DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
B. Sc. I, II & III Year Botany Curriculum
(SEMESTER PATTERN)
Course Structure

Class	Paper No	Title of Paper	Credits	Lectures	Marks
B. Sc. I	**SEMESTER - I**				
	I	Diversity of Cryptogams - I	3	45	50
	II	Morphology of Angiosperms	3	45	50
	III	Practical based on Paper - I	1.5	45	50
	IV	Practical based on Paper - II	1.5	45	50
	SEMESTER – II				
	V	Diversity of Cryptogams - II	3	45	50
	VI	Histology, Anatomy and Embryology	3	45	50
	VII	Practical based on Paper - V	1.5	45	50
	VIII	Practical based on Paper - VI	1.5	45	50
B. Sc. II	**SEMESTER – III**				
	IX	Taxonomy of Angiosperms	3	45	50
	X	Plant Ecology	3	45	50
	XI	Practical based on Paper - IX	1.5	45	50
	XII	Practical based on Paper - X	1.5	45	50
	SEMESTER – IV				
	XIII	Gymnosperms and Utilization of plants	3	45	50
	XIV	Plant Physiology	3	45	50
	XV	Practical based on Paper - XIII	1.5	45	50
	XVI	Practical based on Paper - XIV	1.5	45	50
B. Sc. III	**SEMESTER – V**				
	XVII	Cell Biology and Molecular Biology	3	45	50
	XVIII (A) XVIII (B) XVIII (C) XVIII(D)	Diversity of Angiosperms - I OR Plant Breeding and Seed Technology OR Plant Pathology OR Biotechnology	3	45	50
	XIX	Practical based on Paper - XVII	1.5	45	50
	XX	Practical based on Paper - XVIII	1.5	45	50
	SEMESTER – VI				
	XXI	Genetics and Biotechnology	3	45	50
	XXII (A) XXII (B) XXII (C) XXII (D)	Diversity of Angiosperms - II OR Economic Botany OR Microbiology and Disease Management OR Bioinformatics	3	45	50
	XXIII	Practical based on Paper - XXI	1.5	45	50
	XXIV	Practical based on Paper - XXII	1.5	45	50

Note: For theory paper: 1credit = 15 periods/lectures,
For Practical paper 1credit = 30 periods/lectures

B. Sc. I Year (Theory)
Semester - I
Paper I
(Diversity of Cryptogams - I)

Lectures - 45

Unit - 1 **Credit - 1**

1.1 **Viruses:**

General characters, classification based on host, economic importance, TMV – structure and multiplication (04)

1.2 **Mycoplasma:**

General characters (01)

1.3 **Bacteria:**

General characters, ultra structure, classification based on shape, reproduction, economic importance (05)

1.4 **Cryptogams:**

General characters, classification according to G.M. Smith up to class level (01)

1.5 **Lichens:**

General characters, nature of association, forms of thalli, economic importance, structure and reproduction in *Usnea* (04)

Unit – 2 **Credit - 1**

2. **Algae:**

2.1 General characters, classification according to F.E. Fritsch (1935) up to the class level, economic importance. (02)

2.2 Systematic position, occurrence, thallus structure, reproduction vegetative, asexual and sexual, (excluding development of sex organs) and graphic life cycle with respect to following types:

i. Cyanophyceae – *Nostoc* (02)
ii. Chlorophyceae – *Chara* (03)
iii. Xanthophyceae – *Botrydium* (02)
iv. Phaeophyceae – *Sargassum* (03)
v. Rhodophyceae – *Batrachospermum* (03)

Unit – 3 **Credit -1**

3. **Fungi:**

3.1 General characters, classification according to Alexopoulous and Mims (1979) up to the class level, economic importance (03)

3.2 Systematic position, occurrence, structure of mycelium, reproduction - asexual, sexual and graphic life cycle with respect to the following types:

i) Oomycetes – *Albugo* (03)
ii) Zygomycetes – *Mucor* (02)
iii) Ascomycetes – *Eurotium* (02)
iv) Basidiomycetes – *Agaricus* (03)
v) Deuteromycetes – *Cercospora* (02)

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B. Sc. I Year (Theory)
Semester - I
Paper - II
(Morphology of Angiosperms)

45L

Unit – 1 **Credit 1**

1.1- Basic body plan of flowering plant, modular type of growth, diversity of plant forms – Herbs, Shrubs, Trees, Climbers; annuals, biennials and perennials. (02)

1.2 Morphology of vegetative organs:

a) **Root:** Characteristics, functions, regions of root, types – tap and adventitious, modification of root for storage, mechanical support (stilt root) and vital functions (Pneumatophore). (04)

b) **Stem:** Characteristics, functions, modification – underground, sub aerial and aerial (03)

c) **Leaf:** Parts of typical leaf, phyllotaxy, types (simple and compound), diversity in shape and size, venation and modifications of leaf. (06)

Unit – 2 **Credits 2**

2. Morphology of reproductive organs:

2.1 Inflorescence: Racemose, cymose and special types (05)

2.2 Flower: Definition, parts of typical flower, forms of thalamus, androphore, gynophore, gynandrophore, insertion of floral whorls on thalamus (hypogyny, perigyny and epigyny), structure, function and modification of calyx, corolla, androecium, gynoecium, aestivation and placentation (15)

2.3 Fruit: Types of fruits (06)

2.4 Fruit and Seed dispersal strategies. (04)

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B. Sc. I Year (Practical)
Semester - I
Paper – III
(Diversity of Cryptogams - I)

45L
Credits – 1.5

Note: Study of specimens of Bacteria, Algae, Fungi, through temporary mounting, permanent slides, field work and biovisual aids. Observation of disease symptoms in hosts infected by Fungi may be observed

1. Study of simple and compound microscope
2. Virus: Tobacco Mosaic Virus
3. Gram staining in bacteria, forms of Bacteria
4. **Algae:**
   a) *Nostoc*
   b) *Chara*
   c) *Botrydium*
   d) *Sargassum*
   e) *Batrachospermum*
5. **Fungi:**
   a) *Albugo*
   b) *Mucor,*
   c) *Eurotium*
   d) *Agaricus*
   e) *Cercospora*
6. **Lichens:** Form - Crustose, Foliose, Fruticose; *Usnea.*

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B. Sc. I Year (Practical)
Semester - I
Paper – IV
(Morphology of Angiosperms)

45L
Credits - 1.5

Note: Study of the following with the help of temporary mountings, permanent slides, charts, models, specimens and biovisual aids.

1. **Study of root and its modifications :**
   a) Tap root
   b) Adventitious root
   c) Storage roots
   d) Stilt root
   e) Respiratory root.
2. **Study of stem and its modifications :**
   a) Underground stem
   b) Sub aerial stem
   c) Aerial stem
3. **Study of leaf and its diversity**:
   a) Types of leaf (Simple, Compound)
   b) Shape and size
   c) Venation
   d) Phyllotaxy
   e) Modifications
4. **Study of inflorescence**:
   a) Racemose
   b) Cymose
   c) Special
5. **Study of flowers:**
   a) Typical flower (*Hibiscus* / *Datura*)
   b) Hypogynous, Perigynous and Epigynous
   c) Aestivation
   d) Forms of corolla – cruciform, papilionaceous, infundibuliform and bilabiate
   e) Parts of typical stamen, adhesion and cohesion.
   f) Parts of typical carpel and placentation

6. **Study of flowers with respect to pollination mechanism:**
   a) Calotropis
   b) Ocimum
   c) Salvia
   d) Helianthus
   e) Ficus
   f) Clitoria
7. **Study of fruits:**
   a) Simple: legume, capsule, caryopsis, achene, drupe, berry.
   b) Aggregate: an etaerio of berries, an etaerio of follicles
   c) Composite fruit: sorosis, syconus

Note for paper III and IV:

Candidate shall submit the following at the time of practical exam.

1. Certified laboratory record book.
2. Field note book / Tour report.
3. Collection of specimens from algae and fungi.

In addition to number of practicals prescribed above, the students are required to undertake field excursions to the places of botanical interest and industrial places under the guidance of teacher. Collection of rare flowering and non flowering plants should be avoided during excursion. There shall be frequent study tours in local areas. T.A. and D.A. be paid to the teachers, peons and field collectors as per university rules. The record book is to be signed periodically by teacher in charge and certified by the Head of Department at the end of the term. Candidate should not be allowed to appear for practical examination without a certified record book or a certificate from the Head of Department.

