D. K. Jha, D. Suryanarayana

- **Importance of seed borne microorganisms:** Kind of seed borne inoculum, role of seed microorganisms in agriculture, losses caused by seed borne diseases, **Important seed borne fungi:** *Alternaria*, *Drechslera*, *Cercospora*, *Curvularia*, *Fusarium*, *Colletotrichum*, *Botrytis*, *Ascochyta*, *Cephalosporium*, *Macrophomina*, *Phoma*, *Pyricularia*, *Aspergillus*, *Penicillium*, *Rhizopus*

Unit-II: Seed health testing (10 periods).

- Objective of seed health testing, Methods of seed health testing for fungi, bacteria, viruses and nematodes

Unit-III: Seed borne diseases of cereals (12 periods).

- **Jowar:** Grain smut, grain mould, leaf blight, seed rot, seedling blight, black rot, charcoal rot (seedling blight and hollow stem), **Bajra:** Green ear, ergot, **Wheat:** Loose smut, black point, *Alternaria* leaf blight, *Helminthosporium* leaf blight. Ear cockle

Unit-IV: Seed borne diseases of pulses (10 periods).

- **Pea:** Powdery mildew, **Pigeon pea:** Wilt, **Gram:** Ascochyta blight, wilt, Botrytis grey mould, **Black gram:** Powdery mildew, **Green gram:** Mosaic, powdery
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

SEED TECHNOLOGY

PRACTICAL BASED ON THEORY PAPER-VIIC

(Seed science and general seed technology)

Maximum Marks – 50

_________________________________________
1. Preparation of working samples using mechanical seed divider / trier / repeated having method
2. Determination of physical purity of three field crop seed samples by physical purity analysis by number
3. Determination of physical purity of three field crop seed samples by physical purity analysis by weight
4. Determination of moisture content of seed samples by oven dry method
5. Study of exomorphic and endomorphic features of important field crops
6. Identification and study of common weed crop seeds using seed atlas / manuals, photographs
7. Estimation of starch by spectrophotometer / colorimeter from different varieties of a cereal crop
8. Estimation of protein using a standard graph from different varieties of a leguminous crop
9. Estimation of oil content from vegetable oil crops by tritrimetric / soxhlet extraction
10. Verification of different cultivars through tests at seed level of cultivars of a field crop
11. Study of seed germinability of two crop seed by top paper (TP) and paper towel (PT) methods
12. Study of seed viability test of one each cereal and legume crops by tetrazolium (TZ) test
13. Evaluation of seedling vigour by seedling growth rate and determination of seed vigour index
1. Inspection of dry seed samples.
2. Examination of seed washing and estimation of spore load on seed sample
3. Identification of common seed borne fungi
4. Study of seed borne mycoflora by standard blotter paper method
5. Study of seed borne mycoflora by paper towel method
6. Study of seed borne mycoflora by standard agar plate method
7. Isolation and culture of seed borne bacteria (staining technique)
8. Symptoms caused by seed borne viruses
9. Isolation and observation of nematodes from seeds

10. Diseases of cereals
    - Jowar: Grain smut, grain mould, leaf blight, seed rot, seedling blight, black rot, charcoal rot (seedling blight and hollow stem), Bajra: Green ear, ergot, Wheat: Loose smut, black point, Alternaria leaf blight, Helminthosporium leaf blight. Ear cockle

11. Diseases of pulses
    - Pea: Powdery mildew, Pigeon pea: Wilt, Gram: Ascochyta blight, wilt, Botrytis grey mould, Black gram: Powdery mildew, Green gram: Mosaic, powdery
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III
SEED TECHNOLOGY
THEORY PAPER-VIIC (Elective paper-I)
(Seed science and general seed technology)

Time: Three hours  Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I) Long Answer type OR 10
a. Short answer type 05
b. Short answer type 05

Q.2. (Unit –II) Long Answer type OR 10
a. Short answer type 05
b. Short answer type 05

Q.3. (Unit –III) Long Answer type OR 10
a. Short answer type 05
b. Short answer type 05

Q.4. (Unit –IV) Long Answer type OR 10
a. Short answer type 05
b. Short answer type 05

Q.5. Short notes of the following  (any four) 10
1. Unit-I
2. Unit-II
3. Unit-II
4. Unit-III
5. Unit-III
6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-III

