

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

**B.Sc. GENERAL (ANNUAL PATTERN)
B.Sc. THIRD YEAR
BOTANY - CURRICULUM**

2010

B.Sc. GENERAL (ANNUAL PATTERN)

B. Sc. THIRD YEAR (400 MARKS)

BOTANY CURRICULUM - AN OUTLINE

| Class | Paper No. | Title of Paper | Periods/ Practical | Time duration of Examination | Marks |
|-------------------|---------------------------------------|---|---------------------------|-------------------------------------|--------------|
| B.Sc. III Year | VIII (Th.) | Cell biology, Molecular biology, Genetics and Biotechnology | 80 | 3 Hrs. | 100 |
| | IX (Th.) | Optional- any one of the following | | | |
| | | 1. Plant protection | 80 | 3 Hrs. | 100 |
| | | 2. Taxonomy of angiosperms (Systematic botany) | 80 | 3 Hrs. | 100 |
| | | 3. Molecular biology and Plant Biotechnology | 80 | 3 Hrs. | 100 |
| | 4. Seed technology and Plant breeding | 80 | 3 Hrs. | 100 | |
| | X (Pr.) | Practical based on theory paper-VIII | 24 | 4 Hrs. | 100 |
| | XI (Pr.) | Practical based on theory paper-IX | 24 | 4 Hrs. | 100 |

TOTAL B.SC. THIRD YEAR BOTANY:

Two papers of theory - 200 Marks,

Two papers of practical - 200 Marks,

Total four papers - 400 Marks.

WORKLOAD:

Three periods per paper per week

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – VIII (Compulsory Paper)

(Cell biology, Molecular biology, Genetics and Biotechnology)

Periods – 80

Marks – 100

UNIT –I: CELL BIOLOGY (20 PERIODS)

1. Ultra structure of prokaryotic cell and eukaryotic cell.
2. Structure and functions of cell organelles: Nucleus (Nuclear membrane and nucleolus), Golgi apparatus, Lysosomes, Endoplasmic reticulum and Ribosomes
3. Chromosome : Morphology, structure and function of typical chromosome. Karyotype and idiogram structure and significance of giant chromosomes : polytene chromosome and Lamp brush chromosome
4. Cell cycle : G₀ - G₁ - S - G₂ phase. cell division : Process and significance of *Mitosis* and *Meiosis*

UNIT –II: MOLECULAR BIOLOGY (20 PERIODS)

1. Structure of DNA (Watson and Crick model) Replication of DNA (Meselson and Stahl expt.)
2. Structure, function and types of RNA.
3. Gene and Gene mutation : Classical concept of gene (theory of Morgan) fine structure of gene (*S. Benzer's*)
4. Gene mutation and related diseases : Phenylketonuria (PKU), Alkaptonuria (AKU), Albinism and Amniocentesis (Detection of genetic diseases).

UNIT –III: GENETICS (25 PERIODS)

1. Mendelism: Mendel's Laws of inheritance. Explanation and examples of (Monohybrid, dihybrid cross and Back cross-test cross)
2. Gene interaction and epistasis (Allelic and non allelic) explanation and examples of 9:7, 9:3:4, 12:3:1 and 15:1 ratios, *Collaborator gene* : comb shape in fowl. (Simple problems based on above ratios, only in practical's)
3. Linkage : (Definitions and significance) Coupling and repulsion hypothesis. Type of linkage (maize and *Drosophila*)
4. Sex linked inheritance : Definition classification (x-linked, y-linked and xy-linked)
 - a) Sex linked inheritance in *Drosophila* (White eye colour)
 - b) Sex linked inheritance in *Man* (Hemophilia, colour blindness and Holandric gene - hypertrochosis)
 - c) Sex linked inheritance in *Birds* (Barred feathers)

(Simple problems : based on above, only in practical's)

5. Sex determination : Discovery of sex chromosomes, chromosomal theory of sex determination - in insects (XO-XX), Birds (ZW-ZZ method), Animals (Drosophila and Man), Plants (Melandrium and Asparagus).
6. Genetic variations : Polyploidy : (Haploids, diploids, Triploids, Tetraploids and polyploids) Euploidy- Autopolyploidy and Allopolyploidy with reference to Raphanobrassica and Hexaploid wheat : Aneuploidy (hyper and Hypoploidy) : Syndromes in Man (Autosomal and sex - chromosomal syndromes)
 - i) Down's syndrome
 - ii) Edwards syndrome
 - iii) Patau's syndrome
 - iv) Turner's Syndrome
 - v) Klinefelters syndrome.