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B. Sc. I Year (Theory)

Semester – II

Paper - V

(Diversity of Cryptogams - II)

45 L.

Unit- 1 **Credit 1**

1. Bryophytes:

1.1 General characters of bryophytes, classification as per G. M. Smith (02)

1.2 Systematic position, occurrence, thallus structure (external and internal), reproduction -vegetative, asexual, and sexual (excluding developmental stages), graphic life cycle and alternation of generations of the following types:

a) Hepaticopsida – *Marchantia* (07)

b) Bryopsida – *Funaria* (06)

Credits 2

2. Pteridophytes:

2.2 General characters of Pteridophytes, classification as per G. M. Smith (02)
Systematic position, occurrence, external and internal structure of sporophyte and gametophyte, reproduction (excluding developmental stages), graphic life cycle and alternation of generations of the following types:

a) Psilopsida – *Psilotum* (03)

b) Lycopsida – *Lycopodium, Selaginella* (12)

c) Sphenopsida – *Equisetum* (06)

d) Pteropsida – *Marsilea* (07)

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B. Sc. I Year (Theory)

Semester - II

Paper - VI

(Histology, Anatomy and Embryology)

45 L.

Unit – 1 **Credit - 1**

Histology:

a) Types of tissue:

i. Meristematic tissue – Meristem, structure and types based on origin and position. (03)

ii. Permanent tissues: Simple, Complex and Secretary (06)

iii. Epidermal tissues: Trichomes and Stomata (02)

b) Histological organization of root and shoot apices (02)

c) Various theories of cellular organization (02)

Unit – 2 **Credit 1**

Anatomy:

a) Primary structure of root, stem and leaf of Monocot (Maize) and Dicot (Sunflower) (07)

b) Secondary growth in root and stem of Dicot (Sunflower) (04)

c) Wood anatomy: Growth rings, heart wood and sap wood (02)

d) Periderm: Origin, structure and functions. (02)

Unit – 3 **Credit 1**

Embryology:

a) Structure of anther, microsporogenesis and development of male gametophyte (03)

b) Structure and types of ovule, megasporogenesis and development of female gametophyte (Polygonum type). (04)

c) Pollination -Mechanism, types and agencies. (02)

d) Double fertilization and its significance (01)

e) Development of Dicot embryo (Crucifer type). (01)

f) Structure, development and types of endosperm. (02)

g) Structure of Dicot and Monocot seed (02)

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B. Sc. I Year (Practical)

Semester - II

Paper - VII

(Diversity of Cryptogams II)

45L
Credits – 1.5

Note: Study of specimen of Bryophytes, and Pteridophytes through temporary mounting, permanent slides, field work and biovisual aids.

a) Bryophytes:
   i. *Marchantia*
   ii. *Funaria*

b) Pteridophytes:
   i. *Psilotum*
   ii. *Lycopodium*
   iii. *Selaginella*
   iv. *Equisetum*
   v. *Marsilea*

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B. Sc. I Year (Practical)

Semester - II

Paper - VIII

(Histology, Anatomy and Embryology)

45L
Credits – 1.5

Histology:

1. Meristem: root apex and shoot apex
2. Permanent tissues – simple,complex and secretory
3. Epidermal tissues: trichomes and stomata

Anatomy:

1. Anatomy of young dicot (Sunflower) and monocot (Maize) root. (Double stained permanent slide preparation)
2. Anatomy of young dicot (Sunflower) and monocot (Maize) stem. (Double stained permanent slide preparation)
3. Anatomy of dicot (Sunflower) and monocot (Maize) leaf. (Double stained permanent slide preparation)

Embryology:

1. Study of T.S. of anther
2. Structure of ovule (anatropous), types of ovules
3. Study of Dicot and Monocot seed (embryo)

Note for Paper VII and VIII:

Candidate shall submit the following at the time of practical exam.

1. Certified laboratory record book.
2. Field note book and Tour report.
3. Collection of specimens
4. Permanent slides of root stem and leaf.

In addition to number of practicals prescribed above, the students are required to undertake field excursions to the places of botanical interest and industrial places under the guidance of teacher. Collection of rare flowering and non flowering plants should be avoided during excursion. There shall be frequent study tours in local areas. T.A. and D.A. be paid to the teachers, peons and field collectors as per university rules. The record book is to be signed periodically by teacher in charge and certified by the Head of Department at the end of the term. Candidate should not be allowed to appear for practical examination without a certified record book or a certificate from the Head of Department.

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD

Faculty Of Science

Pattern of Theory Question Paper

B.Sc. I YEAR (BOTANY)

Semester I

Paper I

(Diversity of Cryptogams – I)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Algae) 10

or

Describe in brief:
a. Short answer type ……(Algae)
b. Short answer type ……(Algae)

Q.2. Long answer type question ……..……(Fungi) 10

or

Describe in brief:
a. Short answer type ……(Fungi)
b. Short answer type ……(Fungi)

Q.3. Write short notes on: (Any two) 10
a. Short note (Bacteria, Viruses, Mycoplasma)
b. Short note (Algae)
c. Short note (Fungi, Lichen)

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty Of Science
Pattern of Theory Question Paper
B.Sc. I YEAR (BOTANY)
Semester I
Paper II
(Morphology of Angiosperms)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Root, Stem, Leaf) 10

or

Describe in brief:
a. Short answer type ……(Root, Stem, Leaf)
b. Short answer type ……(Root, Stem, Leaf)

Q.2. Long answer type question ……..……(Inflorescence, Flower, Fruit) 10

or

Describe in brief:
a. Short answer type ……(Inflorescence, Flower, Fruit)
b. Short answer type ……(Inflorescence, Flower, Fruit)

Q.3. Write short notes on: (Any two) 10
a. Short note (Root, Stem)
b. Short note (Leaf)
c. Short note (Flower, Fruit).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. I YEAR (BOTANY)
Semester I
Paper III
(Diversity of Cryptogams -I)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Identify, classify and describe any two algae from the given mixture 10
Q.2. Identify, classify and describe the given specimen of fungi 10
Q.3. Identify and describe the specimen A, B, C and D as per the instructions 10
(A-Algae, B-Fungi, C-Lichen and D-Bacteria / viruses)
Q.4. Submission:
a) Record book, viva - voce and collection 10
b) Tour report and field report 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. I YEAR (BOTANY)
Semester I
Paper IV
(Morphology of Angiosperms)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Identify and describe the structure, modification and pollination mechanism in the given flower 10
Q.2. Identify and describe the structure / modification in the given specimens 'A' and 'B' (Root, stem and leaf) 10
Q.3. Identify and describe the specimens C, D, E and F as per the instructions 10
(C-inflorescence, D-Flower, E-Flower and F-Fruit)
Q.4. Submission:
a) Record book, viva - voce and collection 10
b) Tour report and field report 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty Of Science
Pattern of Theory Question Paper
B.Sc. I YEAR (BOTANY)
Semester II
Paper V
(Diversity of Cryptogams – II)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Bryophytes) 10

or

Describe in brief:
a. Short answer type ……(Bryophytes)
b. Short answer type ……(Bryophytes)

Q.2. Long answer type question ……..……(Pteridophytes) 10

or

Describe in brief:
a. Short answer type ……(Pteridophytes)
b. Short answer type ……(Pteridophytes)

Q.3. Write short notes on: (Any two) 10
a. Short note (Bryophytes)
b. Short note (Pteridophytes)
c. Short note (Pteridophytes)

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD

Faculty of Science

Pattern of Theory Question Paper

B.Sc. I YEAR (BOTANY)

Semester II

Paper VI

(Histology, Anatomy and Embryology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Anatomy) 10

or

Describe in brief:
a. Short answer type ……(Anatomy)
b. Short answer type ……(Anatomy)

Q.2. Long answer type question ……..……(Histology, Embryology) 10

or

Describe in brief:
a. Short answer type ……(Histology, Embryology)
b. Short answer type ……(Histology, Embryology)

Q.3. Write short notes on: (Any two) 10
a. Short note (Histology)
b. Short note (Anatomy)
c. Short note (Embryology)