SEED TECHNOLOGY
THEORY PAPER-VIIC (Elective paper-II)
(Seed pathology and seed health management)

Time: Three hours
Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I)
Long Answer type OR
a. Short answer type 05
b. Short answer type 05

Q.2. (Unit –II)
Long Answer type OR
a. Short answer type 05
b. Short answer type 05

Q.3. (Unit –III)
Long Answer type OR
a. Short answer type 05
b. Short answer type 05

Q.4. (Unit –IV)
Long Answer type OR
a. Short answer type 05
b. Short answer type 05

Q.5. Short notes of the following (any four)
1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-III
5. Unit-III
6. Unit-IV

10
Q1. Determine the physical purity of working seed sample by weight / number method

OR

Estimate the starch / protein / oil content in the given seed sample using a suitable method

Q2. Determine the seed moisture content of the seed sample using oven dry method

OR

Determine the seed viability (T2 test / seed vigor)

Q3. Identify, classify and describe the given seed borne organisms of the seed sample A

OR

Estimate the spore load of given seed sample B

Q4. Comment on seed health of seed sample C

OR

Identify and describe the given seed borne disease of sample D

Q5. Spotting (Four spots) (F, G, H & I)

Q6. Record book & submission

Viva voce
M.Sc. (SECOND YEAR) BOTANY

SEMESTER-IV

THEORY PAPER-V

(Plant Physiology and Metabolism-II)

Periods - 45  Maximum Marks - 50

Unit-I: (10 periods).

- **Plant growth regulators and elicitors:** Role and Mechanism of Auxin, Gibberellins, Cytokinins. Ethylene, abscisic acids, brassinocleroids, polyamines, jasmonic acid and salicylic acids.

- **Photomorphogenesis:** Phytochrome, phytochrome in dark germination seedling, physiological effect of phytochrome and cytochromes.

Unit-II: (10 periods).

- **Floral physiology:** Physiology of flowering and vernalization

- **Sensory photobiology:** Introduction, photophysiology of light induced responses, cellular localization, and molecular mechanism of action of photomorphogenic receptors.

Unit-III: (13 periods).

- **Photochemistry and photosynthesis:** General concepts, photosynthetic apparatus (Cyanobacteria, C3, and C4), photosynthetic pigments and light harvesting mechanism, photooxidation of water, mechanism of electron and proton transport, carbon assimilation (Calvin cycle, photorespiration and its significance), the C4 cycle, the CAM pathway and their significance.

- **Leaf proteins:** Introduction, green crop fractionation in general leaf protein concentration and deproteinized leaf juice (DPJ)

Unit-IV: (12 periods).

- **Respiration:** Introduction of plant respiration, glycolysis, TCA cycle, ETS and ATP synthesis, pentose phosphate pathway.

- **Lipids:** Structural and function of lipids, fatty acid, synthesis of membrane lipids, structural lipids.
M.Sc. (SECOND YEAR) BOTANY

SEMESTER-IV

THEORY PAPER-VI

(Genetic Engineering and Biostatistics)

Periods - 45

Maximum Marks - 50

Unit-I: Genetic engineering (10 periods).

- Aim, strategies for development of transgenic (with suitable example) Agrobacterium the natural genetic engineer, T- DNA and transposon mediated gene tagging, intellectual property eights, possible ecological risks and ethical concern, Application of genetic engineering .

Unit-II: Recombinant DNA technology (12 periods).

- Gene cloning- Principles and techniques, construction of genomic/ cDNA libraries, gene gun choice of vectors, DNA synthesis and sequencing polymerase chain reaction, DNA finger printing , DNA damage and repair.

Unit-III: Genomics and proteomics (13 periods).

- General and physical mapping of genes, molecular markers for introgression of useful traits, genome projects, bioinformatics, functional genomics, protein profiling and its significance.

Unit-IV: Biostatistics (10 periods).

