

**GOVERNMENT ARTS COLLEGE  
(AUTONOMOUS) SALEM-7**

Reaccredited with B Grade by NAAC  
(Affiliated to Periyar University)



**B.Sc., Botany  
Regulations and Syllabus**

**(Effective from the Academic Year 2021-2022)**

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-636 007**

AFFILIATED TO PERIYAR UNIVERSITY, SALEM-11

B.Sc., Botany (Tamil Medium & English Medium)

For candidates admitted from **2021-22** onwards under **CBCS** Pattern

**1. Vision of the Department**

To produce academically competent, professionally skilled and ethically refined students to appreciate and disseminate knowledge in the field of Botany in order to meet the challenges of life and become responsible citizens

**2. Mission of the Department**

- improve academic standards of students hailing from rural areas so as to enhance their lifestyle
- enrich the curriculum enabling our students to face competitive exams with confidence
- open avenues for self employment through job oriented courses
- extend service to the community by providing knowledge on herbal plants

**3. Programme Specific outcome**

Upon completion of B.Sc., Botany degree programme the students will be able to

<b>PSO. No</b>	<b>Programme Specific outcome</b>
PSO-1	Realize the interdisciplinary link among various fields of Science
PSO-2	Recognize, compare and trace the evolution of major groups of both lower (Algae, Fungi and Bryophyta) and higher (Pteridophytes, Gymnosperms and Angiosperms) plants.
PSO-3	Correlate the structure with various functions of plants and acquire knowledge regarding reproduction and development of embryo.
PSO-4	Trace the biochemical pathway and understand transformation of energy.
PSO-5	Understand the organization of plants at gene, molecule, cell and tissue level.
PSO-6	Comprehend the microbial diversity and structure, appreciate their interaction with plants and apply their role in the field of Botany
PSO-7	Apprehend the mechanism of heredity and plant breeding techniques.
PSO-8	Get equipped with the identification and controlling of various plant diseases.

PSO-9	Acquire various traditional and technology oriented biological skills and become self-reliant.
PSO-10	Mingle with society and live in harmony with nature.

#### **4. Programme Educational Objective**

Students will

- ❖ Become competent and proficient in Botany at undergraduate level.
- ❖ Find opportunities for higher studies in reputed universities and colleges.
- ❖ Venture into jobs in the related field of Botany.

**GOVERNMENT ARTS COLLEGE (Autonomous), SALEM -7**

**B.Sc. BOTANY**

(Choice Based Credit System (For the students admitted from the year 2021 onwards))

S. No	Part	Course code	Course Name	Inst. Hrs	Credits	Marks		Max
						IA	SE	
<b><u>SEMESTER – I</u></b>								
1	I	21FTL01	Foundation Tamil -I	5	3	25	75	100
2	II	21FEL01	Communicative English-I	5	3	25	75	100
3	III	21UBY01	Core Course I : Algae and Bryophytes	5	4	25	75	100
4	III	21AZL01	Allied – I- Course I : Zoology I	5	4	25	75	100
5	III	21UBYP1	Core Practical - I	3	--	--	--	--
6	III	21AZLP1	Allied – I-Practical	3	--	--	--	--
7	IV	21AECC1	AECC –I: Value Based Education	2	2	25	75	100
8	IV	21UPE01	Professional English-I	2	2	50		50
<b>TOTAL</b>				<b>30</b>	<b>18</b>			<b>550</b>
<b><u>SEMESTER – II</u></b>								
1	I	21FTL02	Foundation Tamil II	5	3	25	75	100
2	II	21FEL02	Communicative English-II	5	3	25	75	100
3	III	21UBY02	Core Course II : Viruses, Bacteria, Fungi and Lichens	5	4	25	75	100
4	III	21AZL02	Allied – I- Course II : Zoology II	5	4	25	75	100
5	III	21UBYP1	Core Practical- I	3	4	40	60	100
6	III	21AZLP1	Allied – I –Practical : Zoology I	3	3	40	60	100
7	IV	21AECC2	AECC-II: Environmental Studies	2	2	25	75	100
8	IV	21UPE02	Professional English-II	2	2	50		50
<b>TOTAL</b>				<b>30</b>	<b>25</b>	--	--	<b>750</b>

<b>CUM-TOTAL</b>					<b>43</b>			<b>1300</b>
<b><u>SEMESTER – III</u></b>								
<b>1</b>	<b>I</b>	21FTL03	Foundation Tamil III	5	3	25	75	100
<b>2</b>	<b>II</b>	21FEL03	Foundation English – I	5	3	25	75	100
<b>3</b>	<b>III</b>	21UBY03	Core Course III : Anatomy and Embryology of Angiosperms	5	4	25	75	100
<b>4</b>	<b>III</b>	21ACHB1	Allied – II- Course I – Chemistry I	5	4	25	75	100
<b>5</b>	<b>IV</b>	21UBYS1	Skill Enhancement Course I: Microtechniques	2	2	25	75	100
<b>6</b>	<b>IV</b>	21UBYN1	Non-Major Elective Course I: Mushroom Cultivation	2	2	25	75	100
<b>7</b>	<b>III</b>	21UBYP2	Core Practical II	3	--	--	--	-
<b>8</b>	<b>III</b>	21ACHP1	Allied – II –Practical	3	--	--	--	-
<b>9</b>	<b>V</b>	<b>21EXAT1</b>	<b>Extension(Community Service)* : National Cadet Corps</b>	<b>(Self Study)</b>	<b>2</b>			<b>100</b>
		<b>21EXAT2</b>	<b>Extension(Community Service)* : National Social Service</b>					
		<b>21EXAT3</b>	<b>Extension(Community Awareness)* : Indian Heritage and Culture</b>					
		<b>21 EXAT4</b>	<b>Extension(Community Awareness)* : Public Health and Personal Hygiene</b>					
<b>TOTAL</b>				<b>30</b>	<b>20</b>			<b>700</b>
<b>CUM-TOTAL</b>					<b>63</b>			<b>2000</b>
<b><u>SEMESTER – IV</u></b>								
<b>1</b>	<b>I</b>	21FTL04	Foundation Tamil IV	5	3	25	75	100
<b>2</b>	<b>II</b>	21FEL04	Foundation English – II	5	3	25	75	100
<b>3</b>	<b>III</b>	21UBY04	Core Course IV : Pteridophytes, Gymnosperms and Paleobotany	5	4	25	75	100
<b>4</b>	<b>III</b>	21ACHB2	Allied – II-Course-II: Chemistry II	5	4	25	75	100
<b>5</b>	<b>IV</b>	21UBYS2	Skill Enhancement Course II: Mushroom culture Technology	2	2	25	75	100
<b>6</b>	<b>IV</b>	21UBYN2	Non-Major Elective Course - II : Organic Farming	2	2	25	75	100
<b>7</b>	<b>III</b>	21UBYP2	Core Practical –II	3	4	40	60	100
<b>8</b>	<b>III</b>	21ACHPB	Allied – II – Practical: Chemistry I	3	3	40	60	100
<b>9</b>	<b>IV</b>	<b>21AEEC1</b>	<b>Ability Enhancement Elective Course I : Gandhian Thoughts</b>	<b>(Self Study)</b>	<b>2</b>			<b>100</b>
		<b>21AEEC2</b>	<b>Ability Enhancement Elective Course II : Human Rights</b>					
		<b>21AEEC3</b>	<b>Ability Enhancement Elective Course III : Business Startup Fundamentals</b>					
		<b>21AEEC4</b>	<b>Ability Enhancement Elective Course IV : Professional Ethics &amp; Cyber Netiquette</b>					
<b>TOTAL</b>				<b>30</b>	<b>27</b>			<b>900</b>