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. I YEAR (BOTANY)
Semester II
Paper VII
(Diversity of Cryptogams - II)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Identify, classify and describe the given specimen (Bryophytes) on the basis of external and internal features. 10
Q.2. Identify, classify and describe the given specimen (Pteridophytes) on the basis of external and internal features. 10
Q.3. Identify and describe the specimen A, B, C and D as per the instructions 10
(A-Bryophytes, B-Pteridophytes C- Pteridophytes and D- Pteridophytes)
Q.4. Submission:
c) Record book, viva - voce and collection 10
d) Tour report and field report 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. I YEAR (BOTANY)
Semester II
Paper VIII
(Histology, Anatomy and Embryology)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Prepare a double stained permanent preparation of the given specimen. Identify and describe with a well-labelled diagram. 12
Q.2. Identify and describe the structure of Trichome / Stomata in the given leaf. 08
Q.3. Identify and describe the specimens A, B, C and D as per the instructions. 10
(A-Histology, B - Histology, C - Anatomy and D - Embryology)
Q.4. Submission:
a) Record book, viva - voce and collection 10
b) Tour report, field report. 10

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B. Sc. II Year (Theory)
Semester III
Paper -IX
(Taxonomy of Angiosperms)

(45L)
Credit - 1

Unit :1

1. Salient features, origin and evolution of Angiosperms (03)
2. Bentham and Hooker's system of classification upto series level, its merits and demerits (03)
3. Taxonomy in relation to anatomy, embryology, palynology, ecology and cytology (03)
4. Concept of Binomial Nomenclature and its advantages (02)
5. Concept of genus, species and epithet. (02)
6. Herbaria and Botanical Gardens. (02)

Unit:2 **Credits :2**

Study of the following families: systematic position , salient features, floral formula, floral diagram, common examples and their economic importance (30)

i. Annonaceae
ii. Malvaceae
iii. Leguminosae
    Fabaceae (Papilionaceae)
    Caesalpiniaceae
    Mimosaceae
iv. Apocynaceae
v. Solanaceae
vi. Acanthaceae
vii. Lamiaceae (Labiatae)
viii. Nyctaginaceae
ix. Liliaceae
x. Poaceae (Gramineae)

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B.Sc.II Year(Theory)
Semester - III
Paper - X
(Plant Ecology)

45 L

Unit: 1 **Credit: 1**

Plant and environment:

A)Climatic factors – a) Light as an ecological factor, global radiation and photosynthetically active radiation (02)

b) Temperature as an ecological factor (02)

c) Water as an ecological factor, physicochemical properties of water (03)

B)Edaphic factor –

Soil formation -soil profile, physicochemical properties of soil, major soil types of India, soil erosion and soil conservation (08)

Unit:2 **Credit:1**

1. Response of plants to water

Morphological, physiological and anatomical response of plants to water – hydrophytes, xerophytes, halophytes and epiphytes (12)

2. Phytogeography: (03)

Biogeographical regions of India, vegetation types of India

Unit: 3 **Credit:1**

1. Community ecology:

Community characteristics -frequency, density, life forms, biological spectrum (06)

1. Ecosystem:

structure -biotic and abiotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles-nitrogen and phosphorus. (09)

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B.Sc. II year (Practical)
Semester - III
Paper - XI
(Taxonomy of Angiosperms)

45 L
Credits:1.5

Angiosperms:

Study of locally available plants of the following families :

1. Annonaceae
2. Malvaceae
3. Leguminosae
    a) Fabaceae (Papilionaceae)
    b) Caesalpiniaceae
    c) Mimosaceae
4. Apocynaceae
5. Solanaceae
6. Acanthaceae
7. Lamiaceae (Labiatae)
8. Nyctaginaceae
9. Liliaceae
10. Poaceae (Gramineae)

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B.Sc.II year (Practical)
Semester - III
Paper - XII
(Plant Ecology)

45 L
Credit :1.5

1. Study of morphological and anatomical adaptations in hydrophytes – *Hydrilla*, *Eichhornia*, *Typha* and *Nymphaea* .
2. Study of morphological and anatomical adaptations in xerophytes -*Aloe*, *Nerium, Casuarina.*
3. Study of morphological adaptations in halophytes -Pneumatophore, Stilt roots
4. Study of morphological and anatomical adaptations in epiphytes
5. Study of vegetation by quadrat method
6. Estimation of Importance Value Index (IVI) of grassland ecosystem on the basis of relative frequency, relative density and relative abundance.
7. Determination of water holding capacity of different soils
8. Study of meteorological instruments -Rain gauge, Hygrometer, Barometer
9. Determination of percent leaf area injury of different infected leaf samples
10. Estimation of salinity of different water samples
11. Determination of pH of different soils by pH papers/universal indicator/pH meter.

Note for paper XI and XII:

Candidate shall submit the following at the time of practical exams: Certified laboratory record book, Field note book, Tour report and Collection of specimens.

In addition to number of practicals prescribed above, the students are required to undertake field excursions to the places of botanical interest and industrial places under the guidance of teachers. Collection of rare flowering and non flowering plants should be avoided during excursion. There shall be frequent study tours in local areas. T.A. and D.A. be paid to the teachers, peons and field collectors as per university rules. The record book is to be signed periodically by teacher in charge and certified by the Head of Department at the end of the term. Candidate should not be allowed to appear for practical examination without a certified record book or a certificate from the Head of Department.

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B. Sc. II Year (Theory)
Semester - IV
Paper - XIII
(Gymnosperms and Utilization of Plants)

45 L
Credits 1.5

Unit:1

Gymnosperms:

1. Salient features, classification as per Sporne 1965, economic importance (02)
2. Geological time scale, fossilization, types of fossils, *Lyginopteris*, fossil fuels (04)
3. Contributions of Prof. Birbal Sahani (01)
4. Study of morphology, anatomy, reproduction (excluding developmental stages) and graphical representation of life cycle of the following types:
   a) Cycadales – *Cycas* (08)
   b) Coniferales – *Pinus* (08)

Unit:2 **Credits:1.5**

Utilization of Plants:

1. Domestication of plants and their centers of origin (02)
2. History, origin, cultivation, harvesting, improved varieties and economic importance of the following plants: (15)
   i. Food plants – Wheat, Jowar
   ii. Sugar – Sugarcane
   iii. Fibers -Cotton, Jute
   iv. Vegetable oils – Groundnut, Sunflower
   v. Beverages – Tea, Coffee
3. Botanical name, family name and economic importance of the following plants: (05)
   i. Medicinal plants – *Aloe vera, Withania somnifera, Curcuma longa, Vitex negundo*
   ii. Timber and Gum – Teak, Neem, Babul, Sisham
   iii. Cosmetics and Perfumes – Rose, Mogara, Tuberose
   iv. Spices – Clove, Black pepper, Cumin, Coriander, Cinnamon

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B. Sc. II Year (Theory)
Semester IV
Paper XIV
(Plant Physiology)

45 L

Unit:1 **Credit 1**

1. **Plant water relations:**
   a) Diffusion, osmosis, plasmolysis and imbibition (02)
   b) Water absorption and ascent of sap (Transpiration pull theory) (03)
   c) Transpiration – Definition, types -cuticular, lenticular and stomatal, structure of stomata, mechanism of opening and closing of stomata (starch – sugar hypothesis) (02)
2. **Mineral nutrition:**
   a) Macro and microelements: roles and deficiency symptoms of N, P, K, Mg, Ca, Fe, Zn, Bo, Mo.
   b) Mineral uptake – passive (ion exchange theory) and active (carrier concept) (05)
3. **Translocation of solutes:**
   Mass flow hypothesis, protoplasmic streaming theory, Source and sink relationship (03)

Unit:2 **Credits 1**

1. **Enzymes :**:
   Chemical nature – holoenzyme ,apoenzyme, prosthetic group, cofactor and coenzyme, properties , nomenclature, classification basedon type of reactions, mechanism of enzyme action (06)
2. **Growth**: Definition, Phases of Growth, Sigmoid growth curve. (02)
3. **Growth regulators**:
   Discovery, stucture, roles and practical applications of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene (07)

Unit:3

Credit 1

1. **Photosynthesis:**
   Definition, ultra structure of chloroplast, photosynthetic pigments, Light reactions -Hill reaction, red drop and Emerson enhancement effect, two pigment systems (PS I, PS II), photophosphorylation – cyclic and noncyclic, Z-scheme; Dark reactions -C3, C4 and CAM pathways (08)
2. **Respiration:**
   Definition, Ultra structure of mitochondria, types of respiration, Glycolysis, TCA Cycle, Electron transport system, alcoholic and lactic acid fermentation. (07)