- Central value- Mean, mode, median, mean deviation, standard deviation and coefficient of variation, test of significance (T-test, chi-square test), probability and distribution (normal, binomial and Poisson distribution), application of biostatics.
M.Sc. (SECOND YEAR) BOTANY

SEMESTER-IV

PRACTICAL BASED ON THEORY PAPER-V &VI

Maximum Marks – 50

2. Extraction of chlorophyll pigments from leaves and preparation of absorption spectrum of chlorophyll s.
3. Extraction of chlorophyll pigments from leaves and preparation of absorption spectrum of carotenoids.
4. Determination of chlorophyll –‘a’; ‘b’ ratio in c$_3$ plants.
5. Determination of chlorophyll –‘a’; ‘b’ in c$_4$ plants and compare with c$_3$ plants
7. Preparation of standard curve of protein (BSA) and estimation of the protein content in extract of cereal grains.
9. Estimation of starch by colorimetry in plant samples (Tubers / cereals)
10. Study of restriction digestion of the plasmid and estimation of the size of various DNA fragments.
11. Study of mean, mode, median, mean deviation, standard deviation, C.V. from the data.
12. Study of frequency distribution, frequency curve and frequency histogram based on data.
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY
SEMESTER-IV
THEORY PAPER-V
(Plant Physiology and Metabolism-II)

**Time:** Three hours

**Maximum Marks:** 50

---

**Note:**

1. Attempt all questions
2. All questions carry equal marks
3. Draw neat and well labeled diagrams wherever necessary

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<th>Q.1. (Unit –I)</th>
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<td>4. Unit-III</td>
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<td>5. Unit-III</td>
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<td>6. Unit-IV</td>
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SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY
SEMESTER-IV
THEORY PAPER-VI
(Genetic Engineering and Biostatistics)

Time: Three hours

Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I) Long Answer type OR
   a. Short answer type 05
   b. Short answer type 05

Q.2. (Unit –II) Long Answer type OR
   a. Short answer type 05
   b. Short answer type 05

Q.3. (Unit –III) Long Answer type OR
   a. Short answer type 05
   b. Short answer type 05

Q.4. (Unit –IV) Long Answer type OR
   a. Short answer type 05
   b. Short answer type 05

Q.5. Short notes of the following (any four) 10
   1. Unit-I
   2. Unit-I
   3. Unit-II
   4. Unit-III
   5. Unit-III
   6. Unit-IV
SKELETON QUESTION PAPER
M.SC. (SECOND YEAR) BOTANY
SEMESTER-IV
PRACTICAL BASED ON THEORY PAPER-V &VI

Centre:                           Batch No.:          Date:
______________________________________________________________

Time: Six hours                          Maximum Marks: 50
______________________________________________________________

Q1. Any one experiment
   (From experiment No. 1 to 3)             10

Q2. Any one experiment
   (From experiment No. 4 to 6)             10

Q3. Any one experiment
   (From experiment No. 7 to 9)             10

Q4. Any one experiment
   (From experiment No. 10 to 12)           10

Q5. Record book                         05
   Viva voce                                05
Unit-I: Physiological alterations in infected plants (10 periods).
- Effect of infection on photosynthesis, respiration, translocation of water and minerals, phenol metabolism, nitrogen metabolism and growth regulators (auxins, gibberellins and cytokinins)

Unit-II: Host-pathogen interaction (10 periods).
- Cell wall degrading enzymes: Pectolytic enzymes (types, mode of action and maceration), cellulolytic enzymes (types and mode of action),
- Toxins in pathogenesis: Pathotoxins, vivotoxins and phytotoxins, chemical action and mode of action of victorin, lycomerasmin, fusaric acid, wild fire toxins, effect of toxins on plant tissues, aflatoxins

Unit-III: Genetics and biotechnological approaches (13 periods).
- Genetics of host pathogen interaction: Mutation, parasexual recombination. Genetic variability in viruses, bacteria and fungi,
- Biotechnological approaches in plant pathology: Fungal protoplast isolation, protoplast fusion and culture, application of protoplast fusion in plant pathogenic fungi, development of virus free plants by meristem tip culture, single cell culture

Unit-IV: Molecular plant pathology (12 periods).
- Molecular diagnostic: Early detection of plant pathogens in soil and plant tissues using immuno techniques, PCR amplification, methods for isolation of DNA/RNA from plant pathogens, application of molecular biology to plant disease control,
- Resistance genes: Gene for gene concept in plant microbe interaction, inheritance of resistance in the host.
- Genetic engineering of plants for disease resistance: Methods of gene transfer, strategies for development of transgenic.
Unit-I: Diseases of important cereals (12 periods).

