The Vice-Chancellor, after having considered the minutes 1st cited, has approved the III year Botany VI semester syllabus and Model Question Papers for the academic year 2017-18 prepared by the Board of Studies (UG) in Botany. The titles of the papers are mentioned below.

**Semester-VI**

Any one of the Elective Paper:

1. Paper VII-(A): Organic Farming & Sustainable Agriculture (Theory & Practical)
   OR
2. Paper VII-(B): Nursery, Gardening and Floriculture (Theory & Practical)
   OR

Cluster Elective: Any one of the Cluster Elective:

5. Paper VIII-(A2): Ethno Botany and Medicinal Botany (Theory & practical)
   OR
7. Paper VIII-(B1): Biological Instrumentation and Methodology

   (BY ORDER)

To

The Chairman and all members, Board of Studies (UG) in Botany, ANU.

All the Principals of the Affiliated Colleges under ANU area.

Copy to:

The Dean, Faculty of Natural Science, ANU.
The Dean, CDC, ANU.
The Coordinator, UG (Exams), ANU.
The Addl. Controller of Examinations, ANU.
The P.A. to Vice-Chancellor/ Registrar/Rector, ANU.
III B. Sc - SEMESTER- V: BOTANY PRACTICAL MODEL PAPER 
PAPER–VI: PLANT ECOLOGY & PHYTOGEOGRAPHY

<table>
<thead>
<tr>
<th>Task</th>
<th>Marks</th>
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<tbody>
<tr>
<td>1. Study Project under supervision</td>
<td>15</td>
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<tr>
<td>2. Record &amp; Viva-Voce</td>
<td>10</td>
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<tr>
<td>3. Experiment A</td>
<td>10</td>
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<tr>
<td>4. Anatomical adaptations of B (Section cutting)</td>
<td>10</td>
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<tr>
<td>5. Spotters C&amp;D (2x2 1/2)</td>
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<td><strong>Total</strong></td>
<td><strong>50</strong></td>
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1. Study Project of a surrounding Ecosystem (terrestrial or aquatic)(plant diversity, animal diversity, human activity, pollution levels, restoration efforts under supervision.

2. Presentation of the project work in Q & A session.


5. C & D-anemometer/rain gauze/lux meter.
Unit - I: Concept of organic farming:
(12hrs)

1. Introduction: Farming, organic farming, concept and development of organic farming.


4. Scope of organic farming; Andhra Pradesh, National and International status.

5. Agencies and institutions related to organic agriculture.

6. Requirements for organic farming, farm components for an organic farm.

Unit - II: Organic plant nutrient management: (12hrs)


2. Choice of varieties.

3. Propagation-seed, planting materials and seed treatments, water management

4. Green manuring, composting- principles, stages, types and factors, composting methods, Vermi composting


Unit-III: Organic plant protection: (12hrs)

1. Plant protection- cultural, mechanical, botanical pesticides, control agents

2. Weed management

Unit- IV: Organic crop production practices:  

2. Organic crop production methods- vegetables- okra, amaranthus, cucurbits.
3. Livestock component in organic farming.
4. Sustainable Agriculture-Apiculture, Mushroom cultivation.

Unit- V: Organic Certification  

1. Farm economy: Basic concept of economics- demand & supply, economic viability of a farm.
3. Farm inspection and certification.
4. Terrace farming.

Books for Reference:

3. Farming system: Theory and Practice - S.A.Solaimalai

Suggested Activities: Preparation of Vermicompost in small scale, observing sewage sludge disposal mechanisms in urban/semi urban areas, studying the usage, of green manures, neem oil, neem cake, pongamia oil in organic farming, livestock component in various farming methods, visiting an Apiculture center, drawing various terrace farming models

Paper-VII-A : Practical
Semester – VI, Paper-VII-A : Organic Farming and Sustainable Agriculture
Total hours of teaching 30 hrs @ 2 hrs per week

1. Study of different bio pesticides, weedicides, inorganic and organic fertilizers
2. Deficiency symptoms of nutrient deficiency symptoms (photographs)
3. Soil testing, liming, and fertilizing
4. Preparation of enriched Farm Yard Manure.
5. Study of composting methods.
6. Preparation of vermicompost.
7. Study of recycling of farm waste.
8. Study of methods of green manuring.
9. Study of steps in mushroom cultivation.
10. Visit to urban waste recycling unit.
11. Study project report under supervision of lecturer – farm manure preparation/vermicompost/waste management/green manures/mushroom cultivation/nutrient requirements of vegetables

**Expected domain skills to be achieved:** Performing Soil analysis, soil enrichment methods, composting procedure, recycling of wastes, use of waste materials in mushroom cultivation, understanding nutrient requirement of various crops, identifying various methods of keeping soil health

**PRACTICAL MODEL PAPER**

Paper-VII-(A) : Organic Farming and Sustainable Agriculture

Q1. Project report (A) - 15 marks

Viva-voce on study project -05 marks

Q2. Identify and write notes on B, C, D, and E (4x5) -20 marks

B- inorganic manures/bio-weedicides/bio-pesticides (photograph/specimen)

C- Compost preparation method (photograph/instrument)

D- Green manure type (plant specimen/photograph)

E- Waste recycling method (photograph/live specimen/institute/organization)

Q4. Field report - 05 marks

Q5. Record - 05 marks

**TOTAL:** 50 marks
Unit I: Nursery: (12 hrs.)

1. Definition, objectives, scope and building up of infrastructure for nursery.
2. Planning and seasonal activities - Planting - direct seeding and transplants.

Unit II: Gardening (12 hrs.)

1. Definition, objectives and scope - different types of gardening.
2. Landscape and home gardening - parks and its components, plant materials and design.
4. Landscaping Places of Public Importance: Landscaping highways and Educational Institutions)

Unit III: Propagation methods (12 hrs.)

1. Sowing/raising of seeds and seedlings, transplanting of seedlings.
3. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.

Unit IV: Floriculture: (12 hrs.)