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B.Sc. II year (Practical)
Semester IV
Paper XV
(Gymnosperms and Utilization of plants)

45L

Credit:1.5

Gymnosperms:

a) Cycas

i. Habit, young leaf, bulbils, male cone, microsporophyll, megasporophyll, pollen grains, mature seed.
ii. Study through permanent slides-Normal root (T.S.). Stem (T.S.), Ovule (L.S.)
iii. Study through hand section-Coralloid root (T.S.), Rachis (T.S.), Leaflet (T.S.)

b) Pinus

i. Habit, long and dwarf shoot, scale leaves, foliage leaves, male cone, female cone, pollengrains (W.M.), winged seed.
ii. Study through hand sections and permanent slides Root (T.S.), Stem (T.S.), Needle (T.S.)
iii. Study through permanent slide - T.L.S. & R.L.S. of stem, L.S. of male cone, L.S. of female cone

Palaeobotany:

a) Types of fossils (Specimens)
b) *Lygynopteris* (Specimen / Permanent slide)

Utilization of plants :

a) Food plants – Study of the morphology, structure,and histochemical tests of food storing tissue in Jowar & Wheat
b) Histochemical test of lignin and cellulose
c) Vegetable oils – hand section of Groundnut & Sunflower Seed and staining of oil droplets by Sudan III
d) Study of the sources of Timber, Gum, Medicinal plants, Cosmotics and Perfumes
e) Study of Black pepper, Clove, Cinnamon, Cumin, Coriander
f) Field notebook, specimen collection, and tour report.

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B.Sc. II year (Practical)
Semester IV
Paper XVI

(Plant Physiology) 45L

Credits:1.5

1. Osmosis by egg membrane and potato osmoscope
2. Plasmolysis in *Tradescantia* leaves
3. Effect of different conc. of organic solvents on membrane permeability
4. Determination of water potential of any tuber
5. Detection of mineral elements in plant ash
6. Digestion of starch by amylase
7. Detection of enzyme activity : oxidase, peroxidase, catalase and dehydrogenase
8. Separation of chloroplast pigments by paper chromatography
9. Demonstration of Hill reaction
10. Effect of different intensities of light on photosynthesis
11. Effect of different colors of light on photosynthesis
12. Fermentation by Kuhnes fermentation vessel
13. Isolation of starch
14. Isolation of pectin
15. Estimation of total and reducing sugars in fruit juice by Fehling solution
16. Separation of amino acids by paper chromatography
17. Effect of IAA and Gibberellins on seed germination

Note for Paper XV and XVI

Candidate shall submit the following at the time of practical examination: Certified laboratory record book. Field report , Tour report.and Collection of specimens.

In addition to number of practicals prescribed above, the students are required to undertake field excursions to the places of botanical interest and industrial places under the guidance of teachers. Collection of rare flowering and non flowering plants should be avoided during excursion. There shall be frequent study tours in local areas. T.A. and D.A. be paid to the teachers, peons and field collectors as per university rules. The record book is to be signed periodically by teacher in charge and certified by the Head of the Department at the end of the term. Candidate should not be allowed to appear for practical examination without a certified record book or a certificate from the Head of the Department.

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD

Faculty Of Science

Pattern of Theory Question Paper

B.Sc. II YEAR (BOTANY)

Semester III

Paper IX

(Taxonomy of Angiosperms)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 1)

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. II YEAR (BOTANY)
Semester III
Paper X
(Plant Ecology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.2. Long answer type question ……..……(Unit 3) 10

or

Describe in brief:
a. Short answer type ……(Unit 3)
b. Short answer type ……(Unit 3)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 1).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. II YEAR (BOTANY)
Semester III
Paper XI
(Taxonomy of angiosperms)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q. 1. Identify, classify giving reasons and describe the specimen 'A'.Give floral formula and floral diagram. 10
Q.2. Identify, classify giving reasons and describe the specimen 'B'.Give floral formula and floral diagram. 10
Q.3. Identify and describe the specimen C, D, E and F as per the instructions (C- and D - Morphology, E- and F - Economic importance) 10
Q.4. Submission:
a) Record book, viva - voce and collection 10
b) Tour report and field report 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. II YEAR (BOTANY)
Semester III
Paper XII
(Plant Ecology)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Identify and describe morphological and anatomical adaptations in the given specimen. Make a temporary preparation of the given specimen. 10
Q.2.Conduct the ecological experiment, record the principle, observation and result (Experiment No. 5,6,7,9,10,11) 10
Q.3. Identify and describe the specimens A, B, C, and D, as per the instructions (Experiment No. 1, 2, 3, 4, 8) 10
Q.4. Submission:
a) Record book, viva - voce and collection 10
b) Tour report and field report 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD

Faculty Of Science

Pattern of Theory Question Paper

B.Sc. II YEAR (BOTANY)

Semester IV

Paper XIII

(Gymnosperms and Utilization of plants)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions

ii) All questions carry equal marks

iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:

a. Short answer type ……(Unit 1)

b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:

a. Short answer type ……(Unit 2)

b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10

a. Short note (Unit 1 and 2)

b. Short note (Unit 1 and 2)

c. Short note (Unit 1 and 2)

*****

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. II YEAR (BOTANY)
Semester IV
Paper XIV
(Plant Physiology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 3) 10

or

Describe in brief:
a. Short answer type ……(Unit 3)
b. Short answer type ……(Unit 3)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 2)
b. Short note (Unit 2)
c. Short note (Unit 2).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. II YEAR (BOTANY)
Semester IV
Paper XV
(Gymnosperms and Utilization of plants**)**

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Make a double stained permanent preparation of the given specimen 'A'
(Gymnosperm). Identify and describe with a well labeled diagram. 10
Q.2. Histochemical tests in given material 'B'
(Protein / Carbohydrate /Lipid / cellulose / Lignin) 10
Q.3. Identify and describe the specimen C, D, E and F as per the instructions 10
(C- and D - Gymnosperms, E- and F- Utilization of plants)
Q.4. Submission:
a) Record book, viva - voce and collection 10
b) Tour report and field report 10

*****

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. II YEAR (BOTANY)
Semester IV
Paper XVI
(Plant Physiology)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q. 1. Make a list of materials required for the physiological experiment allotted to you.
Show it to the examiner, write the procedure and record the readings. 10
(Expt No. 2, 3, 4,5, 6,7 as per practical syllabus)
Q. 2. Make a list of materials required for the experiment allotted to you.
Show results to the examiner. 10
(Expt No. 8,10,11,13,14,15,16 as per practical syllabus)
Q.3. Identify and describe the principle and working in the given experiment
(Experiment No. 1, 9, 12, 17) 10
Q.4. Submission:
a) Record book, viva - voce 10
b) Tour report / project report 10

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B.Sc.III Botany (Theory)
Semester -V
Paper XVII
(Cell Biology & Molecular Biology)

(45L)

Unit-1 Credit-1

1. Cell:
   Structure of Prokaryotic cell (Bacterial cell) and Eukaryotic cell (plant cell) (02)
2. Cell wall and cell organelles:
   Structure and functions of cell wall and Cell organelles – Golgi complex, Endoplasmic reticulum, Lysosomes (08)
3. Nucleus:
   Ultra structure, (nuclear membrane, nucleolus, chromatin material, nucleoplasm), Functions of nucleus. (05)

Unit-2 Credit-1

1. **Cell division:** (06)
   a) Cell cycle -G1 phase, S phase, G2 phase and M phase
   b) Mitosis – definition,process and significance.
   c) Meiosis-definition, process and significance.

2. **Nucleic acids:** (09)
   a. DNA: Definition, structure, chemical composition (nitrogenous bases, purines, pyrimidines, nucleosides, nucleotides, phosphate and sugars) Watson and Crick's model, Z - DNA, B - DNA, functions of DNA
   b. Replications of DNA – conservative, semi conservative and dispersive.
   c. RNA: Structure, types and functions

Unit-3 Credit-1

1) Chromosome: (07)
Definition, morphology-size, shape, number, Ultra structure – chromatid, chromonema, chromomere, centromere, kinetochore, secondary constriction, satellite, telomere, heterochromatin, euchromatin, Nucleosome model (Woodlock 1973), chemical composition, Functions of chromosome, Giant chromosomes-polytene and lampbrush chromosome.