UNIT –IV: BIOTECHNOLOGY (15 PERIODS)

1. Genetic Engineering : introduction, tools and technique of r-DNA technology (cloning vectors and Gene cloning technique). Genomic and c-DNA libraries;
2. Agrobacterium mediated gene transfer: (Biology of Agrobacterium, Ti - plasmid, structure of T-DNA and Agrobacterium mediated transfer technique).
3. Transgenic plants (Insect resistant, herbicide resistant and pathogen resistant)
4. Tissue culture : Basic concepts, technique of tissue culture (Steps involved) callus culture, differentiation and morphogenesis, plantlets, protoplast culture and Anther culture
5. Applications of Tissue culture.

SKELETON OF QUESTION PAPER

**B. Sc. THIRD YEAR (ANNUAL PATTERN)
BOTANY**

Theory Paper – VIII (Compulsory Paper)
(Cell biology, Molecular biology, Genetics and Biotechnology)

Time: *Three hours*

Maximum Marks: *100*

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 | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.2. (Unit –II) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.3. (Unit –III) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.4. (Unit –IV) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.5. A. Short notes on any two of the following | | 10 |
| | a. Unit-I | |
| | b. Unit-II | |
| | c. Unit-III | |
| | d. Unit-IV | |

B. Ten MCQ

10

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)
(Plant Pathology)

Periods – 80

Marks – 100

UNIT –I: INTRODUCTION TO PLANT PATHOLOGY (20 PERIODS)

1. Brief history and development of plant pathology with special emphasis on plant pathology in India
2. Scope and significance of plant pathology
3. Concept of plant disease
4. Causes of plant disease
5. Classification of plant diseases on the basis of causal agents, symptoms and spread (Air, soil and seed)
6. Plant disease diagnosis: Field and laboratory diagnosis- Isolation of plant pathogens, pure culture techniques, Koch's postulates
7. Seed pathology: Detection of seed borne pathogens- external and internal, Biodeterioration of storage food grains and fruits

UNIT –II: DISEAS DEVELOPMENT AND DEFENCE MECHANISM IN PLANTS (20 PERIODS)

1. Disease Development: Mode of entry of plant pathogens (through stomata, wounds, buds and root hairs), Direct penetration
2. Role of environment on disease development: Temperature, moisture, wind and pH
3. Defense mechanism in plants-Structural and biochemical
4. Role of toxins in disease development: Victoxin, fusaric acid, mycotoxins, general account of cell wall degrading enzymes-Pectinase and cellulose, Roll of amylases, proteases, lipases
5. Plant disease management: Improved cultural practices, exclusion, eradication, physical methods
6. Chemical control: Copper sulphur and systematic fungicides, antibiotics
7. Biological control: Use of botanicals, IPM

UNIT –III: PLANT DISEASE-I (20 PERIODS)

Symptoms, causal organism, disease cycle and control measures of the following diseases

1. Black stem rust of Wheat
2. Grain smut of Jowar
3. Loose smut of Wheat
4. Green ear of Bajra
5. Ergot of Bajra
6. Citrus cankar
7. Root knot of Tomato
8. Powdery mildew of Black gram

9. Wilt of pigeon pea

UNIT –IV: PLANT DISEASE-II (20 PERIODS)

Symptoms, causal organism, disease cycle and control measures of the following diseases

- 1. Leaf spot of Groundnut (Tikka)**
- 2. Leaf spot of Turmeric**
- 3. Leaf spot of Tomato**
- 4. Late blight of Potato**
- 5. Little leaf of Brinjal**
- 6. Downy mildew of Grapes**
- 7. White rust of Mustard**
- 8. Whip smut of Sugarcane**
- 9. Yellow vein mosaic of Bhendi**