1. Ornamental Plants: Flowering annuals; herbaceous, perennials; Divine vines; Shade and ornamental trees.
2. Ornamental bulbous and foliage plants; Cacti and succulents.
3. Ornamentals-palms.
4. Cultivation of plants in pots; Indoor gardening; Bonsai.
Unit V: Commercial Floriculture (12 hrs.)

1. Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers
2. Cultivation of Important cut flowers, Gerbera, Marigold, Rose.

Books for Reference:

Suggested Activities: Raising a nursery, managing it, studying and drawing various landscaping designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.

III B. Sc - BOTANY SYLLABUS SEMESTER- VI (Elective)
Practical Syllabus, Paper VII-(B): Nursery, Gardening and Floriculture
Total hours of teaching 30hrs @ 2hrs per week

1. Tools, implements and containers used for propagation and nursery techniques.
2. Propagation by cutting, layering, budding and grafting
3. Seed propagation- preparation of portable trays, seed treatments, sowing and seedling production.
4. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti and succulents.
5. Planning and designing of gardens, functional uses of plants in the landscape
6. Preparation of land for lawn and planting.
7. Identification of commercially important flower crops and their varieties.
8. Propagation practices in flower crops, sowing of seeds and raising of seedlings of annuals.
9. Use of chemicals and other compounds for prolonging the vase life of cut flowers.
10. Grading, packing and marketing of cut flowers.
11. Visit to commercial nurseries and commercial tissue culture laboratory
12. Study project under supervision of lecturer – nursery/ornamental flowers/plants/lawn designing/landscape designing

**Expected domain skills to be achieved:** Ability to use a variety of garden tools and implements, proficiency in layering and grafting techniques (cleft grafting and bud grafting), landscape drawings using computers, raising of healthy nurseries of flowering plants, managing vase life of cut flowers etc.

**PRACTICAL MODEL PAPER**

Paper-VII-(B): Nursery, Gardening and Floriculture

Q1. Project report (A) - 15 marks
   Viva-voce on study project - 05 marks

Q2. Identify and write notes on B, C, D, and E (4x5) - 20 marks
   B- Tool/instrument/container used in nursery
   C-Seed propagation technique
   D- Plant used in lawn (plant specimen/photograph)
   E-ornamental flower (photograph/live specimen)

Q4. Field report - 05 marks
Q5. Record - 05 marks

50 marks

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**III B. Sc - BOTANY SYLLABUS SEMESTER- VI**

**PAPER – VII – ELECTIVE**

**Paper VII-(C): Plant tissue culture and its biotechnological applications**

Total hours of teaching 60hrs @ 3hrs per week

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**Unit I: PLANT TISSUE CULTURE – 1** (12hrs)

1. History of plant tissue culture research - basic principles of plant tissue callus culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation.
2. Methodology - sterilization (physical and chemical methods), culture media, Murashige and Skoog’s (MS medium), phytohormones, medium for micropropagation/clonal propagation of ornamental and horticulturally important plants.


UNIT-II: Plant Tissue culture -2 (12hrs)
1. Endosperm culture – Embryo culture -culture requirements – applications, embryo rescue technique.
2. Production of secondary metabolites.
3. Cryopreservation; Germ plasm conservation.

Unit III: Recombinant DNA technology (12hrs)
1. Restriction Endonucleases (history, types I-IV, biological role and application); concepts of restriction mapping.
2. Cloning Vectors: Prokaryotic(pUC 18, pBR322, Ti plasmid and Lambda phage, Eukaryotic Vectors (YAC and briefly PAC)
3. Gene cloning (Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning)

Unit IV: Methods of gene transfer (12hrs)
1. Methods of gene transfer- Agrobacterium-mediated, direct gene transfer by Electroporation, Microinjection, Micro projectile bombardment.
2. Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).

Unit V: Applications of Biotechnology (12 hrs)
1. Applications of Plant Genetic Engineering – crop improvement, herbicide resistance, insect resistance, virus resistance.
2. Genetic modification – transgenic plants for pest resistant (Bt-cotton); herbicide resistance (Round Up Ready soybean); improved agronomic traits - flavrSavr tomato, Golden rice); Improved horticultural varieties (Moon dust carnations)

Books for Reference:

**Suggested Activities:** In vitro initiation of callus on artificial medium, seminars on utilization of rDNA technology, debates on applications of Biotechnology (whether it is a boon or bane to the society) studying growth patterns, vegetative characteristics of Bt.cotton and identifying the features of its pest resistance

**III B. Sc - BOTANY SYLLABUS SEMESTER- VI**

**PAPER – VII-(C) Elective**

**Practical Paper VII-(C): Plant Tissue Culture & Plant Biotechnology**

*Total hours of teaching 30hrs @ 2hrs per week*

1. (a) Preparation of MS medium.
   (b) Demonstration of in vitro sterilization methods and inoculation methods using leaf and nodal explants of Tobacco/ Datura/ Brassica etc.
2. Study of embryo and culture, micro propagation of Banana, somatic embryogenesis, artificial seeds through photographs.
3. Construction of restriction map of circular and linear DNA from the data provided.
5. Different steps involved in genetic engineering for production of Bt. cotton, Golden rice, Flavr Savr tomato through photographs.
6. Isolation of plasmid DNA.
8. Restriction digestion and gel electrophoresis of plasmid DNA (optional)

9. Field visit to a lab involved in tissue culture

10. Study project under supervision of lecturer – tissue culture/ genetic engineering

**Expected domain skills to be achieved**: Ability to prepare artificial nutrient media, preparing independently, applying various sterilization procedures for media, glassware and biological materials, in vitro propagation of Banana callus, morphogenesis--s, clonal propagation methods, isolation of plasmid DNA individually and as a group.