2) Chromosomal aberrations : (08)
a) Structural-deletion, duplication, inversion and translocation
b) Numerical: – euploidy and aneuploidy

*****

B.Sc. III Year (Theory)
Semester – V
Paper XVIII(A)
(Diversity of Angiosperms-I) (45 L)

Unit: 1 **Credit-1**

1. Biodiversity (03)

Definition, concept, origin and evolution

2. Types of biodiversity: (05)

Species, genetic, ecological, cropland and agricultural diversity; biodiversity in India; endemism and hot spots; threatened species, threats to biodiversity

3. Conservation of biodiversity: (07)

Major causes for loss of biodiversity, listing of threatened biodiversity; threatened categories – extinct, endangered, vulnerable, rare and indeterminate. Conservation measures: – ex-situ, and in-situ; biodiversity conservation in India.

Unit -2 **Credit -2**

Phytotaxonomy: (08)

Classification of Angiosperms with special reference to Linnaeus, A. P. de Candole, Bentham and Hooker.

Study of diversity following families with reference to the system of classification of Bentham and Hooker

(22)

1. Magnoliaceae
2. Nymphaeaceae
3. Papveraceae .
4. Brassicaceae
5. Capparidaceae .
6. Rutaceae
7. Rhamnaceae
8. Combretaceae
9. Lythraceae
10. Cucurbitaceae
11. Apiaceae

******

B. Sc. III Year (Theory)
Semester -V
Paper: XVIII (B))
(Plant Breeding and Seed Technology) 45L)

Unit -1 **Credits-2**

Plant Breeding :

1. Introduction, history, aims and objectives (02)
2. Domestication, plant introduction and acclimatization (02)
3. Hybridization – history, hybridization procedure. (03)
4. Selection methods -mass selection, pureline selection and clonal selection (04)
5. Hybridization in self pollinating plants (03)
6. Hybridization in cross pollinating plants (03)
7. Heterosis and hybrid vigour (02)
8. Mutation in crop improvement (02)
9. Hybridization programme in Jowar and Cotton (06)
10. Experimental designs and biometrical techniques in plant breeding - Randomized block design, Latin square design, Analysis of variance, Assessment of variability, Simple measures of variability (03)

Unit -2 **Credit-1**

Seed Technology :

1. Seed technology -history, aims and objectives (01)
2. Morphology and anatomy of seed (monocot and dicot seed , endospermic and non endospermic seed) (02)
3. Stages of seed multiplication -
   a. nucleus seed (04)
   b. breeders seed
   c. foundation seed
   d. certified seed
   e. registered seed
   f. truthful seed
4. Seed certification process (02)
5. Stagewise multiplication of foundation and certified seed in Jowar and Cotton (02)
6. Seed processing – drying, cleaning, dressing, bagging, tagging, storage and marketing (02)
7. New techniques in seed technology (02)

****

B.Sc. III Year (Theory)
Semester –V
Paper XVIII (C)
(Plant Pathology)

45L

Unit-1 **Credit-1**

Fundamentals of plant pathology:

1. Plant pathology – history, scope, losses due to pathogens, importance and need to study plant pathology (02)
2. Classification of plant diseases on the basis of symptoms and causal organisms – animate and inanimate (03)
3. Plant pathological institutes – IARI (Indian Agricultural Research Institute), ICRISAT(International Crop Research Institute for Semi Arid Tropics) (02)
4. Seed pathology – concept and importance of seed pathology, seed borne pathogens, methods to study seed borne pathogens (03)
5. Study of air borne pathogens: methods and applications (03)
6. Field and laboratory diagnosis of plant disease - Koch's postulates (02)

Unit-2 **Credit-2**

Plant diseases:

Study of the following diseases with respect to symptoms, causal organism, disease cycle and disease management:

1) Cereals:	a. Black stem rust of wheat	(05)
	b. Grain smut of jowar	
	c. Ergot of bajra	
2) Pulses:	a. Wilt of pigeon pea	(04)
	b. Yellow vein mosaic of bean	
3) Vegetables:	a. Late blight of potato	(05)
	b. Little leaf of brinjal	
	c. Black rot of onion (*Aspergillus*)	(04)
4) Oil seeds:	a. Tikka disease of groundnut	
	b. Damping off of mustard	
5) Cash crops:	a. Grassy shoot of sugarcane	(06)
	b. Downy mildew of grapes	
	c. Angular leaf spot of cotton	
	d. Citrus canker	
6) Ornamentals:	a. Powdery mildew of rose	(02)
7) Weeds:	a. Rust of Euphorbia	(02)
8) Trees:	a. *Cercospora* on *Albizzia* fruits	(02)

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B. Sc. III Year (Theory)
Semester- V
Paper XVIII (D)
(Biotechnology)

45L

Unit- 1 **Credits -2**

Biotechnology:

1. **Introduction:**
   a. Definition, scope and multidisciplinary nature (05)
   b. Biotechnology in India
2. **DNA structure, replication and recombination:** (05)
   a. Structure of DNA
   b. Replication of DNA, Role of DNA polymerase
   c. Denaturation and renaturation of DNA
   d. Recombination
3. **Recombinant DNA technology**: (15)
   a. Introduction, principles and procedure
   b. Enzymes involved in recombinant DNA technology
   c. Vectors
   d. Southern and Northern blotting technique
   e. Techniques in gene mapping
   f. DNA fingerprinting
   g. PCR
   h. DNA sequencing
   i. Genomics and DNA libraries
4. **Genetic engineering:** (05)
   a. Introduction to transgenic plants
   b. Vectors for gene deliveries
   c. Marker and reporter genes
   d. Role of agriculture in crop biotechnology
   e. Achievements in plant biotechnology

Unit- 2 **Credit- 1**

1. **Plant tissue culture:** (10)
   a. Principles of tissue culture
   b. Terminology in tissue culture
   c. Cellular differentiation and totipotency
   d. Organogenesis and embryogenesis
   e. Protoplast isolation and culture
   f. Meristem culture
   g. Anther culture
   h. Applications of tissue culture
2. **Research projects:** (05)
   a. Human genome project
   b. Plant genome project
   c. DBT Ministry Of Science and Technology.

B.Sc.III Botany (Practical)
Semester -V
Paper XIX
(Cell Biology & Molecular Biology)

45 L
Credit – 1.5

Unit-1

1. Study of the cell structure from onion leaf or *Tradescantia* leaf
2. Preparation of cytological (AA, FAA etc.) fixatives and stains (acetocarmine, aceto-orcein).
3. Study of electron micrographs of viruses, bacteria and cyanobacteria
4. Study of electron micrographs of eukaryotic cell and different cell organelles
5. Preparation of slides for the study of mitosis (root tips of onion)
6. Preparation of slides for the study of meiosis (*Rhoeo*, *Aloe* or onion flower buds)
7. Preparation of idiogram from the given micrograph of karyotype
8. Observation of giant chromosomes in *Chironomous* larvae
9. Preparation of wool models of mitosis, meiosis, cell structure, Chromosome, DNA and RNA.

*****

B.Sc. III Year (Practical)
Semester – V
Paper XX (A)
(Diversity of Angiosperms-I)

45 L

Unit: 1 **Credits-1.5**

1. Study of herbarium
2. Study of analytical characters
3. Preparation of indented and bracketed keys
4. Study of following families:
    1. Magnoliaceae
    2. Nymphaeceae
    3. Papaveraceae
    4. Brassicaceae
    5. Capparidaceae
    6. Rutaceae,
    7. Rhamnaceae
    8. Combretaceae
    9. Lythraceae
    10. Cucurbitaceae
    11. Apiaceae,
5. Mounting of pollen grains (acetolysis method)

Note for paper No. XIX and XX

Students should undertake excursion to ecologically different areas for plant study and submission of at least 20 wild plants at the time of practical examination.