History, symptomology, causal organism etiology and management of the following cereal diseases

- **Jowar**: Grain smut, head smut, rust, leaf spot, **Wheat**: Black /stem rust, yellow rust, loose smut, **Bajra**: Green ear, ergot, rust, smut, **Rice**: Brown leaf spot, blast

Unit-II: Diseases of pulses and oil seeds (13 periods).

History, symptomology, causal organism etiology and management of the following pulses and oil seed diseases

- **Pulses**: Pigeon pea: Wilt, sterility mosaic, **Gram**: Wilt, Ascochyta bligt, **Bean**: Bean mosaic, **Black gram**: Powdery mildew,

- **Oil seeds**: **Ground nut**: Leaf spot, rust, **Sunflower**: Leaf spot, downy mildew, rust, **Safflower**: Leaf spot, **Sesame**: Sesamum phylody, **Mustard**: White rust

Unit-III: Diseases of vegetables (10 periods).

History, symptomology, causal organism etiology and management of the following vegetable diseases

- **Tomato**: Early blight, leaf curl, **Potato**: Early blight, late blight, brown rot, **Brinjal**: Little leaf, verticillium wilt, **Chili**: Anthracnose, leaf curl, **Bhendi**: Yellow vein mosaic, powdery mildew, **Spinach**: Leaf spot

Unit-IV: Diseases of cash crops and fruit crops (10 periods).

History, symptomology, causal organism etiology and management of the following cash and fruit crop diseases

- **Cash crops**: **Cotton**: Wilt, black arm, brown leaf spot; **Sugarcane**: Red rot, grassy shoot, whip smut, **Turmeric**: Brown leaf spot

- **Fruit crops**: **Grape**: Downy mildew, powdery mildew, **Banana**: Leaf spot, **Citrus**: Canker, gummosis, decline, **Papaya**: Mosaic, leaf curl
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV

PLANT PATHOLOGY

PRACTICAL BASED ON THEORY PAPER-VIIA &VIII

Maximum Marks – 50

1. Estimation of chlorophyll-a & b, total chlorophylls, from diseased and healthy plants
2. Estimation of reducing sugars from diseased and healthy plants
3. Measurement of phytogalacturanase and CMCase by viscometric method
4. Extraction and separation of aflatoxins from grains
5. Isolation and estimation of DNA / RNA from plant pathogens by spectrophotometry method
6. Production of pathogen free plant through meristem culture
7. Study of diseases of cereals
8. Study of diseases of pulses
9. Study of diseases of oil seed crops
10. Study of diseases of vegetables crops
11. Study of diseases of fruit crops
12. Study of diseases of cash crops
13. Visit to research institute / biotechnology laboratories, plant pathology laboratories, at least two local and one long excursions
SKELETON QUESTION PAPER

M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV

PLANT PATHOLOGY

THEORY PAPER-VIIA (Elective paper-I)
(Physiological and molecular plant pathology)

Time: Three hours

Maximum Marks: 50

Note:
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.2. (Unit –II) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.3. (Unit –III) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.4. (Unit –IV) Long Answer type OR 10
  a. Short answer type 05
  b. Short answer type 05

Q.5. Short notes of the following (any four) 10
  1. Unit-I
  2. Unit-II
  3. Unit-II
  4. Unit-III
  5. Unit-III
  6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV
PLANT PATHOLOGY
THEORY PAPER-VIIIA (Elective paper-II)
(Diseases of crop plants)

*Time: Three hours*  
*Maximum Marks: 50*

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**Note:**  
(i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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<td>6. Unit-IV</td>
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<td>Question</td>
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<tr>
<td>Q1.</td>
<td>Measure phytogalacturonase / CMCase from given specimen-A by viscometric method</td>
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<td>Q2.</td>
<td>Estimate the amount of reducing sugar / chlorophyll-a &amp; b / total chlorophylls from diseased and healthy specimen-B</td>
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<td>Q3.</td>
<td>Identify and describe the given disease specimen-C (Cereals / pulses / oil seed crops)</td>
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<tr>
<td>Q4.</td>
<td>Identify and describe the given disease specimen-D (Vegetables / fruit crops / cash crops)</td>
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<tr>
<td>Q5.</td>
<td>Identify and describe the given spots E, F, G and H</td>
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<tr>
<td>Q6.</td>
<td>Record book&lt;br&gt;Submission&lt;br&gt;Viva voce</td>
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</table>
Unit-I: Taxonomy-I (10 periods).