**PRACTICAL MODEL PAPER**

**Paper-VII-(C) : Plant Tissue Culture & Plant Biotechnology**

Q1. Project report (A) - 15 marks
   Viva-voce on study project - 05 marks

Q2. Identify and write notes on B, C and D (3x4) - 12 marks
   
   B- Tool/instrument/container used in sterilization
   
   C- Tool/instrument/container used in gene transfer
   
   D- GM crops (Photographs)

Q3. Construct restriction map of circular and/or linear DNA from the data provided – 08 marks

Q4. Field report - 05 marks

Q5. Record - 05 marks

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50 marks
CLUSTER ELECTIVES  (Cluster–A or Cluster-B)

III B.Sc.: BOTANY SYLLABUS  SEMESTER- VI

Paper VIII, CLUSTER ELECTIVE,  Cluster-A,

Paper VIII-A-1 : PLANT DIVERSITY AND HUMAN WELFARE

Total hours of teaching 60hrs @ 3hrs per week

Unit- I: Plant diversity and its scope:  (12hrs)

i. Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agro biodiversity and cultivated plant taxa, wild taxa.

ii. Values and uses of biodiversity: Ethical and aesthetic values,  iii. Methodologies for valuation, Uses of plants.

Unit -II: Loss of biodiversity: (12hrs)


ii. Management of plant biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations.

Unit-III: Contemporary practices in resource management:  (12hrs)

i. Environmental Impact Assessment (EIA), Geographical Information System GIS, Ecological footprint with emphasis on carbon footprint.

ii. Solid and liquid waste management
Unit -IV: Conservation of biodiversity (12hrs)

i. Conservation of genetic diversity, species diversity and ecosystem diversity, In situ and ex situ conservation,

ii. Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.

Unit- V: Role of plants in relation to Human Welfare (12hrs)

i. Importance of forestry, their utilization and commercial aspects-
   a) Avenue trees, b) ornamental plants of India.

ii. Fruits and nuts: Important fruit crops their commercial importance. Wood, fiber and their uses.

Suggested Readings:


Suggested activities: Study of flora and its diversity in the college campus or local area, enumerating wild and exotic species (Parthenium, Water hyacinth etc.)

Project work on any one of the International organizations striving for preservation of biodiversity, study of conservation efforts of local people, and civic bodies, study of locally available fruits in different seasons, enumerating the avenue plantations and their diversity in your town/city
1) Study of plant diversity (flowering plants).
2) Study of exotic species- Identification and morphological characteristics.
3) Identification of forest trees through bark, wood, flowers, leaves and fruits.
4) Maceration, Study of wood (Tracheary elements, fibres).
5) Methods of preservation and canning of fruits.
6) Visit to the local ecosystem to study the plants.
7) Write up on the conservation efforts of International organizations.
8) Study of Solid and Liquid waste management systems in rural/urban areas.

**Domain skills expected to achieve:** Identification of exotic plant species, identification of forest trees based on the characteristics of bark, flowers and fruits, understanding the preservation methods of fresh and dry fruits, understanding the methods of safe disposal of biodegradable and non-biodegradable wastes

**SCHEME OF PRACTICAL EXAMINATION**

PRACTICAL- VIII-A-1 : Cluster Elective (MODEL QUESTION PAPER) PLANT DIVERSITY AND HUMAN WELFARE

Time: 3hrs Max. Marks: 50

I. Assign the plants A, B and C to their respective families, giving reasons, family name and classification- 2 marks, important diagrams- 3 marks. \[15 \text{ marks}\]

II. Give the protocol of D \[10 \text{ marks}\]

III. Comment on specimens E, F and G \[3 \times 3 = 9 \text{ marks}\]

IV. Report on Field visit \[6 \text{ marks}\]
To study sources of firewood (10 plants), timber-yielding trees (10 trees) and bamboos.

V. Viva-Voce 5 marks

VI. Practical Record 5 marks

**KEY**

A - Cultivated Plant
B - Wild Plant
C – Exotic plant
D - Preservation and canning of fruits, solid and liquid waste management systems in rural/urban areas
E. Bark/wood/fruit yielding plant
F. Nuts/Alcoholic beverage plant
G. wood/Fibre yielding plant

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**III B. Sc - BOTANY SYLLABUS**

**SEMESTER- VIII : CLUSTER ELECTIVE -A**

**Paper VIII-A-2 : ETHNOBOTANY AND MEDICINAL BOTANY**

Total hours of teaching 60hrs @ 3hrs per week

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**Unit –I: Ethnobotany**  (12hrs)

i. Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context

ii. Major and minor ethnic groups or Tribals of India, and their life styles.

iii. Plants used by the tribal populations: a) Food plants, b) intoxicants and beverages, c) Resins and oils.

**Unit -II: Role of ethnobotany in modern Medicine:**  (12hrs)

i. Role of ethnobotany in modern medicine with special example
Rauvolfia sepentina, Trichopus zeylanicus, Artemisia annua, Withania somnifera.

ii. Significance of the following plants in ethno botanical practices (along with their habitat and morphology)
   a) Azadirachta indica, b) Ocimum sanctum, c) Vitex negundo, d) Gloriosa superba, e) Tribulus terrestris, f) Phyllanthus niruri, g) Cassia auriculata, h) Indigofera tinctoria, i) Senna auriculata j. Curcuma longa.

Unit-III: Ethnobotany as a tool to protect interests of ethnic groups (12hrs)

i. Role of ethnic groups in the conservation of plant genetic resources.


Unit -IV: History, Scope and Importance of Medicinal Plants. indigenous Medicinal Sciences (12hrs)

i. Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments.

ii. Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.


Unit -V: Conservation of endangered and endemic medicinal plants: (12hrs)

i. Definition: endemic and endangered medicinal plants,

ii. Red list criteria

iii. In situ conservation: Biosphere reserves, sacred groves, National Parks

**Suggested Activities:** Studying plant utilization methods by tribal/rural/migrant populations for their beverages, food, medicinal and uses, seminars on role of ethnic groups in conservation of plant genetic resources, project work on traditional knowledge about plant medicines, study of indigenous medicinal sciences and their efficacy.