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B. Sc. III Year (Practical)
Semester -V
Paper: XX(B)
(Plant Breeding and Seed Technology)

45 L

Unit -1 **Credits-1.5**

Plant breeding:

1. Study of floral biology of jowar and cotton
2. Demonstration of male sterility in jowar
3. Artificial emasculation and pollination in jowar and cotton
4. Demonstration of hybridization techniques in jowar and cotton
5. Designing of field experiments
6. Visit to plant breeding centre

Seed technology:

1. Study of morphology and anatomy of monocot, dicot, endosprmic and nonendospermic seeds
2. Study of seed germination – observation of normal and abnormal seedlings, germination percentage
3. Blotter test
4. Method of breaking seed dormancy
5. Study of various seed processes – drying, cleaning, dressing, bagging, tapping and marketing
6. Preparation of seed certification tag
7. Viability test (Tetrazolium test)
8. Visit to various seed farms and research centres

****

B.Sc. III Year (Practical)
Semester –V
Paper XX (C)
(Plant Pathology)

45L

Unit-1 **Credits-1.5**

1.Study of Koch's postulates – isolation, inoculation and disease development

2.Study of the following diseases with respect to symptoms, causal organism, disease cycle and disease management

1) **Cereals:**
   a. Black stem rust of wheat
   b. Grain smut of jowar
   c. Ergot of bajra
2) **Pulses:**
   a. Wilt of pigeon pea
   b. Yellow vein mosaic of bean
3) **Vegetables:**
   a. Late blight of potato
   b. Little leaf of brinjal
   c. Black rot of onion (*Aspergillus*)
4) **Oil seeds:**
   a. Tikka disease of groundnut
   b. Damping off of mustard
5) **Cash crops:**
   a. Grassy shoot of sugarcane
   b. Downy mildew of grapes
   c. Angular leaf spot of cotton
   d. Citrus canker
6) **Ornamentals:**
   Powdery mildew of rose
7) **Weeds:**
   Rust of Euphorbia
8) **Trees:**
   Cercospora on *Albizzia* fruits

*****

B. Sc. III Year (Practical)
Semester- V
Paper XX (D)
(Biotechnology)

45L

Unit- 1 **Credits -1.5**

1. Principle and working of instruments in biotechnology laboratory - Autoclave / Pressure Cooker, Centrifuge, Hot plate, Water bath, Laminar Air flow, Oven, Microscope, pH Meter, Refrigerator, Magnetic Stirrer, Shaker, Agarose Gel Electrophoresis, Green House etc.
2. Sterilization of glasswares
3. Preparation of sterile media, nutrient broth, PDA, M.S. medium, B5 medium, White medium
4. Isolation of bacteria and fungi from air
5. Demonstration of meristem culture
6. Demonstration of anther culture
7. Separation of amino acids by gel electrophoresis

****

B.Sc.III (Theory)
Semester -VI
Paper XXI
(Genetics and Biotechnology)

45 L
Credit : 1

Unit : 1

1. Mendelism: (04)

i. Introduction -G.J. Mendel
ii. Mendelian principles –Law of Dominance , law of segregation, law of independent assortment, back cross and test cross

2. Interaction of genes: (07)

i. Allelic interaction: incomplete dominance, co dominance, lethal genes and blood group inheritance
ii. Non allelic and non epistatic -comb shapes in fowls
iii. Non allelic and epistatic:
   a) Complementary genes or duplicate recessive epistasis (9:7)
   b) Supplementary genes or recessive epistasis (9:3:4)
   c) Dominant epistatic genes or dominant epistasis (12:3:1)
   d) Duplicate genes or duplicate dominant epistasis (15:1)

3. Sex determination: (04)

i. Chromosomal theory of sex determination
ii. Mechanism of sex determination in man (xx -xy), Drosophila (xx and xy), birds (zz-zw), grasshopper (xx-xo) and genic balance theory in Drosophila
iii. Sex determination in plants – *Melandrium*

Unit : 2 **Credit : 1**

1. Sex linked inheritance: (07)

X, XY and Y linked inheritance:
i) Colourblindness and hemophilia in man
ii) Holandric genes
iii) White eye colour in Drosophila,
iv) Gynandromorphs,

2. Structure and function of gene: (08)

i. Fine structure of gene (Seymour Benzer)
ii. One gene one enzyme hypothesis
iii. Genes and related diseases – phenylketonuria, and alkaptonuria
iv. Detection of genetic diseases –amniocentesis Genetic counseling

Unit: 3 **Credit : 1**

Biotechnology: **(15)**

1. Concept of genetic engineering and recombinant DNA technology
2. Restriction endonucleases, their properties and uses
3. Cloning vectors -plasmids and phage vectors
4. Techniques of genetic engineering -isolation of desired gene, gene cloning, transfer of gene into plants
5. Applications of genetic engineering

*****

B.Sc. III Year (Theory)
Semester – VI
Paper XXII (A)
(Diversity of Angiosperms-II)

45 L

Unit: 1 **Credit-1**

Plant identification: keys, herbaria and botanical gardens (04)
Origin of angiosperms: origin and evolution, Bennettitalean, Ranalian and Caytonial theory (05)
Binomial nomenclature: Principles and rules (03)
Modern trends in taxonomy: (03)
Cytotaxonomy, chemotaxonomy, and numerical taxonomy

Unit: 2 **Credits-2**

1.Phytotaxonomy: (10)
Study of Engler & Plantle ,Hutchinson,Takthajan system of classification

2.Study of diversity of families: (20)

a. Asclepiadaceae
b. Scrophulariaceae
c. Oleaceae
d. Convolvulaceae
e. Verbenaceae
f. Amaranthaceae
g. Euphorbiaceae
h. Orchidaceae
i. Liliaceae
j Commelinaceae

****

B. Sc. III Year (Theory)
Semester- VI
Paper: XXII (B)
(Economic Botany)

45L

Unit -1 **Credit-1**

Origin, morphology, production, cultivation practices, harvesting and uses of crop plants.

a) **Cereals:** Maize, Pearl millet and Rice
b) **Pulses:** Bengal gram, Black gram and Pigeon pea
c) **Oil seed crops:** Soybean, Mustard and Castor

Unit -2. **Credit-1**

a) **Fibre crops:** Jute, Sunhemp and Cotton
b) **Horticultural crops:** Banana, Orange and Mango
c) **Ornamentals:** Rose, Orchids and *Chrysanthemum*

Unit -3. **Credit-1**

a) **Beverages:** Tea and Coffee
b) **Forage crops:** Cowpea, Jowar and Lucerne
c) **Vegetable crops:** Brinjal, Potato, Tomato and Onion
d) **Condiments and Spices:** Cardamom, Black pepper and Chillies

*****

B.Sc. III Year (Theory)
Semester –VI
Paper XXII (C)
(Microbiology and Disease Management)

45L

Unit-1 Credit-1

1. Microbiology

Microorganisms in biological world, their classification and features of different groups (03)

2. **Microbial techniques**:

a. Microscopy – simple, compound and electron microscope

b. Micrometry – Principle, working and uses

c. Staining – common stains used in pathology,their preparation and significance, (cotton blue and Gram's Stain)

d. Sterilization of glasswares and media (06)

3. Culture media for isolating plant pathogen

Industrial application of microorganisms - organic acids, alcohol,milk products, antibiotics and biopesticides (06)

Unit-2 **Credit-2**

Disease management:

1. Preventive methods: field sanitation, use of clean planting material, crop rotation, trap crops, time of sowing, planting distance and tillage (02)

2. Control methods –

a. Seed treatment: concept, objective, traditional and modern methods of seed treatment (02)

b. Soil sterilization: concept, objectives and methods (02)

c. Fungicides: Definition, classification and ideal characteristics of fungicides, study of fungicides with respect to active ingredients, formulations, methods of application, mode of action and uses (08)

i. Sulphur fungicides – Inorganic – Wettable sulphur, Organic – Thirum

ii. Copper fungicides

iii. Mercuric chloride – Agrosan – GN

iv. Heterocyclic nitrogenous compounds – Captan

v. Benzene compounds – Dexon

vi. Antibiotics – Streptomycin and Aureofungin

vii. Systemic – Bavistin and Vitavax

d. Pesticides:Nicotin,Neem and pyrethrum (01)

e. Rhodenticides – Zinc phosphoid (01)

f. Nematicides- Nemagon, Propoxar (01)

g Weedicides- 2,4-D (01)

h. Biological control- definition, need, examples and role (02)

Plant quarantine (01)

3. Control measures and environment: pollution due to chemicals, residual effects, toxicity, safe measures, colour code, antidote, symptoms of

poisoning, precautions in using pesticides (03)

4. Pesticide application equipments: principle and working –pneumatic air pump knapsack sprayer, mist blower and duster, types of nozzles (03)