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)

(Plant Pathology)

Time: *Three hours*

Maximum Marks: *100*

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 | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |

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|------------------------|----------------------|----|
| Q.2. (Unit –II) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |

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|-------------------------|----------------------|----|
| Q.3. (Unit –III) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |

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| Q.4. (Unit –IV) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |

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| Q.5. A. Short notes on any two of the following | | 10 |
| | a. Unit-I | |
| | b. Unit-II | |
| | c. Unit-III | |
| | d. Unit-IV | |

| | | |
|-------------------|--|----|
| B. Ten MCQ | | 10 |
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B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)
(Systematic Botany-Angiosperms)

Periods – 80

Marks – 100

UNIT –I: CLASSIFICATION AND PRINCIPLES OF TAXONOMY (20 PERIODS)

Classification:

1. Introduction: Definition, aims, scope and application of angiosperm taxonomy
2. Types of classification: Artificial, Natural and phylogenetic
3. Detail account of Bentham and Hooker's system of classification of angiosperms with merits and demerits
4. Detail account of Engler and Prantle's system of classification of angiosperms with merits and demerits
5. Detail account of Hutchinson's system of classification of angiosperms with merits and demerits

Principles of Taxonomy:

1. ICBN (International Code of Botanical Nomenclature): Brief history, principle of priority, effective and valid publication, typification
2. Species concept (Morphological, taxonomical and biological)
3. Role of phytochemistry in relation to taxonomy
4. Role of cytology in relation to taxonomy
5. Role of anatomy in relation to taxonomy

UNIT –II: ORIGIN OF ANGIOSPERMS AND TAXONOMIC TOOLS (20 PERIODS)

Origin of Angiosperms:

1. Bennettitalean theory
2. Gnetalean theory
3. Pteridosperm theory
4. Concept of primitive flower of angiosperms

Taxonomic Tools:

1. Herbarium: Techniques of plant preservation
2. Importance of herbarium
3. Role of Botanical gardens in plant taxonomy
4. Important Botanical gardens
5. Use of keys in plant identification

UNIT –III: STUDY OF DICOT FAMILIES (20 PERIODS)

Polypetalae:

Study of following families according to Bentham and hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance

Polypetalae: Papaveraceae, Capparidaceae Combretaceae, Myrtaceae, Rutaceae Cucurbitaceae

Gamopetalae And Apetalae:

Study of following families according to Bentham and hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance

Gamopetalae and Apetalae: Rubiaceae, Asclepiadaceae, Apocynaceae, Convolvulaceae, Verbenaceae, Nyctaginaceae

UNIT –IV: STUDY OF MONOCOT FAMILIES AND PALYNOLOGY (20 PERIODS)

Monocot Families:

Study of following families according to Bentham and hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance

1. Orchidaceae
2. Musaceae
3. Zingiberaceae
4. Cannaceae
5. Marantaceae
6. Commelinaceae
7. Cyperaceae

Palynology:

1. Morphoforms of pollen grains with reference to size, shape, polarity, symmetry pollen wall, apertures of the pollen grains of Hibiscus, Datura, Ipomoea and Grasses
2. Economic importance of palynology

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)

(Systematic Botany-Angiosperms)

Time: Three hours

Maximum Marks: 100

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 | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.2. (Unit –II) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.3. (Unit –III) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.4. (Unit –IV) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.5. A. Short notes on any two of the following | | 10 |
| | a. Unit-I | |
| | b. Unit-II | |
| | c. Unit-III | |
| | d. Unit-IV | |
| B. Ten MCQ | | 10 |

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)
(Molecular Biology and Plant Biotechnology)

Periods – 80

Marks – 100

UNIT –I: CHEMICAL NATURE OF GENETIC MATERIAL (20 PERIODS)

Introduction, Constituent of nucleic acid, variation from Watson & Crick model- a, b & z, DNA, Denaturation and melting curve, transcription apparatus, RNA, Polymerases and proteins involved in transcription (initiation, elongation and termination steps)

UNIT –II: DNA REPLICATION (20 PERIODS)