**Suggested Readings:**


**Cluster Elective VIII-A-2: Practical:**

ETHNOBOTANY AND MEDICINAL BOTANY

1. Ethnobotanical specimens as prescribed in theory syllabus
2. Detailed morphological and anatomical study of medicinally important part(s) of locally available plants (Minimum 8 plants) used in traditional medicine.
3. Field visits to identify and collect ethno medicinal plants used by local tribes/folklore.
**Domain skills expected to achieve:** Identification of various plant parts used as medicines by ethnic groups, understanding the difference between ancient wisdom and modern system of medicine, traditional medicine at the rescue of curing drug resistant maladies like malaria and viral diseases, understanding the role of spices in Indian kitchens, their therapeutic role

**PRACTICAL- VIII-A-2 Cluster Elective : MODEL QUESTION PAPER**

**Paper VIII-A-2: ETHNOBOTANY AND MEDICINAL BOTANY**

**Time: 3 Hours**

Max. Marks- 50

I. Identify the specimen A- Give reasons (morphological and anatomical) and draw labeled sketches 15 marks

II. Identify and write about the medicinal uses of B and C- 2x5= 10 marks.

III. Comment on D and E. 2x 4=8 marks

IV. Report on Field visit: 7 marks

List to be prepared mentioning special features of plants used by tribal populations as Medicinal Plants & Spices. Write their botanical and common names, parts used and diseases/disorders for which they are prescribed.

V. Viva-voce 5 marks

VI. Record 5 marks

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Total = 50 marks

**KEY**

A-Plants given in unit II (i)
B-Plants used in Ayurvedic preparations (Amla in Chyavanprash, Senna in Laxatives)

C - - Do -

D. Photographs of National parks, Biosphere reserves and Botanical gardens.

E. Photograph of famous personalities in Ayurveda/Siddha medicine.

III B. Sc - BOTANY SYLLABUS  SEMESTER- VIII

CLUSTER ELECTIVE, Paper VIII-A-3

Paper VIII-A-3: Pharmacognosy and Phytochemistry

Total hours of teaching 60hrs @ 3hrs per week

Unit-I: Pharmacognosy (12hrs)
Definition, Importance, Classification of drugs - Chemical and Pharmacological, Drug evaluation methods

Unit –II: Organoleptic and microscopic studies: (12hrs)
Organoleptic and microscopic studies with reference to nature of active principles and common adulterants of Alstonia scholaris (bark), Adhatoda vasica (leaf), Strychnos nuxvomica (seed), Rauwolfia serpentina (root) and Zinziber officinalis Catharanthus roseus.

Unit-III: Secondary Metabolites: (12hrs)
i. Definition of primary and secondary metabolites and their differences, major types - terpenes, phenolics, alkaloids.

UNIT-IV: Phytochemistry: (12hrs)

Biosynthesis and sources of drugs:

(i) Phenols and phenolic glycosides: structural types, biosynthesis, importance of simple phenolic compounds, tannins, anthocyanins.
(ii) Steroids, sterols, saponins, Biosynthesis, commercial importance.
(iii) Alkaloids: Different groups, biosynthesis,

(IV) Volatile oils, aromatherapy.

UNIT-V: Enzymes, proteins and amino acids as drugs: (12hrs)

i. Vaccines, toxins and toxoids, antitoxins, immune globulins, antiserums,

ii. Vitamins, Antibiotics – chemical nature, mode of action.

iii. Pharmacological action of plant drugs, antioxidants, phytoestrogens

iv. Role of different enzyme inhibitors.

Suggested Activities: Isolation techniques of active principles from various parts of popular medicinal plants, debates on the efficacy of plant medicines and palliative cure, volatile oils from plants-extraction methods, project work on crude drugs

BOOKS FOR REFERENCE:


VIII-A-3: Pharmacognosy and Phytochemistry: PRACTICALS

1. Physical and chemical tests for evaluation of unorganized drugs- Asaphoetida. Honey, Castor oil. Acacia
2. Identification of bark drugs – cinchona, cinnamom
3. Identification of fruit drugs – Cardamom, Coriander
4. Identification of root and rhizome drugs- Ginger, Garlic, Turmeric
5. Identification of whole plant – Aloes, Vinca, Punarnava
6. Herbarium of medicinal plants (minimum of 20 plants)
7. Collection of locally available crude drugs from local vendors (minimum of 20)

Domain skills expected to achieve: Identification of various plant parts used as medicines, extraction of active principles from them, isolation by chromatographic techniques, learning callus culture techniques for secondary metabolite enrichment and understanding ethno-pharmacological principles

PRACTICAL: VIII-A-3 Cluster Elective: MODEL QUESTION PAPER
Pharmacognosy and Phytochemistry

Time: 3hrs. Max. Marks=50

I. Identify the given crude drugs A & B by morphological study and chemical tests. 10 marks

II. Perform suitable chemical test and identify the given phytochemical C
III. Comment on D and E

2x5=10 marks

IV. Herbarium and submission of drugs

-10 marks

IV. Viva-Voce

5 marks

V. Practical Record

5 marks

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Total = 50 marks

KEY

A- Flower/fruit drugs

B- Rhizome/whole plant drugs

C- Tannins/ phenolics/steroids/ isoprenoids /Asaphoetida/ Honey/ Castor oil/ Acacia

D. Column Chromatography/ Gas Chromatogram/HPLC (photograph/ instrument used for chemical analysis of drugs

E. photograh/instrument used for tissue culture
III B.Sc.: BOTANY SYLLABUS  SEMESTER- VI

Cluster Electives, CLUSTER–B
CLUSTER ELECTIVE, PAPER–VIII-B-1

Paper VIII-B-1: Biological instrumentation and Methodology

Total hours of teaching 60hrs @ 3hrs per week

Unit -I: Imaging and related techniques:  (12hrs)
Principles of microscopy; Light microscopy; Fluorescence microscopy; Electron Microscopy
(a) Flow cytometry  (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit- II: pH and Centrifugation:  (12 hrs)

Unit- III: Spectrophotometry:  (12hrs)
Principle involved in Spectrophotometer; Spectrophotometric techniques, Instrumentation: ultraviolet and visible spectrophotometry (single and double beam, double wavelength spectrophotometers), Infrared spectrometers - Luminometry and densitometry – principles and their applications - Mass Spectroscopy- principlesof analysis, application in Biology.