5. Plant clinic: Concept, objective and need (01)

6. Recent techniques in plant pathology: Genetically modified organisms (GMO's), B.T.Cotton, Pheromones (02)

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B. Sc. III Year (Theory)
Semester- VI
Paper XXII (D)
(Bioinformatics) 45L

Unit- 1 **Credit -1**

1. Introduction to bioinformatics and its applications (03)

2. Sampling, sample size, sampling techniques (03)

3. Data collection and presentation: (05)

a. Types of data

b. Methods of data collection

c. Data presentation - line chart, bar chart, histogram, polygon, ogive curve, pie diagram

4. Measures of central tendency: (04)

a. Mean

b. Median

c. Mode ,

Unit – 2 **Credit-1**

Measures of variability: (05)

a. Mean deviation,

b. Standard deviation

c. Coefficient of variation

d. Standard error

2. Probability, chi-square test, t – test (05)

3. Introduction to computer basics- general characters, types of computer (03)

4. Hardware-input and output devices, CPU, storage devices (02)

Unit – 3 **Credit-1**

1. Software – MSDOS, Windows, Linux, concept of files and folders and directories, (08)
Application software - Word processor, Spread sheet, Presentation, MS-access, html document

2. Networking technology - LAN, WAN, Arpanet, Internet, Web browsing and servers – Netscape navigator, Internet explorer, search engines like yahoo, google etc.Introduction to MEDLINE, CCOD and PUBMED for biological information, Introduction to bioinformatics software - bioperl biojava bioxml (07)

B.Sc. III (Practical)
Semester -VI
Paper XXIII
(Genetics and Biotechnology)

(45 L)

Credits : 1.5

1. Quiz
2. Working out laws of inheritance by using seed mixtures
3. Problems based on gene interaction
4. Problems based on sex linked inheritance

B.Sc. III Year (Practical)
Semester – VI
Paper XXIV (A)
(Diversity of Angiosperms-II)

(45 L)
Credits-1.5

1 . Study of following families:

1. Oleaceae
2. Asclepiadaceae
3. Convolvulaceae
4. Scrophulariaceae
5. Verbenaceae
6. Amaranthaceae
7. Euphorbiaceae
8. Orchidaceae
9. Liliaceae
10. Commelinaceae

2. Mounting of pollen grains (acetolysis method) and measurement of pollen size.
3. Study of different types of stomata and epidermal structures (Trichome)
4. Identification of plants up to species by using flora (Flora of Bombay Presidency/ Flora of Marathwada)
5. Students should undertake excursion to ecologically different areas for plant study and submission of at least 10 wild plants at the time of examination.

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B. Sc. III Year (Practical)
Semester- VI
Paper: XXIV (B)
(Economic Botany) **45L**
Credit-1.5

Economic Botany:

1. Study of morphology, structure and simple histochemical tests of food storing tissues in Maize, Rrice, Jowar, Gram, Pigeon pea, Potato
2. Study of histochemical tests of lignin and cellulose (Jute, Cotton, Sunnhemp)
3. Hand section of Groundnut, Sunflower and staining of oil droplets
4. Study of plantation crops(Tea and Coffee)
5. Study of condiments and spices (Cardamom, Black Pepper and Chillies)
6. Study of horticultural crops (Banana, Orange and Mango)
7. Study of Vegetable crops (Brinjal, Potato, Onion, Tomato)
8. Study of ornamental plants (Rose and *Chrysantemum*)

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B.Sc. III Year (Practical)
Semester –VI
Paper XXIV (C)
(Microbiology and Disease Management)

45L

Credit-1.5

1. Study of fungicides as per theory syllabus
2. Preparation of Bordeaux mixture, burgundy mixture and Bordeaux paste
3. Study of insecticides with respect to active ingredient, colour code, formulation, mode of action, antidote and uses
4. Study of *Trichoderma* culture
5. Study of plant protection equipments –pneumatic air pump, knapsack sprayer, mist blower cum duster
6. Principle and working of autoclave, laminar air flow, Tilak air sampler
7. Use of aerobiological techniques to study fungal spora (gravity slide method, Tilak air sampler)
8. Calibration of microscope and measurement of fungal spores
9. Sketching of fungal spore by camera lucida technique
10. Detection of organic acids from healthy and infected leaves by circular paper chromatography
11. Detection of Amino acids from healthy and infected leaves by circular paper chromatography
12. Study of pathogens in fruits from local market
13. Study of fungi from locally available seed samples
14. Preparation of sterile media - nutrient agar, potato dextrose agar
15. Preparation of stains and mounting media - cotton blue, lacto phenol and gram stain

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B. Sc. III Year (Practical)
Semester- VI
Paper XXIV (D)
(Bioinformatics) 45L

Credit -1.5

1. Use of operating system and creation of a job from word processor, spread sheet, presentation and data base
2. Creating files, folders and directories
3. Internet browsing and downloading information with special reference to biological literature
4. Creating an e - mail account, sending and receiving e - mail
5. Graphical presentation of data
6. Computer based statistical techniques
7. Frequency table of single discrete variable
8. Computation of mean, median, and mode
9. Computation of mean deviation, standard deviation, coefficient of variation, variance, and standard error
10. Computation of chi- square test, and t - test
11. Students should undertake a visit biotechnology industry, biotechnology research laboratory

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester V
Paper XVII
(Cell Biology and Molecular Biology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 3)
b. Short note (Unit 3)
c. Short note (Unit 3).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester V
Paper XVIII (A)
(Diversity of Angiosperms - I)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 1).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester V
Paper XVIII (B)
(Plant Breeding and Seed Technology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 2)
b. Short note (Unit 2)
c. Short note (Unit 2).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester V
Paper XVIII (C)
(Plant Pathology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 1).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester V
Paper XVIII (D)
(Biotechnology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 2)
b. Short note (Unit 2)
c. Short note (Unit 2).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester V
Paper XIX
(Cell Biology and Molecular Biology)

Time: 1½ Hour | Max. Marks: 50
Date: _____ | Batch No. _____
Center: _____

Q.1. Prepare a temporary squash / smear of the given material. Identify and describe any two stages (Mitosis / Meiosis). 10

Q.2. Prepare a temporary slide of the given material. Identify and describe giant chromosome (*Chironomous* larvae).

or

Prepare an idiogram of the given karyotype and comment. 10

Q.3.Identify and describe (Electron micrograph) 05

Q.4. Prepare a temporary preparation of given material (Onion/*Tradescantia* leaf) 05

Q.5. Submission:

a) Record book, viva - voce 10

b) Tour report and wool models 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester V
Paper XX (A)
(Diversity of Angiosperms - I)

Time: 1½ Hour | Max. Marks: 50
Date: _____ | Batch No. _____
Center: _____

Q.1. Identify, classify giving reasons and describe the specimen 'A' upto family level. Give floral formula and floral diagram 10

Q.2. Identify, classify giving reasons and describe the specimen 'B' upto family level. Give floral formula and floral diagram 10

Q.3. Identify and describe the specimens C, D, E and F as per the instructions (C-inflorescence, D-Flower, E-Flower and F-Fruit) 10

Q.4. Submission:

a) Record book, viva - voce 10

b) Project report /Tour report and Herbarium 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester V
Paper XX (B)
(Plant Breeding and Seed Technology)

Time: 1½ Hour — Max. Marks: 50
Date: _____ — Batch No. _____
Center: _____

Q.1. Explain hybridization technique in given plant	10
Q.2. Viability test of given seeds	10
Q.3. Preparation of seed certification tag	05
Q.4. Designing of field experiment	05
Q.4. Submission:	
a) Record book, viva - voce	10
b) Project report / Tour report and collection	10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester V
Paper XX (C)
(Plant Pathology)

Time: 1½ Hour — Max. Marks: 50
Date: _____ — Batch No. _____
Center: _____

Q.1. Identify and describe the symptoms and causal organisms of the specimen 'A' Explain on the basis of external and internal characters	10
Q.2. Identify and describe the symptoms and causal organisms of the specimen 'B'. Explain on the basis of external and internal characters	10
Q.3. Identify and describe specimens as per instructions (Four spots)	10
Q.4. Submission:	
a) Record book, viva - voce	10
b) Project report / Tour report and collection	10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester V
Paper XX (D)
(Biotechnology)