<b>CUM-TOTAL</b>					<b>90</b>			<b>2900</b>
<b><u>SEMESTER – V</u></b>								
<b>1</b>	<b>III</b>	21UBY05	Core Course V : Morphology and Taxonomy of Angiosperms	5	5	25	75	100
<b>2</b>	<b>III</b>	21UBY06	Core Course VI : Biochemistry and Biophysics	5	5	25	75	100
<b>3</b>	<b>III</b>	21UBY07	Core Course VII : Plant Ecology and Phytogeography	4	5	25	75	100
<b>4</b>	<b>III</b>	21UBYM1	Major Based Elective I : Biotechnology	4	5	25	75	100
		21UBYM2	Major Based Elective II : Plant Tissue Culture and Plant Medicine					
<b>5</b>	<b>III</b>	21UBYM3	Major Based Elective III : Seed Technology	4	5	25	75	100
		21UBYM4	Major Based Elective IV : Agricultural and Horticultural Products					
<b>6</b>	<b>IV</b>	21UBYS3	Skill Enhancement Course III : Horticulture	2	2	25	75	100
<b>7</b>	<b>III</b>	21UBYP3	Core Practical – III	3	-	--	--	-
<b>8</b>	<b>III</b>	21UBYP4	Core Practical – IV	3	-	--	--	-
<b>TOTAL</b>				<b>30</b>	<b>27</b>			<b>600</b>
<b>CUM-TOTAL</b>					<b>117</b>			<b>3500</b>
<b><u>SEMESTER – VI</u></b>								
<b>1</b>	<b>III</b>	21UBY08	Core Course VIII : Plant Physiology	5	5	25	75	100
<b>2</b>	<b>III</b>	21UBY09	Core Course IX : Cytology and Genetics	5	5	25	75	100
<b>3</b>	<b>III</b>	21UBY10	Core Course X: Economic Botany	4	5	25	75	100
<b>4</b>	<b>III</b>	21UBYM5	Major Based Elective V : Medicinal Botany	4	5	25	75	100
		21UBYM6	Major Based Elective VI : Biofertilizer					
<b>5</b>	<b>III</b>	21UBYM7	Major Based Elective VII: Agricultural Microbiology	4	5	25	75	100
		21UBYPR	<b>Project Work</b>					
<b>6</b>	<b>IV</b>	21UBYS4	Skill Enhancement Course IV : Plant Protection	2	2	25	75	100
<b>7</b>	<b>III</b>	21UBYP3	Core Practical – III	3	4	40	60	100
<b>8</b>	<b>III</b>	21UBYP4	Core Practical – IV	3	4	40	60	100
<b>TOTAL</b>				<b>30</b>	<b>35</b>			<b>800</b>
<b>CUM-TOTAL</b>					<b>152</b>			<b>4300</b>

## SEMESTER -II

COURSE CODE	COURSE NAME	Lecture (L)	Tutorial	Practical	Credit
21UBY01	ALGAE AND BRYOPHYTES			-	4

### OBJECTIVES

1. To understand the structure, reproduction and life cycle of different algae
2. To understand different uses of algae
3. To understand the structure and life cycle of Bryophytes
4. To develop an understanding of biological facts and appreciation of their economic significance

### Unit I

Algae – General characteristics and classification (F.E. Fritsch, 1935). Pigmentation and reserve food in algae. Economic importance of algae.

### Unit II

A detailed study of the structure, reproduction and life cycle of the following algal genera; *Oscillatoria*, *Nostoc*, *Chlamydomonas*, *Volvox* and *Oedogonium*.

### Unit III

A detailed study of the structure, reproduction and life cycle of the following algal genera; *Ulva*, *Caulerpa*, *Chara*, *Sargassum* and *Polysiphonia*.

### Unit IV

Bryophytes- General characteristics, occurrence and classification (Rothmaler, 1951). Economic importance of bryophytes. A detailed study of the structure, reproduction and life cycle of the following genus; *Riccia*.

### Unit V

A detailed study of the structure, reproduction and life cycle of the following genera; *Porella*, *Anthoceros* and *Polytrichum*.

### Practical

A detailed study of the examples cited in the theory syllabus

To make suitable micro preparations of type prescribed in Algae and Bryophytes

To observe and identify microscope specimens and to write illustrated and explanatory notes on them.

### Text books

1. Palaniyappan S., (1988), Algakkal (in tamil), T.K. Publishing house, Chennai, India.
2. Palaniyappan S., (1988), Bryophyta (in tamil), T.K. Publishing house, Chennai, India.
3. Vashishta B.R., (1993), Botany for Degree students-Algae, S.Chanad & Co. (P) Ltd., New Delhi, India.

4. Kumerasen V., (1997), Algae and Bryophytes, Saras Publications, Nagarcovil, India.
5. Pandey B.P., (1993), A text book of botany-Algae, S.Chanad & Co. (P) Ltd., New Delhi, India.
6. Vashishta, B.R. (2010) Botany for Degree Students – Algae ,S. Chand & Co., New Delhi

#### REFERENCE BOOKS

1. Smith, G.M (1995) – Cryptogamic Botany (Vol. I-Algae, Fungi & Lichens), Mc Graw Hill Book Co, New York.
2. Trainor, F.A (1990) – Introductory Phycology, John Wiley.
3. Lee, R.E (1980) – Phycology, Cambridge University Press.
4. Kumar, H.D (1990) – Introductory Phycology, Affiliated East West Press (P) Ltd., New Delhi.
5. Kumaresen, V (1997) – Algae and Bryophytes, Saras Publications, Nagar Coil, India.

#### WEB RESOURCES

- <https://www.plantscience4u.com/2014/04/classification-of-algae-by-smith.html>
- [www.biology.lifeeasy.org/5290/economic-importance-of-bryophytes](http://www.biology.lifeeasy.org/5290/economic-importance-of-bryophytes)

#### COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO	COURSE OUTCOME	BLOOM'S VERB
CO1	Demonstrate the various trends for classification of Algae,	Understand
CO2	Familiarize with basic information in Botany with special attention to the economic importance of lower group of plants.	Understand
CO3	Compare and contrast the characteristics of lower group of plants and compare the diversity with other forms of plant kingdom	Analyze
CO4	Familiarize with basic information in Bryophytes,	Remember
CO5	Examine the structure of certain life forms and their economic importance Bryophytes	Understand

#### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M	S		M	M			L	S
CO2	S	S	S		M					S
CO3	S	S	S		M	M			M	S
CO4	S	S	S		M					S
CO5	S	S	S		M			M		S

**S-Strong;M-Medium;L-Low**



GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc., Botany  
Choice Based Credit System  
(For the Candidates admitted from 2021 -2022 onwards)  
ALGAE AND BRYOPHYTES - 21UBY01

Time: 3 Hrs

Max: 75 Marks

Part – A (15x1=15 Marks)  
(Answer ALL the questions)