Unit- IV: Chromatography:  (12hrs)
Chromatographic techniques: Principle and applications – Column - thin layer –paper, affinity and gas chromatography - Gel filtration - Ion exchange and High performance liquid chromatography techniques– Examplesof application for each chromatographic system - Basic principles of electrophoresis.
Unit-V: Preparation of molar, molal and normal solutions, buffers, the art of scientific writing


   The art of scientific writing and presentation of scientific matter. Scientific writing and ethics. Writing references. Powerpoint presentation. Poster presentation. Introduction to copyright-academic misconduct/plagiarism in scientific writing.

Suggested Readings:


Suggested activities: Preparing various laboratory reagents, operating laboratory instruments, noting instrument readings, calculating results accurately, Skills on writing scientific articles, presentation of scientific results through tables, graphs, poster presentations and practicing power point presentations.

Paper VIII-B-1: PRACTICAL SYLLABUS

1. Microscopy – Light microscopy: principles, parts & function

2. Micrometry- principle and measurement of microscopic objects: Low power and high power.

3. Camera Lucida drawing with magnification and scale.

4. Principle and working of phase contrast microscope

5. Principle & operation of Centrifuge
6. Preparation of standard acid and alkali and their standardization.
   b) Preparation of various solutions (normal, molar, and percent) and ppm/ppb
      by serial dilutions
7. Study of principle and working of pH meter and Measurement of pH of
   Milk, Pepsi, Lemon juice etc. using pH paper and pH meter
8. Study of principle of Chromatography and separation of amino acids mixture
   By ascending Paper Chromatography
7. Principle & operation of Colorimeter
8. Principle & operation of Spectrophotometer
9. Chromosome banding, FISH, chromosome painting
9. Principle and technique of TLC (demonstration)
10. TLC separation of Amino acids from purified samples and biological materials
    (demonstration)
11 PCR - The Polymerase Chain Reaction (protocol) -demonstration
13. Study visit to an institute /laboratory

**Domain skills expected to achieve:**

Skill in operating laboratory equipment, their upkeep, and adept at various biological techniques. Ability to prepare molar, molal, normal solutions and solutions of different dilutions. Interpreting scientific results, and ability to present results in a scientific way through graphs, photographs, poster presentations and power point presentations.

**Paper VIII-B-1: Theory: Biological instrumentation and Methodology**

**PRACTICAL MODEL PAPER**

1. Perform the experiment (A). Write the protocol of the experiment - 15 marks
2. Measure the pH of given sample (B) using pH paper and pH meter. Write the procedure and observation. 10 marks
3. Identify C, D, and E. Write the principle and use of them. 3X5 -15 marks
4. Viva voce on Field visit 05 marks
5. Record 05 marks
Key
A. Amino acid separation by paper chromatography
B. Milk, Pepsi, Lemon juice etc
C. Camera Lucida/ Micrometer/phase contrast microscope
D. Colorimeter/ Spectrophotometer
E. Chromosome banding, FISH, chromosome painting

(Cluster Electives –B)

III B.Sc.: BOTANY SYLLABUS  SEMESTER- VI, CLUSTER ELECTIVE -2-B

PAPER – VIII-B-2

Paper VIII-B-2: Mushroom Culture and Technology

Total hours of teaching 60hrs @ 3hrs per week

Unit I: Introduction, history:  (12hrs)

Introduction - history - scope of edible mushroom cultivation. Types of edible mushrooms available in India – Volvariellavolvacea, Pleurotuscitrinopileatus, Agaricusbisporus. Medicinal value of edible mushrooms; Poisonous mushrooms.

UNIT II: Pure culture-spawn preparation:  (12hrs)

Pure culture - preparation of medium (PDA and Oatmeal agar medium) sterilization - preparation of test tube slants to store mother culture – culturing of Pleurotus mycelium on Petriplates, preparation of mother spawn in saline bottle and polypropylene bag and their multiplication.

Unit III: Cultivation Technology:  (12hrs)

Infrastructure: Substrates (locally available) Polythene bags, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, composting technology in mushroom production.

Unit IV: Storage and nutrition:  (12hrs)

Short-term storage (Refrigation - up to 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content – Vitamins.
Unit V: Food Preparation:
(12hrs)

Types of foods prepared from mushrooms; soup, cutlet omelette, samosa, pickles and curry.

Research Centres - National level and Regional level. Cost benefit ratio.

Suggested Readings:


Suggested activities: Growing spawn on laboratory prepared medium in petriplates and maintaining, preparing compost and compost beds, packing of beds, spawning, maintaining moisture, picking, blanching and packing. Collecting naturally growing mushrooms and identifying them properly, visits to mushroom houses.

Paper VIII-B-2: PRACTICAL SYLLABUS

1. Identification of different edible and poisonous mushrooms.

2. Microscopic and anatomical observations of different mushroom species.

3. Pure culture - preparation of medium (PDA and Oatmeal agar medium) sterilization.

4. Isolation and preparation of spawn under controlled conditions(preparation of mother spawn in saline bottle and polypropylene bag and their multiplication).