Time: 1½ Hour | Max. Marks: 50
Date: _____ | Batch No. _____
Center: _____

Q.1. Identify the experiment and describe principle and procedure
(Meristem Culture / Anther Culture / Protoplast Culture) 10

Q.2. Separation of amino acids by gel electrophoresis

Or

Identify contaminating bacteria and fungi from the given culture 10

Q.3. Identify and describe the given specimens A, B, C, D as per instructions. 10

Q.4. Submission:

a) Record book, viva - voce 10

b) Project report and Tour report 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXI
(Genetics and Biotechnology)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 3)
b. Short note (Unit 3)
c. Short note (Unit 3).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXII(A)
(Diversity of Angiosperms - II)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 1).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXII (B)
(Economic Botany)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 3)
b. Short note (Unit 3)
c. Short note (Unit 3).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXII (C)
(Microbiology and Disease Management)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 2)
b. Short note (Unit 2)
c. Short note (Unit 2).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Pattern of Theory Question Paper
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXII (D)
(Bioinformatics)

Time: 1½ Hour Max. Marks: 30

N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question ……..……(Unit 1) 10

or

Describe in brief:
a. Short answer type ……(Unit 1)
b. Short answer type ……(Unit 1)

Q.2. Long answer type question ……..……(Unit 2) 10

or

Describe in brief:
a. Short answer type ……(Unit 2)
b. Short answer type ……(Unit 2)

Q.3. Write short notes on: (Any two) 10
a. Short note (Unit 3)
b. Short note (Unit 3)
c. Short note (Unit 3).

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXIII
(Genetics and Biotechnology)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Quiz based on genetics and biotechnology.	05
Q.2. Working out laws of inheritance using seed mixture	05
Q.3. Problem based on gene interaction	10
Q.4..Problem based on sex-linked inheritance	10
Q.5. Submission:	
a) Record book ,	10
b) viva - voce	10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXIV (A)
(Diversity of Angiosperms - II)

Time: 1½ Hour Max. Marks: 50
Date: _____ Batch No. _____
Center: _____

Q.1. Identify, describe and classify giving reasons the specimen upto the family level. Give floral formula and floral diagram	10
Q.2. Identify genus and species of the given plant by using flora	05
Q.3. Determine analytical and synthetic characters between specimens provided	05
Q.4. Identify and describe the specimens A, B, C and D, as per the instructions (A and B – morphology, C- Eco.Imp. D-pollen/trichome/stomata)	10
Q.4. Submission:	
a) Record book, viva - voce	10
b) Project report /Tour report and Herbarium	10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXIV (B)
(Economic Botany)

Time: 1½ Hour — Max. Marks: 50
Date: _____ — Batch No. _____
Center: _____

Q.1. Histochemical tests in given materials 'A' and 'B'
(Starch / Proteins / lipids / cellulose / Lignin) 10
Q.2. Identify and describe the specimens C, D, E, F and G as per the instructions 20
Q.3. Submission:
a) Record book, viva - voce 10
b) Project report / Tour report and collection 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXIV (C)
(Microbiology and disease management)

Time: 1½ Hour — Max. Marks: 50
Date: _____ — Batch No. _____
Center: _____

Q.1. Calibrate the microscope, measure the given spore and sketch with
camera lucida technique 10
Q.2. Detect of organic acids / amino acids from infected and healthy leaves
by circular paper chromatography 10
Q.3. Identify, and describe specimens as per instruction (Four spots) 10
(2 apparatus, 2 pesticide / fungicide)
Q.4. Submission:
a) Record book, viva - voce 10
b) Project report / Tour report and collection 10

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DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,AURANGABAD
Faculty of Science
Practical Examination
B.Sc. III YEAR (BOTANY)
Semester VI
Paper XXIV (D)
(Bioinformatics)

Time: 1½ Hour | Max. Marks: 50
Date: _____ | Batch No. _____
Center: _____

Q.1. Calculate mean, standard deviation, coefficient of variation and standard error of the provided data 10

Q.2. Prepare of a job using - word processor / spread sheet /presentation / database.

or

Represent given data by graphical method 10

Q.3. Computation of chi-square/ t-test 10

Q.4. Submission:

a) Record book, viva - voce 10

b) Project report and Tour report 10

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Recommended books:

1. Principles and Procedures of Plant Protection –S.B. Chattopadhyay.
2. A Hand book of Plant Protection - D. Seshagiri Rao.
3. Chemistry of Insecticides and Fungicides – U.S. Sreeramulu.
4. Plant Protection - Mukundan
5. Systemic Fungicide - S.C. Was
6. Fungicides by- Nene & Thapliyal.
7. Fungi and Plant diseases –B.B. Mundkur.
8. Text book of Modern Plant Pathology - K.S. Bilgrami and H.C. Dube.
9. Plant diseases - R.S. Singh
10. Essentials of Plant Pathology – V.N. Pathak.
11. Plant Pathology –R.S. Mehrotra.
12. Introduction to principle of Plant Pathology- R.S. Singh.
13. Plant Pathology – Agrios.
14. Principles of Plant breeding – H.K. Choudhary.
15. Weed Science – Thakur.
16. Modern Weed Science – O.F. Gupta & P.S. Lamba.
17. Principles of Weed Science - V.S.Rao.
18. Manual of Weed Science – N.C. Joshi.
19. Elements of Economic entomology– Vasantraj Devid and T. Kumar swami.
20. Agricultural Pests of India and South East Asia – A.S. Atwal.
21. General and applied Entomology – K.E. Nayar, B. V. David
22. Crop protection recommendations published by Department of AgricultureM.S.Pune
23. Plant protection recommendations for Horticulture crops-Directorate of Horticulture M. S. Pune –411005
24. Plant diseases in India- G. Rangaswami.
25. Diseases of cereals and millets – T.S. Ramkrishna.
26. Principles of Plant disease control- S.A. J. Tarr,1971.
27. Scientific principles of crop protection – Mortin, Hubert & David Woodcock – Edward Ashold USA.
28. Entomogrow nematodes- Ficheer G. O. Jr.
29. Applied plant Biotechnology – Rao, Dr. S. Ignacimlie, Tak Maegrere.
30. Advances in Mycology & Plant Pathology – R. Chaudhar
31. Text book of Fungi O.P. Sharma – Tata McGraw
32. Elements of Economic Entomology-David & Kumar Swami.
33. Text book of toxicology – Shrivastava.
34. Toxicology of Insecticides – Matsmura
35. Plant orgin insecticides.
36. Recent Advances in Host Plant Resistance –S. S. Dhahiliwa
37. Introduction to In Pest management – G.S. Ahaliwal.
38. Blod, H.C., Aloxopoulos, G. J. and Delevoryas, T. 1980. Morphology Plant and Fungi (4th Edition) Harper and Foul Co., New York.
39. Clifton, A. 1958 Introduction to the Bacteria. McGraw Hill Co., New York.
40. Dube, H. C. 1990. An Introduction to Fungi Vikas Publishing House Pvt. Ltd., Delhi.
43. Gifford, E. M. and Foster, A. S. 1989. Morphology and Evolution of Vascultar Plants W.H. Freeman & Co., New York.
44. Gilbert, M. S. 1985. Cryptogamic Botany Vol. I & II (2nd Edition), Tata Mcgraw Hill Publishing Co., Ltd New Delhi.
45. Kumar, h. D. 1988, Introductory Phycology. Affiliated East-West Press

Ltd.,New York.
46. Mandahar, C. L. 1998 Introduction to plant Viruses Chand & Ltd., Delhi.
8. Puri, P. 1985. Bryophytes. Amarm & Sons, Delhi.
9. Rangswamy, G. and Mahadevan A. 1999. Diseases of Crop Plants in India Prentice Hall India Pvt. Ltd., New Delhi.
10. Sporne, K. R. 1991. The Moropology of Gymmosperms. B. I. PublicationsPvt., Bombay, Calcutta, Delhi.
11. Wilson, N. S. and Rothwell, G. W. 1983 Palaeobotany and the Evolution ofPlants (2nd Edition). Cambridge University Press U.K.
12. Cronquist, A.. 1968. The evolution and classification of flowering plants. Thomas Nelson (Printers) Ltd., London & Edinburgh.
13. Delevoryas, Th. 1965 Plant Diversification. Modern Biology Series, Half Rinehart & Winston, New York.
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