- Which are the most primitive group of algae?  
a) Green algae    b) Blue green algae    c) Brown algae    d) Red algae
- Plants which are not differentiated into leaf, stem and root are grouped under  
a) Gymnosperms    b) Pteridophytes    c) Thallophytes    d) Sporophytes
- Agar - agar is obtained from  
a) *Gelidium*    b) *Polysiphonia*    c) *Fucus*    d) *Laminaria*
- Nitrogen fixing alga is  
a) *Ulva*    b) *Nostoc*    c) *Volvox*    d) *Oedogonium*
- Blepharoplast is present in  
a) *Oedogonium*    b) *Chlamydomonas*    c) *Ulva*    d) *Oscillatoria*
- Which One of the following is sea-lettuce?  
a) *Chara*    b) *Ulva*    c) *Caulerpa*    d) *Sargassum*
- Stone wort alga is  
a) *Sargassum*    b) *Polysiphonia*    c) *Chara*    d) *Caulerpa*
- Presence of Airbladder is the salient feature of  
a) *Sargassum*    b) *Chara*    c) *Polysiphonia*    d) *Navicula*
- Carpogonia is the female sex organ in which class of the algae  
a) Rhodophyceae    b) Xanthophyceae    c) Chrysophyceae    d) Chlorophyceae
- Which plant group is known as Amphibian plant?  
a) Algae    b) Bryophytes    c) Both (a) and (b)    d) None of the above
- Peat moss is  
a) *Riccia*    b) *Sphagnum*    c) *Anthoceros*    d) *Polytrichum*
- Function of elaters is  
a) Spore releasing    b) Movement    c) Fixation    d) Reproduction
- Presence of amphigastria is associated with  
a) *Anthoceros*    b) *Polytrichum*    c) *Riccia*    d) *Porella*
- A specialized organ connecting sporophyte and gametophyte is  
a) Stalk    b) Seta    c) Foot    d) Apophysis
- Which one of the following bryophytic plant is highly evolved?  
a) *Polytrichum*    b) *Porella*    c) *Anthoceros*    d) *Riccia*

**Part - B**  
**(Answer any TWO questions)**

**(2x5 = 10 Marks)**

16. Write notes on general characters of Algae.
17. Describe the structure of *Nostoc* with diagram.
18. Explain the internal structure of rhizome in *Caulerpa*.
19. Draw a labeled diagram of cross section of *Riccia* thallus with notes.
20. Describe the structure of antheridia in *Anthoceros*.

**Part - C (5x10 =50 Marks)**  
**(Answer ALL the questions)**

21. a) Describe the classification of Algae proposed by F.E.Fritsch.  
(or)
  - b) Enumerate the economic importance of Algae.
22. a) Illustrate the fine structure of *Chlamydomonas*.  
(or)
  - b) Explain the structure of *Volvox* with diagram.
23. a.) Write an essay on the habitat and structure of *Chara* with diagram.  
(or)
  - b) Describe the habitat and structure of *Caulerpa* with diagram.
24. a) Point out the general characters of bryophytes.  
(or)
  - b) Explain the economic importance of bryophytes.
25. a) Write an essay on the sporophyte of *Anthoceros*.  
(or)
  - b) Describe the sporophyte of *Polytrichum*.

## SEMESTER -II

COURSE CODE	COURSE NAME	Lecture (L)	Tutorial	Practical	Credit
21UBY02	VIRUSES, BACTERIA, FUNGI AND LICHENS			-	4

### OBJECTIVES

1. To understand the salient features of Viruses, Bacteria, Fungi and Lichens.
2. To study the structure and reproduction of various genera mentioned in the syllabus.
3. To develop an understanding of biological facts and appreciation of their economic significance
4. To understand the characteristics of microorganisms, nature of plant disease epidemics and how to manage them

#### Unit I

**VIRUSES:** General characters of Viruses, Plant Viruses, General account of Bacteriophages, Cyanophages and Mycophages. Reproduction of T<sub>4</sub>- Phage.

#### Unit – II

**BACTERIA** – classification (Bergy's 74), Morphology, Structure, Growth, Physiological characteristics Nutritional types - Photosynthetic and Chemosynthetic Bacteria. Reproduction in bacteria. Economic importance of bacteria.

#### FUNGI

##### Unit – III

A study of the general characteristics and mode of nutrition and life of the main classes of fungi. Classification of fungi (C.J.Alexopoulos and Mims). Economic importance of Fungi.

A study of the occurrence, structure, reproduction, life cycle and significance of the following genera: *Albugo*, *Saccharomyces*, *Aspergillus* and *Neurospora*.

##### Unit – IV

A study of the occurrence, structure, reproduction and life cycle of the following genera: *Peziza*, *Puccinia*, *Polyporus*, *Agaricus* and *Cercospora*. An account on AM.

##### Unit – V

**LICHENS:** General characteristics, occurrence, classification, structure, reproduction and economic importance.

### PRACTICALS

1. A detailed of the examples cited in the theory part.
2. A general study of various types of Lichens.
3. To make suitable micro preparation of the types prescribed in Fungi and Lichens.
4. To observe and identify microscopic specimens and write illustrated and explanatory notes on them.

## TEXT BOOKS

1. Alexopoulos, C.J. (1962) Introductory Mycology. John Wiley.
2. Vashista, B.R. (1969) Botany for degree students. Part II. Fungi. S.Chand and Co.
3. Srivastava, J.P. (1970) An introduction of Fungi, Central Book Depot, Allahabad.
4. Dube, H.C. (1978) A Text Book of Fungi, Bacteria and Viruses, Vikas Publishing House (P) Ltd.
5. Purohit, S.S. (1986) Viruses, Bacteria and Mycoplasma. Agro Botanical Publishers, Bicaner, India.
6. Sharma, O.P. (1992) Text Book of Fungi. Tata McGraw Hill Publishing Co., New Delhi.

## REFERENCE BOOKS

1. Sistrom, W.R. (1962) Microbial life. Holt, Rinchart Winson.
2. Mishra, A and Agarwal, R.P. (1970) Lichens, A Preliminary Text, Oxford & IBH Publishing Co.
3. Webster, J. (1970) Introduction to Fungi. Cambridge University Press.
4. Ainsworth, G.C and Alfred, S. (1973) The Fungi (An Advanced Treatise) Academic Press, New York.
5. Biswas, S.B. and Biswas, A. (1976) An Introduction to Viruses. Vikas Publishing Houses Pvt. Ltd.
6. Pelczar, J., Chan, Ecs, and Kriez, R. (1998) Microbiology. Tata McGraw Hill, New Delhi.
7. Aneja, K.R. and Mehrotra, R.S. (2015) An Introduction to Mycology, New Age International Publishers ,2<sup>nd</sup> Edition

## WEB RESOURCES

- [www.biologydiscussion.com/fungi/life-cycle-of-albugo-with-diagram.../63415](http://www.biologydiscussion.com/fungi/life-cycle-of-albugo-with-diagram.../63415)  
[www.biologydiscussion.com/lichens-2/lichens...structure-and-reproduction.../69697](http://www.biologydiscussion.com/lichens-2/lichens...structure-and-reproduction.../69697)  
[www.knowledgebank.irri.org/decision-tools/rice-doctor/rice...fact.../bacterial-blight](http://www.knowledgebank.irri.org/decision-tools/rice-doctor/rice...fact.../bacterial-blight)