Model of DNA replication: semi conservative mechanism of DNA replication in E.coli (Bi-directional, Meselson and Stahl experiment), Eukaryotic telomeres and its replication, enzymes involved in replication, step by step process

UNIT –III: POST TRANSCRIPTIONAL PROCESSING AND PROTEIN BIOSYNTHESIS (20 PERIODS)

Post transcriptional processing of RNA, 's t-RNA, r-RNA, m-RNA splicing, inhibitors of transcription, The genetic code and Wobble hypothesis, Codon usage, characteristics of genetic code, differences between prokaryotic and eukaryotic protein synthesis

UNIT –IV: PLANT BIOTECHNOLOGY (20 PERIODS)

Production of commercially useful compounds by plant cell culture, Applications of recombinant DNA technology in agriculture. Production of therapeutic proteins from transgenic plants, Application of plant biotechnology for the production of quality oil, industrial enzymes, antigens (edible vaccine) and plantibodies

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)

(Molecular Biology and Plant Biotechnology)

Time: Three hours

Maximum Marks: 100

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 | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.2. (Unit –II) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.3. (Unit –III) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.4. (Unit –IV) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.5. A. Short notes on any two of the following | | 10 |
| | a. Unit-I | |
| | b. Unit-II | |
| | c. Unit-III | |
| | d. Unit-IV | |
| B. Ten MCQ | | 10 |

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)
(Seed Technology)

Periods – 80

Marks – 100

UNIT –I: SEED DEVELOPMENT, SEED MORPHOLOGY AND SEED PHYSIOLOGY (18 PERIODS)

1. Introduction and importance of seed technology
2. Roll of seed industries in seed technology in India
3. Seed: Definition, types and morphology of monocot and dicot seeds
4. Seed dormancy: Factors affecting seed dormancy, methods of breaking seed dormancy
5. Seed germination: Types, factors affecting seed germination, mobilization of food reserves during seed germination, Seedling abnormalities in major monocot and dicot seeds (any two forms of each)

UNIT –II: SEED PRODUCTION (18 PERIODS)

1. Principles: Genetic principle- Deterioration of varieties, maintainance of genetic purity during seed production; Agronomic principle
2. Hybrid seed production: Cereales- Sorghum and Maize, Pulses- Pea and Soyabean, Oil seeds- Groundnut and Sunflower, Fibre crop-Cotton, Cash crop- Sugarcane

UNIT –III: SEED PATHOLOGY AND SEED HEALTH TESTING (22 PERIODS)

1. Seed pathology: Seed infection- Seed borne pathogens (External and internal)
2. Methods of studying seed borne pathogens
3. Transmission of seed borne pathogens- Methods (Seed to plant, plant to seed, seed to seed, plant to plant)
4. Seed health testing: Kinds of seed inoculum principles, Methods of seed health testing, seed purity and determination of other species, seed moisture content and it's effect

UNIT –IV: SEED CERTIFICATION; SEED PROCESSING, HARVESTING, STORAGE AND MARKETING (22 PERIODS)

1. Seed certification: Definition, minimum seed certification standards, ISTA certificates
2. Quarantine: seed quarantine, plant quarantine in India, Importance and principles of quarantine
3. Seed processing: Seed drying, treatment, cleaning, upgrading and packing
4. Seed storage: seed viability and seed vigour test
5. Marketing of seeds

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Theory Paper – IX (Optional Paper)

(Seed Technology)

Time: Three hours

Maximum Marks: 100

- 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 | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.2. (Unit –II) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.3. (Unit –III) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.4. (Unit –IV) | Long Answer type | 20 |
| | Or | |
| | a. Short answer type | 10 |
| | b. Short answer type | 10 |
| Q.5. A. Short notes on any two of the following | | 10 |
| | a. Unit-I | |
| | b. Unit-II | |
| | c. Unit-III | |
| | d. Unit-IV | |
| B. Ten MCQ | | 10 |

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – X (Compulsory Paper)

(Based on theory paper-VIII: Cell biology, Molecular biology, Genetics and Biotechnology)