5. Types of Compost preparation and sterilization.

7. Inoculation and spawning of compost.

6. Incubation and harvesting of mushrooms (collection, drying and preservation).

7. Diseases of mushrooms (photographs).

8. Post-harvest technology steps (photographs).

9. Study tour to mushroom cultivation farms

11. Project work – cultivation of paddy straw/ oyster/white button mushrooms.

Domain skills expected to achieve: Identification of different edible species, skill in media and substrate preparation, isolation of pure culture for spawn, compost preparation, and practices in growing methods of different cultivated mushrooms, postharvest handling and packing

**SCHEME OF PRACTICAL EXAMINATION**

**PAPER – VIII-B-2 (Cluster Elective): Mushroom Culture and Technology**

PRACTICAL- VIII-B-2: Cluster Elective (MODEL QUESTION PAPER)

<table>
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<th>Time: 3hrs</th>
<th>Max. Marks: 50</th>
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I. Prepare the culture medium for isolation of spawn and make the slants. Write the protocol for preparation of the medium (A) 20 marks

II. Write the protocol for preparation of compost (B) 08 marks

III. Comment on given specimens C, D and E 3x4 = 12 marks

IV. Report on Field visit 05 marks

V. Practical Record 05 marks

Total = 50 marks

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KEY

A- PDA /Oatmeal agar medium  
B- Paddy straw compost  
C - Edible mushroom (Photograph)  
D- Poisonous mushroom (Photograph)  
E. Preservation technique (Photograph)

Cluster Electives - B  

III B.Sc.: Botany Syllabus   Semester- VI, Theory: Cluster Elective –B-3

PAPER – VIII-B-3 (Cluster Elective)

Paper VIII-B-3: Internship/ Project Work preferably either in an Institute or Industry

B.Sc - BOTANY  

SEMESTER-V/VI: THEORY MODEL PAPER  

(General Model Paper)

Time: 3 Hours  Max. Marks:75

SECTION-A (Short Answer Questions)

(Instructions to the paper setter: Set minimum ONE question from each unit, maximum Eight from all.)

Answer any five of the following question 5x5=25M

1.  
2.  
3.  
4.  
5.  
6.  
7.  
8.  

SECTION-B (Essay Questions)

(Instructions to the paper setter: Set minimum two questions from each unit, either or internal choice)
Answer All of the following questions 5x10=50M

9. a) Or from unit I
   b)

10. a) Or from unit II
    b)

11. a) Or from unit III
    b)

12. a) Or from unit IV
    b)

13. a) Or from unit V
    b)

INTERNAL EXAMS - 25Marks
(15 marks for unit tests, 5 marks for assignments and remaining 5 marks for seminar etc.)
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*7th* paper of each of the domain specific subjects (1st paper of semester VI) will be a domain related Elective. More than one Elective may be offered giving choice to students. The Electives may be of Domain specific applied or advanced (specialization) in nature. The number of Electives may be decided (along with the syllabus) by the University concerned keeping the feasibility of conduct of University examinations in view.

**Applied Elective:** It is desirable that around 25% of syllabus is taught by field experts. The college has to make such an arrangement.

*8th* paper of each of the domain specific subjects (2nd paper of semester VI) will also be an Elective. The Electives may be of Inter-domain Clusters**- each Cluster having three papers with or without project work, or General in nature. The number of Clusters may be decided (along with the syllabus) by the University concerned keeping the feasibility of conduct of University examinations in view. It is desirable that around 25% of syllabus is taught by field experts.

**Cluster:** *In the last semester, for paper-8, each domain subject has one elective totaling three papers for each student. Electives may be given as Clusters of three papers each for each subject. A student can opt for all the three papers of the same subject (cluster or stream) including or excluding project work for a wider learning experience. The student will not study the other two domain subjects for paper-8.*

**Total Credits for a B.Sc. Course:** 158
Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions) (5 x 5 = 25M)

Answer any FIVE of the following.

5. Mechanical methods for plant protection.

మహోత్ దుస్తులయ్యాదు ముఖ్తా బాబులు.

7. Livestock component in organic farming.

జీవంత జీవంతావేయడానికి వాటి విభాగం.
8. Terrace farming – పాత్రే జీవంత రాళ్లం.

SECTION – B (Essay questions) (5 x 10 = 50M)

Answer ALL of the following.


ఒంటర్మే జీవంత రాళ్లం ఎంతాదని? ఒంటర్మే జీవంత రాళ్లం మాత్రమే లేదు?

(OR)

b) Enumerate the requirements for organic farming.

ఒంటర్మే జీవంత రాళ్లం ఉపయోగయ్యించడానికి ఎంతాం వివిధ విషయాలు ఉంటాం?
10. a) Write an account on the propagation of seeds and planting materials.
   (OR)
   b) Write an essay on the types of bio-fertilizers and the methods of application.

11. a) Give an account of botanical pesticides.
    (OR)
    b) Write an essay on weed management.

12. a) Write an account of organic crop production methods of rice.
    (OR)
    b) Write an essay of mushroom cultivation.

13. a) Write an essay on the policies and incentives of organic production.
    (OR)
    b) Write an account of certification process in organic farming.

/// ***** ///

::2::
Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions) (5 x 5 = 25M)
Answer any FIVE of the following.

1. Soil sterilization – స్థల స్పష్టీకరణ.
3. Mist chamber – మాస్‌చామ్‌.
4. Rooting Medium – నాగద మాటాంతు.
5. Ornamental palms – వర్ణోత్తర పాల్యా.
6. Bonsai – బొంసేయ
7. Methods of prolonging vase life of flowers.
   పూర్వ పరిమితికి పూసానం మాటాంతు ప్రత్యేకిత పదార్థాల సమయం.

SECTION – B (Essay questions) (5 x 10 = 50M)
Answer ALL of the following.

9. a) Write an account on vegetative propagation.
   తమిళ వెంబడి పంచా పాలకత్వం.
   (OR)

   b) Write an essay on pruning techniques.
   పుష్పపరిషక్తి మైనం ప్రాంగణ పంచం పలిచేది స్పష్టుంచండి.