## COURSE OUTCOME

On successful completion of the course, students will be able to

CO Number	COURSE OUTCOME	BLOOM'S VERB
CO1	To understand the importance of Fungi and to relate the different classification systems to gain knowledge on the lower plants.	Understand
CO2	Compare and contrast the characteristics of fungi and compare the diversity with other forms .	Analyze
CO3	Familiarize with basic information in Botany with special attention to the economic importance of fungi	Remember
CO4	To develop the knowledge on occurrence and economic importance of lichen and viruses	Apply
CO5	To study and understand the microbial flora and identify their roles.	Understand

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**MAPPING WITH PROGRAMME SPECIFIC OUTCOME**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO1	S	M	S		L				S	S
CO2	S	S	S		L				S	S
CO3	S	M	S		L	S			S	S
CO4	S	S	S		L	S			S	S
CO5	S	S	S		L	S			S	S

**S-Strong;M-Medium;L-Low**

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7**

**B.Sc., Botany**

**Choice Based Credit System**

**(For the Candidates admitted from 2021 -2022 onwards)**

**VIRUSES, BACTERIA, FUNGI AND LICHENS - 21UBY02**

**Time: 3 Hrs**

**Max: 75 Marks**

**Part – A (15x1=15 Marks)**

**(Answer ALL the questions)**

1. Special type of hyphae which absorb food material is called?  
a) rhizoids      b) haustoria      c) mycelium      d) root hair
2. Which fungus is called as death angel  
a) Toad tools      b) Veriline      c) Amanita      d) Yeast
3. Aflotoxin is produced by  
a) *Penicillium*      b) *Aspergillus*      c) Yeast      d) *Albugo*
4. Thread like filaments, which form the plant body of fungi are  
a) rhizoids      b) praphysis      c) hyphae      d) haustoria
5. The cell wall of yeast is composed of  
a) cellulose      b) pectose      c) pectin      d) chitin and mannan
6. Number of ascospores formed in *Sacchromyces cerevisiae*  
a) 4      b) 8      c) 16      d) 2
7. *Agaricus* is member of  
a) ascomycetes      b) deuteromycetes      c) basidimycetes      d) phycomycetes
8. Mycorrhiza forms relationship in between fungi and higher plant  
a) parasitic      b) saprophytic      c) symbiotic      d) epiphytic
9. Black rust disease caused by  
a) *Albugo*      b) *Puccinia*      c) *Cercospora*      d) *Aspergillus*
10. Symbiotic association of algae and fungi is called  
a) mycorrhiza      b) lichen      c) mutualism      d) VAM
11. Lichens are the major pollution indicators of  
a) SO<sub>2</sub>      b) NO<sub>2</sub>      c) CO      d) mercury
12. Viruses which eat bacteria is called  
a) bacteriophage      b) mycophage      c) cyanophage      d) viruses
13. A cluster of polar flagella is called

- a) peritrichous    b) monotrichous    c) amphitrichous    d) lophotrichous

14. Which of the cocci occurring in pairs

- a) diplococci                      b) streptococci                      c) tetrads                      d) monococci

15. Bacteria convert ammonia into usable nitrates?

- a) denitrification    b) nitrogen fixation    c) ammonification    d) nitrification

**Part – B      (2x5 = 10 Marks)**

**(Answer any TWO questions)**

16. Write notes on general characters of fungi.  
17. Give an account on asexual reproduction in *Albugo*.  
18. Explain the structure and fruit body of *Polyporus*.  
19. List out the general characters of Lichen.  
20. Explain the mode of nutrition in Bacteria.

**Part - C      (5x10 =50 Marks)**

**(Answer ALL the questions)**

21. a) Describe the classification of fungi proposed by Alexopoulos.  
(or)  
b) Enumerate the economic importance of fungi.
22. a) Write an essay on structure and reproduction of *Neurospora*.  
(or)  
b) Explain the detail about the structure and reproduction in *Peziza*.
23. a.) Write an essay on the life cycle of heteroecious fungi you have studied.  
(or)  
b) Give an account on VAM fungi.
24. a) Enumerate the classification and types and uses of Lichens.  
(or)  
b) Explain the following  
a) Cyanophages  
b) Mycophages
- 25a) Explain the classification of bacteria proposed by Bergey.  
(or)  
b) Explain the economic importance of Bacteria.

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7**

B.Sc., BOTANY

Choice Based Credit System

(For the candidates admitted from 2021-2022 onwards)

**SEMESTER - II**

**CORE PRACTICAL –I; PAPER CODE- 21UBYP1**

(For Theory Papers I & II)

Time: 3 hrs

Max: 60 Marks

Practical: 50 Marks

Record : 10 Marks

1. Cut transverse section of A, B and C. Stain and mount in glycerin. Identify giving reason. Draw diagrams. Leave the slides for valuation. (21 Marks)
2. Draw diagrams and write notes of interest on D, E, F and G. (16 Marks)
3. Name the genus, group and morphology of given part of H, I and J. (9 Marks)  
(Diagrams not necessary)
4. Identify and write notes on economic importance of K and L (4 Marks)

**KEY**

A, B, C - Sectioning of materials from Algae, Fungi and Bryophyta.

D, E, F, G - Spotters / Permanent Microslides

H, I, J - Macroscopic specimens

K and L - Economic importance



## Semester- I

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21ABY01	Allied Botany I Morphology, Taxonomy of Angiosperms, Cytology, Genetics, Anatomy and Embryology				4

### OBJECTIVES

To attain and impart knowledge on different aspects of botany like Taxonomy, cytology, genetics, anatomy and embryology.

#### Unit - I

**Morphology:** Phyllotaxy, Types of Leaf- Simple, Compound- Parts of flower, Inflorescence- Racemose, Cymose. Special Types – Head, Cyathium. Terminology and symbols with reference to flower and floral formula.

#### Unit - II

**Taxonomy:** Binomial Nomenclature, Bentham & Hookers Classification. A study of the following families with their economic importance- Annonaceae, Leguminosae, Cucurbitaceae, Rubiaceae, Asteraceae and Poaceae

#### Unit – III

**Cytology and Genetics:** Eukaryotic cells (Plant cell), Cell Wall, Plasma membrane, Cell Organelles - structure and function of Chloroplast, Mitochondrion and Nucleus. Cell division: Amitosis, Mitosis and Meiosis. Mendel's Monohybrid, Dihybrid cross, Test and Back cross.

#### Unit – IV

**Anatomy:** Simple Permanent Tissues- Parenchyma, Collenchyma and Sclerenchyma, Complex Permanent Tissues- Xylem and Phloem. Primary structure of Dicot and Monocot stem, Dicot root and Dicot leaf.

#### Unit V

**Embryology:** Structure of mature anther, pollen grain, development of male gametophyte, structure of mature ovule, development of female gametophyte (*Polygonum* type), fertilization and development of dicot embryo (*Capsella* type)

### TEXT BOOKS

1. Rao K.N. and Krishnamurthy K.V. (1979). Ancillary Botany. S Viswanathan Pvt Ltd Chennai
2. Narayanasamy R.V. and Rao K.N.(1976) Outlines of Botany.
3. Pandey B.P. (1978). Plant Anatomy S. Chand & Co. Ltd., New Delhi.
4. Bhojwani, S.S. and Bhatnagar, S.P. (2000). *The Embryology of Angiosperms* (4th Edition). Vikas Publishing House (P) Ltd., UBS Publisher's Distributors, New Delhi.