Practical – 24

Marks – 100

1. **Practical-01:** Study of cell organelles with the help of photocopies / slides.
2. **Practical-02:** Study of giant chromosome with the help of photocopies / slides.
3. **Practical-03:** Study of Salivary gland chromosome from chironomous larvae.
4. **Practical-04:** Cell division - study of mitosis (Onion/Garlic/ Any other available material - Root tips).
5. **Practical-05:** Study of Mitotic index (of above material)
6. **Practical-06:** Study of karyotype and idiogram from photocopies of onion / Aloe plant material.
7. **Practical-07:** Meiosis from onion / maize floral buds or any other available material.
8. **Practical-08-14:** Problems based on monohybrid/Dihybrid ratio; 9:7/9:3:4/12:3:1/15:1 ratios and collaborator gene.
9. **Practical-15-16:** Problems based on sex-linked inheritance.
10. **Practical-17:** Study of syndromes in Man by using photocopies.
11. **Practical-18-20:** Tools used in GE/Tissue culture laboratory for sterilization and inoculation. Principle and working of Autoclave, oven, incubator, Laminar Air flow, Inoculating chamber, callus culture, plantlet, Anther culture and protoplast culture.
12. **Practical-21-24:** One Long excursion, one short excursion, visits to tissue culture laboratory/ Biotechnology institute etc.

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – X (Compulsory Paper)

(Based on theory paper-VIII: Cell biology, Molecular biology, Genetics and
Biotechnology)

Time: Four hours

Maximum Marks: 100

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

- Q.1.** Prepare a temporary squash/Smear of the given material (Root tips/floral buds) identify and describe any two stages of Mitosis /Meiosis, giving reasons. 15
- Q.2.** Calculate the Mitotic index from the given material (Root tips) 10
OR
Prepare a karyotype from the given photocopy
- Q.3.** Problems (04) based on: i) Dihybrid ratio ii) Gene interactions iii) collaborator gene iv) Sex linked inheritance. (One problem from each) 40
- Q.4.** Spotting (05 spots) on: 1) Cell organelle (1) 2) Giant chromos / Chromosome: SAT/Centro mere (1) 3) Syndrome (1), 4) Instrument (1), 5) Callus /Anther/ protoplast culture (1) 15
- Q.5.**
- a) Record Book 10
 - b) Vivo-Voce 05
 - c) Submission of wool models of mitosis and meiosis etc. 05

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BOTANY

Practical Paper – XI (Optional)

(Based on theory paper-IX: Plant Pathology)

Practical – 24

Marks – 100

1. **Practical-01:** Study of laboratory equipments- Autoclave, Hot air oven, Inoculating chamber, Laminar air flow, Air sampler, Incubator, Centrifuge
2. **Practical-02:** Preparation of culture media- PDA, NA
3. **Practical-03:** Micrometry- Calibration of microscope and measurement of spore size
4. **Practical-04:** Isolation of fungal pathogens from diseased plant parts
5. **Practical-05:** Isolation and identification of seed-borne pathogens by blotter agar plate method
6. **Practical-06:** Study of air-borne pathogens from exposed petri plates / air sampler
7. **Practical-07:** Effect of fungicide on spore germination by hanging drop technique
8. **Practical-08:** Effect of plant extracts on growth of fungal pathogens by food poison technique
9. **Practical-09:** Assay of amylases / proteases / lipases produced by fungal pathogens
10. **Practical-10:** Effect of fungal toxin on seed germination / shoot cuttings
11. **Practical-11:** Study of symptoms and causal organisms of Black stem rust of wheat
12. **Practical-12:** Study of symptoms and causal organisms of Late blight of potato
13. **Practical-13:** Study of symptoms and causal organisms of Downy mildew of grapes
14. **Practical-14:** Study of symptoms and causal organisms of Tikka disease of groundnut
15. **Practical-15:** Study of symptoms and causal organisms of Leaf spot of tomato
16. **Practical-16:** Study of symptoms and causal organisms of Leaf spot of turmeric
17. **Practical-17:** Study of symptoms and causal organisms of White rust of locally available plants
18. **Practical-18 to 21:** Study of symptomology of the following diseases-Citrus canker, Root knot of tomato, Little leaf brinjal, Yellow vein mosaic of bhendi, Green ear of bajra, ergot of bajra, Loose smut of wheat, Whip smut of sugarcane, Grain smut of jowar, Wilt of pigeonpea
19. **Practical-22:** Field visits- at least two visits in each season (Kharif & Rabi)
20. **Practical-23:** Excursion to plant pathological laboratories, agriculture universities
21. **Practical-24:** At least one long excursion to National research institutes / centres and universities