- Homology v/s Analogy, Alfa v/s omega taxonomy, primitive v/s Advanced characters, synthetic v/s analytic characters, Qualitative v/s Quantitative characters and morphophylotic v/s polygenetic origin of angiosperms.

Unit-II: Taxonomy-II (12 periods).

- Phenetic v/s phylogenetic system, classification in taxonomy, relevance of taxonomy to conservation, sustainable utilization of bioresources and ecosystem research.

Unit-III: Systematics-I (10 periods).

- Comparative account of floral morphology, interrelationship and plant families belonging to the order Sapindales, Rosales, Asterales and Embenales (as per Engler and Prantle’s system of classification)

Unit-IV: Systematics-II (13 periods).

- Comparative account of floral morphology, interrelationship and plant families belonging to the order Utricales, Princeps, Spathiflorae, Farinosae (as per Engler and Prantle’s system of classification)
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV

ANGIOSPERMS

THEORY PAPER-VIIIB (Elective paper-II)

(Plant Anatomy and Pharmacognosy)

Periods - 45 Maximum Marks – 50

Unit-I: Plant anatomy-I (10 periods).

- cytological and molecular analysis of shoot apical meristem, control of cell division and cell to communication, root stem transition.

Unit-II: Plant anatomy-II (13 periods).

- Vascularization of the flower and inferior ovary, General account of anatomy of fruit, General account of anatomy of seed.

Unit-III: Pharmacognosy-I (10 periods).

- Cultivation, harvesting, drying and storage of drug plants, Drug adulteration and type of adulterants, Micro and macroscopic characteristics of drug plants

Unit-IV: Pharmacognosy-II (12 periods).

- Leaf drug of Adhatoda, caster, Nirgudi, Essential oils – (Eucalyptus, cinonella) Fatty oils (sesamum, Saffower) with their medicinal uses, Plant foods in the treatment of diseases with plants for arthritis, constipation, diarrhea, diabetes, hypertension
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV
ANGIOSPERMS
PRACTICAL BASED ON THEORY PAPER-VIIB &VIIB

Maximum Marks – 50

<table>
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<tr>
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<th>Description and identification of flowering plants belonging to different families of the orders prescribed in theory paper-VIIB (elective-I, Unit-III&amp;IV) up to genus and species level with their sketches and floral diagrams</th>
</tr>
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<tbody>
<tr>
<td>7-10.</td>
<td>Study of qualitative and quantitative characters of plants (at least five)</td>
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<tr>
<td>11-13.</td>
<td>Study of analytic and synthetic characters of plants (at least two)</td>
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<tr>
<td>14-15.</td>
<td>Study of floral anatomy with the help of microtome (at two dicot and two monocot plants)</td>
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<tr>
<td>16-18.</td>
<td>Study of macro and microscopic characters of parts and powder of drug plants (Adhatoda, Withania and Vitex)</td>
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<tr>
<td>19-20.</td>
<td>Study of essential oils (Eucalyptus, Citronella) and fatty oils (Sessamum, Safflower) with the help of Soxhlet apparatus</td>
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SKELETON QUESTION PAPER

M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV
ANGIOSPERMS
THEORY PAPER-VIIIIB (Elective paper-I)
(Taxonomy and systematic)

Time: Three hours Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I) Long Answer type OR 10
   a. Short answer type 05
   b. Short answer type 05

Q.2. (Unit –II) Long Answer type OR 10
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   b. Short answer type 05

Q.3. (Unit –III) Long Answer type OR 10
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   b. Short answer type 05

Q.4. (Unit –IV) Long Answer type OR 10
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   b. Short answer type 05

Q.5. Short notes of the following (any four) 10
   1. Unit-I
   2. Unit-II
   3. Unit-II
   4. Unit-III
   5. Unit-III
   6. Unit-IV
# SKELETON QUESTION PAPER

**M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV**  
**ANGIOSPERMS**  
**THEORY PAPER-VIIIB (Elective paper-II)**  
**(Plant Anatomy and Pharmacognosy)**

*Time: Three hours*  
*Maximum Marks: 50*

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**Note: -**  
(i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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**Q.1. (Unit –I)**  
Long Answer type **OR**  
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a. Short answer type  
05  
b. Short answer type  
05