5. Rogland, A. (2000). Developmental Botany (Embryology of Angiosperms).Saras Publications, Nagercoil.
6. Vidyarathi RD and Tripathi SC. (2002).A Text book of Botany. S Chand & Co Ltd., New Delhi.

### **COURSE OUTCOME**

On successful completion of the course, students will be able to

<b>S. NO.</b>	<b>COURSE OUTCOME</b>	<b>BLOOM'S VERB</b>
CO1	Explain the Morphology of leaves and flowers	Remember
CO2	Apply the Morphological concepts in the identification of plants and assign them to under appropriate families	Understand
CO3	Correlate structure and functions of various cellular organelles	Remember
CO4	Distinguish between simple and complex tissues	Analyze
CO5	Appraise the development of plant embryo	Understand

### **MAPPING WITH PROGRAMME SPECIFIC OUTCOME**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO1	S	S				L			S	S
CO2	S	S				L				S
CO3	S	S	M		M	L	S		S	S
CO4	S	S				L			S	S
CO5	S	S	M			L			M	S

**S-Strong;M-Medium;L-Low**

B.Sc., Degree Examination  
(For candidates admitted from the academic year 2021-2022 onwards)  
**ALLIED BOTANY - PAPER – I - 21ABY01**  
(External Morphology, Taxonomy of Angiosperms, Cytology, Genetics, Anatomy and Embryology)

**Time: 3 hrs.**

**Max.: 75 Marks**  
**(15 X 1 = 15 Marks)**

**Part - A**  
**(Answer all the questions)**

1. Ternate phyllotaxy is found in  
a. *Nerium*                      b. *Quisqualis*                      c. *Hibiscus*                      d. All of these
2. The number of female flowers found in *Cyathium* inflorescence is  
a. Two                      b. One                      c. Three                      d. Many
3. The word Monoecious means  
a. Bisexual flowers on a plant  
b. Male and female flowers on the same plant  
c. Male & female flowers on separate plants  
d. Bisexual & female flowers on the same plant
4. Father of Taxonomy  
a. Carolus Linnaceus                      b. Gaspard Bauhin  
c. Sir Joseph Dalton Hooker                      d. Adolf Engler
5. The fruit of the members of *Caesalpiniaceae* is  
a. Berry                      b. Drupe                      c. Legume                      d. Caryopsis
6. Sugarcane belongs to family  
a. *Leguminosae*                      b. *Poaceae*                      c. *Rubiaceae*                      d. *Cucurbitaceae*
7. Study of cell structure and function  
a. Cytology                      b. Anthology                      c. Mycology                      d. Phycology
8. The chromosome number is reduced to half in  
a. Mitosis                      b. Meiosis                      c. Amitosis                      d. Parthenogenesis
9. Test cross involves  
a. Cross between heterozygous tall plant and homozygous dwarf plant  
b. Cross between two F1 hybrids  
c. Cross between F1 hybrid and its homozygous recessive parent.  
d. Crossing between two genotypes with dominant trait
10. The mesophyll of a Dicot leaf is differentiated into  
a. Spongy parenchyma                      b. Palisade parenchyma  
c. Prosenchyma                      d. Both (a) and (b)

11. The dead element present in the phloem is  
 a. Companion cells    b. Phloem fibres    c. Phloem parenchyma    d. Sieve tubes
12. Vascular bundles are open in  
 a. Dicot Root    b. Monocot Root    c. Dicot Stem    d. Monocot Stem
13. Fertilization in which pollen tube enters the ovule through integuments is called  
 a. Porogamy    b. Mesogamy    c. Chalazogamy    d. Anisogamy
14. The study of pollen grains is known as  
 a. Palynology    b. Bryology    c. Mycology    d. Phycology
15. Double fertilization is characteristic of  
 a. Gymnosperms    b. Angiosperms    c. Pteridophytes    d. Bryophytes

**Part - B**

**(2 X 5 = 10 Marks)**

**(Answer any TWO questions)**

16. Give a brief account on the type of Compound leaves.
17. Write the characteristic features of the family Annonaceae
18. Describe the ultra structure of Mitochondria.
19. Describe the internal structure of Dicot root
20. Describe the structure of Mature Anther

**Part - C    (5 X 10 = 50 Marks)**

**(Answer all the questions)**

- 21a. Give an elaborate account of Cymose inflorescence  
 (or)  
 b. Write an essay about Terminology and Symbols with reference to flower and floral formula
- 22a. Write a detailed account on Bentham and Hooker's system of classification  
 (or)  
 b. Describe the family Cucurbitaceae .
- 23a. Explain in detail about Mitosis Cell Division.  
 (or)  
 b. What is Monohybrid cross and explain
- 24a. Write an essay on simple permanent tissues  
 (or)  
 b. Describe the anatomical structure of Dicot Stem with diagram
- 25a. Draw and describe the development of male and female gametophyte  
 (or)  
 b. Explain in detail about Fertilization

## Semester- II

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21ABY02	<b>Allied Botany II</b> Thallophytes, Bryophytes, Pteridophytes, Gymnosperms, Plant physiology and Ecology				4

### Unit – I

**Thallophytes:** Algae – general characters, study of the structure and life cycle of the following genera – *Oscillatoria*, *Oedogonium*, *Ectocarpus* and *Polysiphonia*.

### Unit – II

**Fungi** - general characters, study of the structure and life cycle of the following genera- *Albugo*, *Pencillium*, *Agaricus*. Elementary knowledge of Bacteria and Viruses. Economic importance of Fungi and Bacteria.

### Unit – III

**Bryophytes, Pteridophytes and Gymnosperms:** Structure and life cycle of *Funaria*, *Lycopodium* and *Cycas*.

### Unit – IV

**Plant Physiology:** Osmosis, Absorption of water, Photosynthesis – Light reaction, Calvin cycle. Respiration- Glycolysis, Krebs cycle, Electron transport system, Nitrogen cycle, Hormones (Auxins only)

### Unit - V

**Plant Ecology:** Factors affecting vegetation – Climatic, Edaphic and Biotic. Morphological and Anatomical adaptations in Hydrophytes and Xerophytes.

### Practical

To describe in technical terms of plants belonging to any of the families prescribed and identify the family.

To identify the plant family and morphology of the parts used for the following plant specimens.

*Annona* – Fruit

*Arachis hypogea* – Ground nut

*Dolichos biflorus* – Horse gram

*Cicer arietinum* – Bengal gram

*Pisum sativum* – Pea

*Phaseolus mungo* – Black gram

*Phaseolus radiata* – Green gram

*Tamarindus indica* – Fruit

*Abrus precatorius* – Seed

*Acacia cocinna* – Soapnut  
*Luffa aegyptiaca* – Fibrous skeleton of the fruit  
*Cucumis sativus* – Fruit  
*Coffea arabica* – seeds  
*Eclipta alba* - Plant

### TEXT BOOKS

1. Palaniappan S. 1985, Thavaravial Thunaipaadam (Tamil), Mohan Padippagam, Channai.
2. Pandey, B.P, 1986, Text Book of Botany ( College Botany) Vol I and II, S.Chand and Co. New Delhi.

### REFERENCE BOOKS

1. Fuller H.J and Trippo O, 1949, College Botany, Henry Holt & Co. Ganguly A.K, 1975. General Botany Vol – I (1971) & Vol – II , The New Book Stall, Calcutta.
2. Rao, K.N, Krishnamoorthy, K.V. and Rao, G.S, 1979, Ancillary Botany, S.Viswanathan Pvt. Ltd. Madras.
3. Singh V. Pandey P.C. and Jain D.K. (2014). A Text book of Botany.Rastogi publications. Meerut.