10. a) Write an essay on landscaping.
    వృక్ష పంచా పంచం విస్తరణ స్పష్టుంచండి.
    (OR)

    b) Write an essay on different types of gardening.
    విభిన్న వంటి పంచా పంచం విస్తరణ స్పష్టుంచండి.
11. a) Write an account on sowing and transplanting.
   సంపదం నిషేధం సమాచార ప్రతిపాదం.  
   (OR)

   b) Write an essay on the propagation of ornamental plants by rhizomes, corms and tubers.
   రీచాంగ్టులు, కంరస్టేషన్ పండ్లు పరిశీలన ప్రతిపాదం పండ్లు రీచాంగ్టు పరిశీలన ప్రతిపాదం.  

12. a) Write an account of the propagation of cacti.
   నిషేధం నిషేధం ప్రతిపాదం.  
   (OR)

   b) Write an essay on the cultivation of plants in pots.
   పండ్లు పండ్లు పండ్లు పండ్లు పరిశీలన ప్రతిపాదం.  

13. a) Write an essay on the factors affecting flower production.
   ఫలితాల నిషేధం నిషేధం ప్రతిపాదం ప్రతిపాదం.  
   (OR)

   b) Write an essay on the cultivation of cut flowers: Marigold and Rose.
   కండ నిషేధం నిషేధం ప్రతిపాదం ప్రతిపాదం. 

/// ***** /////
Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions)  
(5 x 5 = 25M)
Answer any FIVE of the following.

1. Differentiation and Dedifferentiation – పరిపాలన పరుస్తుందానికి పరుసులు ప్రారంభం.
2. Somatic embryogenesis – సాంఘటన ఎమ్బ్రోయేజి.
3. Elicitation – ప్రాతినిధ్యం
5. Types of restriction endonucleases – శిర్ది శిర్ది శిర్ది శిర్ది శిర్ది.
8. Flavr Savr tomato – ఫ్లావర్ సార్ తామాతూ.

SECTION – B (Essay questions)  
(5 x 10 = 50M)
Answer ALL of the following.

9. a) Describe the methods of plant tissue culture in detail.
పాలన పరిపాలన పరిపాలన పరిపాలన పరిపాలన.

(OR)

b) Describe various methods of sterilization.
పరిపాలన పరిపాలన పరిపాలన పరిపాలన.

10. a) Describe the technique of embryo culture and its applications.
పరిపాలన పరిపాలన పరిపాలన పరిపాలన.

(OR)

b) What are secondary metabolites? How they can be produced in culture? Describe factors affecting secondary metabolite production in culture.
సమాచారాలు సమాచారాలు సమాచారాలు సమాచారాలు?
సమాచారాలు సమాచారాలు సమాచారాలు?
సమాచారాలు సమాచారాలు సమాచారాలు?
సమాచారాలు సమాచారాలు సమాచారాలు?
సమాచారాలు సమాచారాలు సమాచారాలు?

::1::
11. a) What is a vector? Describe a plasmid and a phage vector for E.coil.

(OR)

b) What is Gene cloning? Describe various steps involved in genecloning.

12. a) What is transformation? Describe Agrobacterium mediated gene transfer and Microprojectile bombardment used for bacterial transformation.

(OR)

b) What are Selectable Markers? Describe various categories of Selectable Markers.

13. a) What are the applications of genetic engineering in crop improvement?

(OR)

b) Discuss the various applications of transgenic plants and the problems encountered in their production / utilization.
Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions)  (5 x 5 = 25M)
Answer any FIVE of the following.

2. Uses of plants – ఉద్భాగ్యం సంచారించడానికి.
3. NBPG – NBPG
5. EIA – EIA

SECTION – B (Essay questions)  (5 x 10 = 50M)
Answer ALL of the following.

9. a) Write an essay on values of biodiversity.
పరిశ్రామ సంచారించడానికి.

(OR)

b) What are the various methods adopted for valuation of biodiversity?
పరిశ్రామ సంచారించడానికి.

10. a) Write an essay on Agrobiodiversity.
పరిశ్రామ సంచారించడానికి.

(OR)

b) What is the role of IUCN, UNESCO and WWF in biodiversity management?
పరిశ్రామ సంచారించడానికి IUCN, UNESCO సంచారించడానికి WWF సంచారించడానికి.

::1::
11. a) What is carbon footprint? Explain it.
(OR)

b) Write an essay on solid waste management.

12. a) Write about ex-situ conservation of biodiversity.
(OR)

b) Write about social approaches for conservation of biodiversity.

13. a) Give the commercial importance of ornamental plants in India.
(OR)

b) What are important fruit crops? Give their commercial importance.
Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions) (5 x 5 = 25M)

Answer any FIVE of the following.

1. Objectives of Ethnobotany – ऐथनोबॉटनी के उद्देश्य
2. Major ethnic groups of India – भारत के मुख्य जाति जमातें
3. Role of Rauwolfia serpentina in modern medicine.
   रौफव्लिया सर्पेंटिना के इस्तेमाल मorden रुचिकरण में.
4. Cassia auriculata – morphology – कासिया अरिकूलेटा पेड़ की आकृति।
5. Biopiracy – बायोपीरेसी.
6. Any five plants used in Siddha medicine – शिद्धा चिकित्सा में पाए जाने वाले पांच प्रमुख पौधे.

SECTION – B (Essay questions) (5 x 10 = 50M)

Answer ALL of the following.

9. a) Describe the importance of ethnobotany in the 21st Century.
   21वीं सदी के महत्वपूर्ण ऐथनोबॉटनी का अहम
   (OR)
   b) Name any five plants used by tribals as intoxicants and beverages and write their uses.
   ट्रिबल्स द्वारा किसी पांच पौधों से बनाए जाने वाले अंधकार और पानी के उपयोग और उनके उपयोग.
10. a) What is the role of ethnobotany in modern medicine?
(OR)

b) Describe the habitats and morphology of the following plants.
   i) Azadaricheta indica –
   ii) Vitex negundo –
   iii) Indigoferatintoria –
   iv) Gloriosa superba –

11. a) Write an essay on role of ethnic groups in the conservation of plant genetic resources.
(OR)

b) What are intellectual property rights? Why is it necessary to promote and protect intellectual property?