**Q.2. (Unit –II)**  
Long Answer type **OR**  
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a. Short answer type  
05  
b. Short answer type  
05

**Q.3. (Unit –III)**  
Long Answer type **OR**  
10  
a. Short answer type  
05  
b. Short answer type  
05

**Q.4. (Unit –IV)**  
Long Answer type **OR**  
10  
a. Short answer type  
05  
b. Short answer type  
05

**Q.5. Short notes of the following (any four)**  
10

1. Unit-I  
2. Unit-II  
3. Unit-II  
4. Unit-III  
5. Unit-III  
6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV
ANGIOSPERMS
PRACTICAL BASED ON THEORY PAPER-VIIB&VIIIIB

Centre: Batch No.: Date:

Time: Six hours Maximum Marks: 50

Q1. Describe, identify and classify the given specimen A&B with their floral formula and floral diagram 08

Q2. Identify genus and species of the given specimen C&D with the help of flora 08

Q3. Identify and describe morphological characteristics of powder constituents
Perform chemical tests and comment on uses of given specimen E (plant drug) 08

Q4. Macerate the given specimen F, identify and describe vessel elements 08

OR

Peel of the given plant material G, prepare temporary and describe types of stomata / trichomes with diagrams

Q5. Spotting (Six spots) (Morphology-1, economic importance-1, node / venation-1, medicinal uses-1) 08

Q6. Record book 05
Viva voce 02
Submission and field report 03
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV

SEED TECHNOLOGY

THEORY PAPER-VIIC (Elective paper-I)

(Seed science and general seed technology)

Periods - 45                                                                                     Maximum Marks – 50

________________________________________________________________________

Unit-I: Seed harvesting and storage *(10 periods).*

- Methods of harvesting, drying operations, cleaning and upgrading of seeds and equipments used, principles and methods of self seed storage, types of storage structures, seed factors affecting storage life, effect of storage environment on seed longevity

Unit-II: Seed dormancy and longevity *(10 periods).*

- Dormancy, Significance and types, control of dormancy, release of dormancy, life span of seed, factors affecting longevity, biochemical and cytological effects of longevity

Unit-III: *(12 periods).*

- **Seed certification:** Definition, development of certification concept, minimum seed certification standards, general and specific crop standards, field inspection, ISTA certificates
- **Seed legislation:** Legislation and seed laws (regulation), the seed act of 1966, seed rules 1968 with amendments, the seed control order 1983, export-import order of seeds 1989 and the plant variety act (PVP) 1993, seed law enforcement, limitations of the act and seed frauds

Unit-IV: *(13 periods).*

- **Seeds programme:** National seed programme, National seed corporation, seed industry in India, seed companies / agencies responsible for achieving self reliance in production and supply of quality seeds (seed forums, corporation of India, state level companies, national seed development council, central seed committee)
- **Synthetic seed biotechnology:** Introduction, artificial seed biotechnology, drying and storage of somatic embryo, crop application of artificial seeds
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV

SEED TECHNOLOGY

THEORY PAPER-VIIC (Elective paper-II)

(Seed pathology and seed health management)

Periods - 45                                                                                     Maximum Marks – 50

Unit-I: Diseases of oil seeds, vegetables and cash crops (13 periods).

- **Groundnut**: Tikka, collar rot, root rot, **Sunflower**: Leaf spot, rust, grey mould, **Soyabean**: Purple stain, pod blight, bacterial pustule, **Cowpea**: Cowpea mosaic, **Bean**: Anthracnose, mosaic, **Cotton**: Black arm, anthracnose, **Sugarcane**: Red rot, whip smut

Unit-II: Unit-IV: Seed infection and disease development (10 periods).

- **Seed infection**: Seed borne pathogens, location of in seed (infected parts of seed), parts of infection, environmental factors affecting infection and its establishment
- **Transmission of seed borne pathogens**: Methods of transmission of seed borne pathogens- seed to plants, plant to seed, seed to seed, plant to plant
- **Seed borne inoculum and disease development**: Inoculum density, its assessment in relation to plant infection, seed borne inoculum and epidemics

Unit-III: Management of seed borne diseases (12 periods).

- Importance of seed borne pathogens and losses due to seed borne diseases, Methods of seed treatments (physical, chemical, biological), chemical treatment methods with reference to some important seed borne pathogens, biological treatment method

Unit-IV: storage fungi and Quarantine for seed (10 periods).