### WEB RESOURCES

[www.biologydiscussion.com/fungi/life-cycle-of-albugo-with-diagram.../63415](http://www.biologydiscussion.com/fungi/life-cycle-of-albugo-with-diagram.../63415)

### COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand the general characters and life cycle of various Algae	Understand
CO2	Summarize the characteristic features, structure and life cycle of Fungi, Bacteria and Viruses	Understand
CO3	Classify and compare the structure and life cycle of Bryophytes Pteridophytes and Gymnosperms	Remember
CO4	Analyze various vital functions of plants	Analyze
CO5	Assess various factors affecting the growth of vegetation	Evaluate

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		S				S	M
CO2	S	S	S		S	M		L	S	M
CO3	S	S	S		S				S	M
CO4	S	S	M	S	M				S	M

CO5	S	S	S		S				S	M
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**S-Strong;M-Medium;L-Low**

B.Sc., Degree Examinations

(For candidates admitted from the academic year 2021-2022 onwards)

**ALLIED BOTANY - PAPER – II - 21ABY02**

(Thallophytes, Bryophytes, Pteridophytes, Gymnosperms, Plant Physiology and Ecology)

Time: 3 hrs.

Max.: 75 Marks

**Part - A**

**(15 X 1 = 15 Marks)**

(Answer all the questions)

- The study of algae is known as
  - Mycology
  - Phycology
  - Taxonomy
  - Physiology
- The reserve food material in algae is
  - Cellulose
  - Starch
  - Protein
  - Glycogen
- Algae living on the ice and snow are called
  - Lithophytic algae
  - Thermophytic algae
  - Cryophytic algae
  - Halophytic algae
- Reserve food material in fungi is
  - Cellulose
  - Starch
  - Protein
  - Glycogen
- Bacteria oxidize inorganic compounds
  - Chemolithotrophs
  - Chemoorganotrophs
  - Heterotrophic bacteria
  - Photolithotrophs
- Viruses that attack bacteria are called
  - Phytophage
  - Lysophage
  - Bacteriophage
  - None of the above
- Gemma is a
  - Asexually producing
  - Sexually producing
  - Vegetative producing
  - None of the above
- Vascular Plants are
  - Bryophytes
  - Algae
  - Pteridophytes
  - Lichens
- Cycas* plants are
  - Homosporous and dioecious
  - Homosporous and monoecious
  - Heterosporous and dioecious
  - Heterosporous and monoecious
- Which is common between aerobic respiration and anaerobic respiration?
  - Similar substrate
  - Glycolysis
  - Pyruvic acid
  - All of these
- Energy released during electron transport
  - Photosynthesis
  - ATP
  - Plasmolysis
  - Photolysis
- Which of the following is not a Natural growth promoter
  - 2,4 D
  - IAA
  - Gibberellins
  - Ethylene
- Plants grow in saline soils are termed as

- a. Mesophytes                      b. Thallophytes                      c. Halophytes                      d. Xerophytes
14. Which one of the following is a Hydrophyte  
 a. *Eicchnornia*                      b. *Oxalis*                      c. *Mentha*                      d. *Musa*
15. Cladodes are found in  
 a. Mesophytes                      b. Hydrophytes                      c. Thallophytes                      d. Xerophytes

**Part – B**                      **(2 X 5 = 10 Marks)**

(Answer any TWO questions)

16. Write the general characters and structure of *Oedogonium* with suitable diagram.
17. Briefly explain the economic importance of Bacteria.
18. Write structure of *Funaria* with suitable diagram.
19. Give a detailed account on Calvin cycle.
20. Explain the morphological adaptations of Hydrophytes.

**Part - C**                      **(5 X 10 = 50 Marks)**

(Answer all the questions)

- 21.(a) Write an essay on life cycle of *Polysiphonia*  
 (or)  
 (b) Write an essay on life cycle of *Oedogonium*
- 22.(a) Explain the economic importance of Fungi  
 (or)  
 (b) Explain the life cycle of *Penicillium*.
- 23.(a) Write the life cycle of *Lycopodium*  
 (or)  
 (b) Write an essay on life cycle of *Cycas*.
- 24.(a) What are the steps involved in Glycolysis? Explain it.  
 (or)  
 (b) Write an essay on Nitrogen cycle.
- 25.(a) Explain the factors affecting vegetation.  
 (or)  
 (b) Explain the morphological and anatomical adaptations of Xerophytes



**GOVERNMENT ARTS COLLEGE, (AUTONOMOUS), SALEM-7**  
Choice Based Credit System  
(For Candidates admitted from 2021- 2022 Onwards)  
**SEMESTER - II**  
**ALLIED BOTANY PRACTICAL -I ; PAPER CODE : 21UBYAP1**

Time : 3 hrs

Max : 60 marks  
Practical : 50 marks  
Record : 10 marks

1. Refer A and B to their respective families by giving reasons. Diagrams not necessary  
(2X5 = 10 marks)
2. Identify the plant, family and morphology of useful part in C, D, E,F and G  
(5X3 =15 marks)
3. Cut transverse sections of H and I. Stain and mount in glycerine. Identify giving reasons.  
Draw diagrams. Submit slides for valuation. (2X5=10 marks)
4. Write notes on J, K, L, M, N and O. Draw diagrams (6X2 =12 marks)
5. Comment on the set up P. (3 marks)

**KEY**

1. A & B – Taxonomy
2. C, D, E, F and G – Economic importance
3. H, I - Anatomy
4. J – Morphology  
K – Cytology / Genetics  
L – Anatomy / Embryology  
M – Algae / Fungi / Bryophytes  
N- Pteridophytes / Gymnosperms  
O- Ecology
5. P- Physiology

## SEMESTER – III

Course code	Course name	Lecture (L)	Tutorial (T)	Practical (P)	Credit
21UBY03 MAJOR	ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS				4

### OBJECTIVES

1. To impart knowledge about the plant tissues, distribution and internal structures.
2. To study the basic principles of reproduction and development of embryo.

### ANATOMY

#### UNIT-I

Meristems: Classification, distribution, structure function - Theories: Tunica-Corpus and Quiescent centre- Simple permanent tissues: Parenchyma, Collenchyma, Sclerenchyma (fibres and sclereids)- Transfer cells.

#### UNIT-II

Complex tissues: Xylem- tracheids, vessels, xylem fibres and xylem parenchyma. Secondary xylem, Annual rings, Heart wood and sap wood - Phloem: Sieve elements, companion cells, phloem fibres and phloem parenchyma. Secondary phloem: Laticifers – Structure of Dicot and Monocot leaf - Stomatal types: Ranunculaceous, Cruciferous, Caryophyllaceous, Rubiaceus and Gramineous.

#### UNIT-III

Primary and secondary structure of dicot stem – Anomalous secondary growth in dicot and monocot stems of *Bignonia*, *Boerhaavia*, *Nyctanthes* and *Dracaena*- Primary and Secondary structure of Dicot Root – Primary structure of Monocot stem and root –Nodal Anatomy (Uni, Tri and Multilacunar nodes).

### EMBRYOLOGY

#### UNIT –IV

Structure and development of anther. Development of male gametophyte. Ultra structure of pollen grain. Types of ovules. Development of female gametophyte: Monosporic (*Polygonum*), Bisporic (*Allium*) and Tetrasporic (*Peperomia*).