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – XI (Optional)

(Based on theory paper-IX: Plant Pathology)

Time: Four hours

Maximum Marks: 100

Note: -

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

- Q1.** Calibrate the microscope and measure the size of given spore-**A** 15
- Q2.** Effect of fungicide / plant extract on spore germination of the given pathogen-**B** 15
- Q3.** Identify and describe the symptoms and morphology of causal organism from the given specimen-**C** 16
- Q4.** Identify and describe the symptoms of diseased specimen-**D & E** 12
- Q5.** Identify, classify and describe any two spore types from exposed culture petriplates / aerobiological slide 10
- Q6.** Identify and describe the given spots-**F, G, H & I** (F-equipment, G-toxin / enzyme, H-diseased plant material, I-plant protectant) 12
- Q7.**
- a) Record book 10
 - b) Submission 05
 - c) Viva-voce 05

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – XI (Optional)

(Based on theory paper-IX: Systematic Botany-Angiosperms)

Practical – 24

Marks – 100

Description, identification and classification with sketches, floral formulae and floral diagrams of locally available plants of the following families

1. **Practical- 01:** Papaveraceae
2. **Practical- 02:** Capparidaceae
3. **Practical- 03 :** Combretaceae
4. **Practical- 04:** Myrtaceae
5. **Practical- 05:** Rutaceae
6. **Practical- 06:** Cucubitaceae
7. **Practical- 07:** Rubiaceae
8. **Practical- 08:** Asclepiadaceae
9. **Practical- 09:** Apocynaceae
10. **Practical- 10:** Convolvulaceae
11. **Practical- 11:** Verbenaceae
12. **Practical- 12:** Nyctaginaceae
13. **Practical- 13:** Musaceae
14. **Practical- 14:** Cannaceae
15. **Practical- 15:** Commelinaceae
16. **Practical- 16:** Preparation of dichotomous key by studying locally available plants of the same family
17. **Practical- 17 to 18:** Identification of at least six locally available plants up to species level with the help of flora (sketches, floral formulae and floral diagrams are not expected)
18. **Practical- 19 to 20:** Study of pollen morphology by temporary preparation of pollen grains of Hibiscus, Datura, Ipomoea and Grasses by using acetolysis method
19. **Practical- 21 to 24:** Botanical excursions

Note: Student must attend at least one long and two short botanical excursions. They must submit field notebook, excursion report and collection at the time of practical examinations

SKELETON OF QUESTION PAPER

**B. Sc. THIRD YEAR (ANNUAL PATTERN)
BOTANY**

Practical Paper – XI (Optional)

(Based on theory paper-IX: Systematic Botany-Angiosperms)

Time: Four hours

Maximum Marks: 100

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

-
- Q1.** Describe, identify and classify the given specimens-**A&B** to their respective families with floral formulae and floral diagrams 30
- Q2.** Identify the given specimens-**C&D** up to species level with the help of flora 20
- Q3.** Make a temporary preparation of pollen grain of the given specimen-**E**, identify and describe 06
- Q4.** Identify and describe the spots-**F, G, H, I, J** and **K** as per the given instructions (3 spots on morphology; 3 spots on economic importance) 24
- Q7.**
- a) Record book 10
 - b) Submission 05
 - c) Viva-voce 05

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – XI (Optional)

(Based on theory paper-IX: Seed Technology)