- **Effect of storage fungi on seed**: Field fungi and storage fungi, harmful effect of storage fungi- discoloration of seed, reduction in seed germination, deterioration of seed (biochemical changes), types of mycotoxins and their effect on animal and human health, enzymes in seed deterioration
- **Quarantine for seed**: Importance and principles of quarantine regulations, phytosanitary certificates, plant quarantine in India
- **Co-operation in seed pathology**: Internal organizations, regional plant protection organizations, national organizations and co-operation
1. Identification and study of common adulterants in seed samples and their possible effects on food
2. Study of uniformity of a seed lot by heterogeneity test calculation
3. Study of in vitro production of microtubers of potato tubers for multiplication purpose
4. Determination of hard and fresh ungerminated seeds for suitable seed sample of a field crop
5. Detection of seed dormancy in different seed samples and study of breaking hard reededness dormancy and physiological dormancy
6. Comparative study of seed leachates from normal and infected seed lots of a field crop
7. Demonstration of the study of ISTA and phytosanitary certification process
8. Visits to seed production fields, seed testing laboratories, seed industries, seed storage, NSC, SSC, quarantine centres
9. Diseases of oil seeds, vegetables and cash crops
   - **Groundnut**: Tikka, **Sunflower**: Leaf spot, rust, **Bean**: Bean mosaic, **Cotton**: Black arm, **Sugarcane**: Red rot, whip smut
10. Effect of toxins on seed germination, leaf necrosis and seedling growth
11. Seed treatments (chemical and biological)
12. Detection of aflatoxin contamination in stored seed sample by UV light
13. Determination of aflatoxin contents in seeds by TLC
14. Role of enzymes of seed borne fungi on biodeterioration of seed
15. Estimation of reducing sugars, starch, proteins, crude fat in seeds
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV
SEED TECHNOLOGY
THEORY PAPER-VIIC (Elective paper-I)
(Seed science and general seed technology)

**Time: Three hours**

**Maximum Marks: 50**

**Note:**
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

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Q.1. (Unit –I)  
Long Answer type **OR**  
10  
a. Short answer type  
05  
b. Short answer type  
05

Q.2. (Unit –II)  
Long Answer type **OR**  
10  
a. Short answer type  
05  
b. Short answer type  
05

Q.3. (Unit –III)  
Long Answer type **OR**  
10  
a. Short answer type  
05  
b. Short answer type  
05

Q.4. (Unit –IV)  
Long Answer type **OR**  
10  
a. Short answer type  
05  
b. Short answer type  
05

Q.5. Short notes of the following  
(any four)  
10  
1. Unit-I  
2. Unit-II  
3. Unit-II  
4. Unit-III  
5. Unit-III  
6. Unit-IV
SKELETON QUESTION PAPER
M.Sc. (SECOND YEAR) BOTANY SEMESTER-IV
SEED TECHNOLOGY

THEORY PAPER-VIIC (Elective paper-II)
(Seed pathology and seed health management)

Time: Three hours
Maximum Marks: 50

Note: -
(i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

Q.1. (Unit –I) Long Answer type OR 10
   a. Short answer type 05
   b. Short answer type 05

Q.2. (Unit –II) Long Answer type OR 10
   a. Short answer type 05
   b. Short answer type 05

Q.3. (Unit –III) Long Answer type OR 10
   a. Short answer type 05
   b. Short answer type 05

Q.4. (Unit –IV) Long Answer type OR 10
   a. Short answer type 05
   b. Short answer type 05

Q.5. Short notes of the following (any four) 10
   1. Unit-I
   2. Unit-II
   3. Unit-II
   4. Unit-III
   5. Unit-III
   6. Unit-IV
Q1. Identify and describe the common seed adulterant in seed sample A&B 08

Q2. Comment on effect of toxins on seed germination / seedling growth of seed sample C 08

Q3. Identify and describe the given seed borne disease of sample D 08

Q4. Estimate the amount of reducing sugar / starch / proteins / fats in seed sample E 08

Q5. Spotting (Four spots) (F-minor disease, G-Aflatoxin / equipment, H-Seed disinfectant, I-Seed lots) 08

Q6. Record book 05
    Viva voce 02
    Submission and field report 03