## UNIT –V

A brief account on pollination, fertilization and double fertilization- Endosperm: Nuclear, Cellular, Helobial and Ruminant. Endosperm haustoria - Development of Embryo in Dicot (*Capsella bursa-pastoris*) –Polyembryony, Apomixis and Embryo Culture.

### PRACTICALS

1. Study of simple and complex tissues by using permanent slides.
2. Study of primary structure and sectioning of Dicot stem, Dicot root, Monocot stem and Monocot root.
3. Normal secondary thickening in Dicot stem and root.
4. Anomalous secondary structure –*Bignonia Boerhaavia*, *Nyctanthes* (Permanent slides)
5. T.S. of Anther at various stages of development.
6. Types of ovules (Permanent slides).
7. Stages in Microporogenesis and megasporogenesis.
8. Male gametophyte and female gametophyte (Permanent slides).
9. Embryo mounting (Tridax).

### TEXT BOOKS

1. Pandey, B.P. (1978) Plant Anatomy, S.Chand and Co., New Delhi.
2. Vashista, P.C. (1968). A Text book of Plant Anatomy.
3. John Jothi Prakash, E. (1987). A Text book of Plant Anatomy.
4. Bhojwani, S.S and Bhatnagar, S.P. The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd., New Delhi.
5. Dwivedi, J.N, 1988. Embryology of Angiosperms. Rastogi and Co. Meerut.

### REFERENCE BOOKS

1. Fahn, A. (1982). Plant Anatomy (3rd Edition). Pergoman Press, Oxford.
2. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin Cummings Publication Co. Inc., Mehlo Part, California, USA.
3. Esau, K. (1960). Plant Anatomy. Wiley Eastern Private Ltd., New Delhi.
4. Maheswari, P. 1971. An introduction to the embryology of Angiosperms. Tata McGraw Hill Publishing Co., Ltd., New Delhi.

5. Swamy, B.G.L. and Krishnamurthy, K.V. From Flower to Fruit. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

### WEB RESOURCES

<https://www.easybiologyclass.com/plant-anatomy-online-tutorials-lecture-notes-study-materials/>

<https://examupdates.in/plant-anatomy-and-embryology-book/>

### COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO	COURSE OUTCOME	BLOOM'S VERB
CO1	Demonstrate the various types of cells and classification	Remember
CO2	Explain the complex tissues and leaf	Understand
CO3	Distinguish between primary and secondary structure of stem and root	Analyze
CO4	Familiarize with basic information in Structure and development of anther and Types of ovules	Remember
CO5	Compare the pollination, fertilization and embryo	Analyze

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		S				S	L
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		L			
CO5	S	S	S		M		S		S	L

**S-Strong;M-Medium;L-Low**

B.Sc., BOTANY  
(For the candidates admitted from 2021-2022 onwards)  
**MAJOR PAPER –III -21UBY03**

**ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS**

**Time: 3 Hrs**

**Max: 75 Marks  
(15x1=15 Marks)**

**Part A**

(Answer All the questions)

1. A tissue that contain lignin  
A) Sclerenchyma B) Parenchyma C) Collenchyma D) Chlorenchyma
2. What are the external protective tissues of the plant?  
A) Cortex and epidermis B) Cork and cortex C) Pericycle and cortex D) Cork and epidermis
3. Intercalary meristem leads to  
A) Primary growth B) Secondary growth C) Apical growth D) None
4. The age of the tree can be determined by  
A) Measuring its diameter B) Counting the number of annual rings C) Counting the number of leaves D) Finding out the number of branches
5. Which is living mechanical tissue  
A) Phloem B) Parenchyma C) Collenchyma D) Sclerenchyma
6. Sieve tube is  
A) Enucleated B) Dead cells C) Multinucleated D) Nucleated
7. Stele is made up of  
A) Vascular bundles B) Pericycle C) Pith D) All of these
8. Cork cambium is also called  
A) Phellem B) Phellogen C) Phelloderm D) None of the above
9. The microspores of anther refers to  
A) Pollen B) ovule C) Integument D) Nucellus
10. Number of Synergids present in Embryo sac  
A) five B) two C) one D) one
11. Nutritive layer of anther is  
A) Epidermis B) Endodermis C) Endothecium D) Tapetum
12. Endosperm is  
A) Monoploid B) diploid C) triploid D) tetraploid
13. Pollination by insects is  
A) Hydrophily B) Entomophily C) Anemophily D) Zoophily
14. Embryos develop without fertilization is  
A) Amphimixis B) Embryo culture C) Apomixis D) Polyploidy
15. The condition in which pollen tubes are developed for the transfer of male cells to the eggs is

A) siphonogamy B) syngamy C) embryogenesis D) isogamy

**Part B**

**(2x5=10 Marks)**

(Answer Any TWO Questions)

(Draw diagrams wherever necessary)

16. Write short on quiescent centre.
17. Mention the different types of stomata and its functions.
18. Write about the internal structure of monocot leaf.
19. Explain the development of microsporangium.
20. Write short notes on pollination.

**Part C**

**(5x10=50 Marks)**

(Answer ALL the questions)

(Draw diagrams wherever necessary)

- 21a. Give a detailed account on classification of meristem.  
(or)
  - b. Describe the permanent tissues with diagram.
- 22a. Write an essay on the components of xylem tissues.  
(or)
  - b. Differentiate heart wood and sap wood and explain annual rings.
- 23a. Explain the secondary growth in dicot stem  
(or)
  - b. Explain the secondary structure of dicot root.
- 24a. Discuss the development of female gametophyte in Angiosperms  
(or)
  - b. Explain the development of male gametophyte in Angiosperms.
- 25a. Write an essay on Apomixis.  
(or)
  - b. Explain about the endosperm and its type with diagram

### SEMESTER III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYS1	MICROTECHNIQUES			-	2

#### OBJECTIVES

1. To impart knowledge on scientific slide making
2. To facilitate self employment.

#### Unit I

Microscopy- Principles and Parts, Types- Simple, Compound and Electron Microscopy, Fluorescent Microscopy Uses and Handling.

#### Unit II

Microtechnical Process: Fixation, staining, negative staining, Staining equipment.

#### Unit III

Special techniques: Smearing, Squashing, Maceration and Whole mounts

#### Unit IV

Sectioning, Microtome Types -Rocking, Rotary, Sledge Microtomes and their Uses

#### Unit V

Microscopic preparations: Temporary, Semi permanent and Permanent slides. Imaging and photographic techniques of Tissues and Specimens.

#### TEXT BOOKS

1. Sas. Joe E. 1964. Botanical Microtechnique Oxford and IBH.
2. Purvis M.J.et al 1966.Laboratory Techniques in Botany, Butter Worths, London.

#### REFERENCE BOOKS

1. Johanson D.A. 1940.Plant Microtechnique.Mac - Graw Hill, New Delhi.
2. Duggington C.L. 1960. Practical Microscopy Pitman, London.
3. Allen Peack H. 1966. Elementary Microtechniqe, Edward Arnold Publisher Ltd.,
4. Pearse AGE. 1980. Histochemistry, Theoretical and Applied ChurchilLivington.
5. Grey P. 1964. Handbook of Basic microtechnique Mc. Graw Hill.
6. Mc. Clung, C.E. 1961.Handbook of Microscopical Technique, Hafner, New York.