Practical – 24

Marks – 100

1. **Practical-01:** Demonstration and handling of stereobinocular microscope.
2. **Practical-02:** Screening of seed samples of normal and abnormal seeds
3. **Practical-03:** Examination of suspensions obtained from seed washing test to determine seed borne inoculum
4. **Practical-04:** Study of seed mycoflora by standard blotter paper method
5. **Practical-05:** Study of seed mycoflora by standard agar plate method
6. **Practical-06:** Effect of fungi on viability of seed by germination method
7. **Practical-07:** Study of seed production practices of cereals, pulses, oilseeds and fibre crops
8. **Practical-08:** Study of ecological relations among seed borne pathogens (Fungi-Fungi, Fungi- Bacteria)
9. **Practical-09:** Physical purity analysis by number and weight of given crops
10. **Practical-10:** Isolation and culture of seed borne bacteria (staining techniques)
11. **Practical-11:** Common physical methods of control of seed borne pathogens
12. **Practical-12:** Determination of moisture content in seed samples by oven dry method
13. **Practical-13:** Identification of different varieties of crop seeds
14. **Practical-14:** Determination of pollen viability of self and cross pollinated crops
15. **Practical-15:** Handling of bees for pollination
16. **Practical-16:** Plant protection equipments and their uses
17. **Practical-17:** Detection of seed dormancy in different seed samples and study of breaking of seed dormancy
18. **Practical-18:** Visit to seed plots and study of maintainance of varieties
19. **Practical-19:** Visit to seed testing laboratory and study of the techniques used
20. **Practical-20:** Visit to seed industries
21. **Practical-21-24:** Excursions

SKELETON OF QUESTION PAPER

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – XI (Optional)

(Based on theory paper-IX: Seed Technology)

Time: Four hours

Maximum Marks: 100

Note: -

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

- | | |
|---|----|
| Q1. Detect the reserve food materials in the given seed samples- A&B | 20 |
| Q2. Describe and identify the seed-borne pathogen- C&D from the given petriplates | 10 |
| Q3. Determination of real value (purity) of seed | 10 |
| Q4. Determination of pollen viability of the given crop- E | 10 |
| OR | |
| Determination of moisture content of given seed sample- E | |
| | |
| Q5. Comparison of seed germination of treated and untreated seeds | 10 |
| Q6. Spotting (Four spots) | 20 |
| a. Instrument | |
| b. Floral morphology of hybrid seed production crop | |
| c. Types of seed germination | |
| d. Seed disinfectant | |
| Q7. a) Record book | 10 |
| b) Submission | 05 |
| c) Viva-voce | 05 |

B. Sc. THIRD YEAR (ANNUAL PATTERN)

BOTANY

Practical Paper – XI (Optional)

(Based on theory paper-IX: Molecular Biology and Plant Biotechnology)

Practical – 24

Marks – 100

1. **Practical-01:** Isolation of plant genomic DNA
2. **Practical-02:** Isolation of fungal genomic DNA
3. **Practical-03:** Isolation of bacterial genomic DNA
4. **Practical-04:** Isolation of plasmid DNA
5. **Practical-05:** Estimation of DNA by DPA method
6. **Practical-06:** U V spectroscopic analysis of DNA
7. **Practical-07:** Isolation of RNA from *S.cervisiae*
8. **Practical-08:** Estimation of RNA by Orcinol method
9. **Practical-09:** UV spectroscopic analysis of RNA
10. **Practical-10:** Estimation of protein by Folin-Lowery method
11. **Practical-11:** Isolation of streptomycin resistant mutant of *E.coli*
12. **Practical-12:** Visualization of DNA by Agarose Gel Electrophoresis
13. **Practical-13:** Demonstration of restriction enzyme digestion
14. **Practical-14:** Isolation and visualization of plasmid on agarose gel
15. **Practical-15:** Restriction mapping
16. **Practical-16:** Transformation, screening for recombinants
17. **Practical-17:** Characterization of proteins by poly acrylamid gel electrophoresis
18. **Practical-18:** Preparation of media and initiation of callus from any one selected plant species
19. **Practical-19:** Micro propagation of plants(any one)
20. **Practical-20:**Preparation of synthetic seeds
21. **Practical-21:** production of alcohol by fermentation and estimation of alcoholby colory
22. **Practical-22:** Production of biofertilizer
23. **Practical-23:** Growth curves of bacteria, measurement of growth in liquidcultures
24. **Practical-24:** Visit to biotechnology national laboratories, institutes, University departments, industr