12. a) Name any ten plants used in ayurveda and write their uses.
(OR)

b) What is the origin of Siddha medicinal system? What are the basic concepts of siddha medicine?

13. a) How can a taxon be considered endangered?
(OR)

b) Describe ‘in situ’ conservation of endemic and endangered medicinal plants?
Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions) (5 x 5 = 25M)

Answer any FIVE of the following.

1. Importance of Pharmacognosy – పరిమాణానికి సంబంధించిన పరిమాణాంధ్రం.
2. Active principle of Rauwolfia Serpentina – దైవీని ప్రతిబంధితంగా ఉండే పరిమాణం.
3. Primary metabolites – ప్రపంచం ప్రముఖ పరిమాణం.
4. Extraction of alkaloids – అల్కాలోయడ్స్ ప్రతిరోధానికి ఉపయోగించడానికి ఉండే పరిమాణం.
5. Importance of tannins – టింట్స్ పరిమాణం.

SECTION – B (Essay questions) (5 x 10 = 50M)

Answer ALL of the following.

9. a) Write an essay on classification of drugs.

(OR)

b) What are the various drug evaluation methods? Explain any two methods.

10. a) Write organoleptic and microscopic studies of Alstonia Scholaris and Catharanthus roseus with reference to their adulterants.

(OR)

b) Write organoleptic and microscopic studies of Adathoda vesica and Zinziber officinalis and add a note on their adulterants.
11. a) Define "Secondary Metabolites". Write an account of terpenes.

"పిల్లికీబడతా విస్తరించిన సంహారితం" - పిల్లికీబడతా  సంహారితం

(OR)

b) Write detailed account of Mevalonate pathway.

మరియు మరియు మరియు మరియు మరియు మరియు మరియు మరియు

12. a) What are different types of phenols? Describe their biosynthesis.

మరియు మరియు మరియు మరియు మరియు మరియు మరియు మరియు

(OR)

b) What are different groups of alkaloids? Describe their biosynthesis.

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13. a) What is the chemical nature of antibiotics? Describe their mode of action.

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(OR)

b) What is the role of different enzyme inhibitors?

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**SECTION – A (Short Answer Questions) (5 x 5 = 25M)**

Answer any FIVE of the following.

1. Principle of light microscopy – **Draw neat and labelled diagrams wherever necessary.**
2. Cytometry – 
3. Types of rotors – 
4. Sonication – 
5. Luminometer – 
6. Thin layer chromatography – 
7. Technique of using micropipette – 
8. Copy right – **SECTION – B (Essay questions) (5 x 10 = 50M)**

Answer ALL of the following.

9. a) What is fluorescence microscopy? Write the applications of fluorescence microscopy. **(OR)**

9. b) What is electron microscopy? Describe various stages of sample preparation for electron microscopy. **(OR)**

10. a) What is the structure of pH meter? What is its working principle? **(OR)**

10. b) What is centrifugation? Explain differential and density gradient centrifugation?
11. a) What is the principle involved in Spectrophotometer? What are the essential components of a spectrophotometer instrumentation?

(OR)

b) What is mass spectroscopy? Write an essay on its applications in Biology.

12. a) Write an essay on gel filtration and its applications.

(OR)

b) What is ion exchange chromatography and how does it work? What are its applications?

13. a) Write an essay on preparation of solutions.

(OR)

b) What are common toxic chemicals? Write about the safety measures to be taken while handling them.

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Draw neat and labelled diagrams wherever necessary.

SECTION – A (Short Answer Questions) (5 x 5 = 25M)
Answer any FIVE of the following.

1. Pleurotus citrinopileatus – ప్యూరాటస్ చిత్రనపిలెయటస్
2. Poisonous mushrooms – పోఝనాస్ మచ్చాయుక్తి
3. Oat meal agar medium preparation – మడకుల మచ్చాయుక్తి జాఖాయప్యుక్తి
4. Mushroom bed preparation – మచ్చాయుక్తి జాఖాయప్యుక్తి
5. Cold pasteurization – కల్డ్ పాస్ట్రేజిస్నేషన్
6. Vitamins present in mushroom – మచ్చాయుక్తిలోని విటమిన్లు
7. Cost benefit ratio – సాంస్థిక బైండరిట్యు సామాన్యం
8. Soup – సాపూ

SECTION – B (Essay questions) (5 x 10 = 50M)
Answer ALL of the following.

9. a) How many types of edible mushrooms are available in India? Write briefly about them.
   (డారిటైటియా నెప్పు తయారు పదార్ధాలు మచ్చాయుక్తిలో మనద్యమత్తులు ఎన్నివున్నాయని?
   (డారిటైటియా నెప్పు తయారు పదార్ధాలు మచ్చాయుక్తిలో మనద్యమత్తులు ఎన్నివున్నాయని?
   (OR)

   b) What are the medicinal values of mushrooms?
      మచ్చాయుక్తిలో పండ్లాళ్ల ముద్రపండ్లాళ్లు

10. a) What are the various steps included in the preparation of mother spwan?
    మాయా మచ్చాయుక్తి తయారు పదార్ధాలు ఎన్నివున్నాయని?
    (డారిటైటియా నెప్పు తయారు పదార్ధాలు మచ్చాయుక్తిలో మనద్యమత్తులు ఎన్నివున్నాయని?
    (OR)

   b) How can a culture medium be prepared? Give details.
      జాఖాయప్యుక్తి తయారు పదార్ధాలు ఎన్నివున్నాయని?
      మనద్యమత్తులు ఎన్నివున్నాయని?
11. a) Write about the tools used in the cultivation of mushrooms.
(OR)

b) What is compost? Write long method of composting.

12. a) What are the storage methods used for storing mushrooms?
(OR)

b) Write an account on nutritional value of mushrooms?

13. a) What are the different types of foods prepared from mushrooms? Give the recipes for curry and cutlet.
(OR)

b) Give an account of national level and regional research centres on mushroom cultivation.

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