#### WEB RESOURCE

<https://www.biologydiscussion.com/biologyarticles>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Distinguishing different types of Microscope	Understand
CO2	Illustration of fixation and staining process	Analyse
CO3	Demonstration of suitable technique in slide making	Understand
CO4	Use of appropriate microtome	Apply
CO5	Preparation of slides and technique of photography	Create

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S			L	L		S	S	S
CO2	S	S	M	L	M	S	L	M	S	S
CO3	S	S	S			M		M	S	S
CO4	S	S	M		L	S		L	S	S
CO5	S	S	S	M	M	S	M	S	S	S

S- Strong; M-Medium; L-Low



B.Sc., Degree Examinations  
(For candidates admitted from the academic year 2021-2022 onwards)  
**SKILL ENHANCEMENT COURSE -I- 21UBYS1**  
**MICROTECHNIQUES**

Time: 3 hrs.

Max.: 75 Marks  
**(15x1=15 Marks)**

**Part A**

(Answer all the questions)

1. A segment of image is magnified by the eyepiece(ocular). What is the best resolving power?  
A. 0.1 nM,    B. 0.4 mm    C. 0.2  $\mu$ M    D. 3.0  $\mu$ M
2. Paraffin embedded sections of tissue are cut by:  
A. Electron beams    B. Sharp knife    C. Laser    D. Microtome
3. How thick are paraffin embedded sections that has been cut?  
A. 5-8  $\mu$ M    B. 5-8 nM    C. 3-4 mm    D. 3-4 cm
4. How can you achieve better resolution in microscopy?  
A. Using paraffin-embedded sections    B. Using thinner resin-embedded sections  
C. Using formaldehyde-embedded sections    D. Using a mixture of paraffin and resin
5. What are epoxy resin sections stained with after being cut with a microtome?  
A. Blue trichrome    B. Hematoxylin and eosin  
C. Sudan III    D. Toluidine blue
6. Which staining method is best for lipid detection?  
A. Sudan III& IV    B. Berlin blue  
C. Feulgens nuclear reaction    D. Colloid gold
7. What method is used for: observation of unstained structures in dark field or using phase contrast (tissue cultures)  
A. Electron microscopy    B. Transmission EM  
C. Light microscopy    D. Autoradiography
8. What is advantages and disadvantages of Frozen sections cut by microtome?  
A. Disadvantage: Shrinkage of tissue  
B. Disadvantage: it is impossible to prepare think sections  
C. Advantage: the use of fat solvents can be avoided  
D. Disadvantage: Inactivation of enzymes
9. What is the temperature of the paraffin the tissue is placed in ?  
A. 76° c    B. 35° c    C. 56° c    D.70° c
10. What color will Haemotoxylins stain the nuclei ?  
A. Red    B. Dark    C. Greenish blue    D. Reddish
11. What will be the colour of CNS nuclei while using Nissl stain :

A. Dark      B. Reddish      C. Greenish blue      D. Yellow

12. Which one is a general tissue stain?

- A. Haematoxylin and eosin(HE)      B. Toluidine blue  
C. Sudan IV and eosin      D. None of the above

13. In Neurohistology, Which of the following is used to stain Myelin sheath

- A. Perls reaction      B. Sudan III      C. Canada balsam      D. Luxol blue

14. Which of the following is used for staining Haemosiderin pigment?

- A. Perl's reaction      B. Nuclear red      C. Best carmine      D. Green trichrome

15. Nuclear red is a

- A. Basic stain      B. Acidic stain  
C. Used to stain reticular fibres      D. Used to stain myelin sheath

**Part B**

**(2x5=10 Marks)**

(Answer any TWO questions)

16. Write an essay on fluorescent microscope with its uses.  
17. Describe the various phases involved in double staining process.  
18. Discuss the squash technique involved in onion root observation.  
19. Describe the different types of microtome used in sectioning process.  
20. Explain the process involved in permanent slide making.

**Part C**

**(5x10=50 Marks)**

(Answer all the questions)

21. (a). Describe the working principle of compound microscope.  
(or)  
(b). Discuss on safe handling of microscope.
22. (a). Write an essay on fixatives and its importance.  
(or)  
(b). Explain the types of stains.
23. (a). Explain in detail the steps involved in whole mounts.  
(or)  
(b). What do you mean by smearing? Explain the process in detail.
24. (a). Discuss about the types of knives used in microtome sectioning.  
(or)  
(b). Discuss about blocks used in sectioning.
25. (a). Discuss the materials needed for making a good microscopic preparation?  
(or)  
(b). Write the importance of photographic techniques in biology.

## SEMESTER - III

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYNI NON-MAJOR ELECTIVE COURSE-I	MUSHROOM CULTIVATION				2

### OBJECTIVES

1. To impart knowledge about the cultivation of mushroom.
2. To make students understand the nutritional and medicinal value of mushroom.
3. To facilitate self – employment.

### Unit – I

Biodiversity of Mushroom – History and scope – edible and non-edible mushroom factors affecting mushroom cultivation – Importance of mushroom cultivation – Morphology of edible mushroom – production of spawn.

### Unit – II

Cultivation – White button mushroom – Oyster mushroom and Milky mushroom – Giant mushroom – Black ear mushroom.

### Unit – III

Cultivation – Paddy straw mushroom – Silver ear mushroom and winter mushroom – Medicinal Mushrooms, symptoms of mushroom poisoning.

### Unit – IV

Management of mushroom diseases – pests and weed and fungal attack – production of vermicompost from spent mushroom bed – post harvest technology, storage methods – food production.

### Unit – V

Nutritive and medicinal value of mushrooms – uses of mushrooms – advantages of mushroom – marketing – cost-benefit analysis.

### TEXT BOOKS

1. Panneerselvam *et al.*, 2005. Hand book on edible Mushroom cultivation. KR Printers.

2. Panneerselvam *et al.*, 2016. Edible mushroom cultivation Technology KR Printers.
3. Kumaresan 2009. Text book of Biotechnology Saras Publication.

### REFERENCE BOOKS

1. Marimuthu,T. Krishnamoorthy, AS. Sivaprakasam,K and Jayarajan R (1991).Oyster Mushrooms. Department of Plant Pathology, TNAU, Coimbatore.
2. Kapoor, J.N.( 1989) . Mushroom Cultivation, ICAR Publication, Krishi Anusandhan, Pusa, New Delhi

### WEB RESOURCE

<https://www.krishisewa.com/production-technology/46-technology-for-mushroom-cultivation.html>

### COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO.	COPURSE OUTCOME	BLOOM'S VERB
CO1	Describe the morphology of edible mushroom and distinguish between edible and non-edible mushrooms	Understand
CO2	Explain the cultivation methods of edible mushrooms.	Understand
CO3	Understand medicinal uses of mushroom	Remember
CO4	Develop management strategies in disease control	Apply
CO5	Formulate cost-benefit analysis of mushroom marketing	Create

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	L	M		L	L	M	S	S	S
CO2	S	L	M		L	L			S	S
CO3	M	L	L		L	L		L	S	S
CO4	S	L	L	L	L	L	L	S	S	S
CO5	S		L		L			L	S	S

S- Strong; M-Medium; L-Low

B.Sc., Botany Degree Examination,  
**NMEC-I - 21UBYN1**  
**MUSHROOM CULTIVATION**

Time : 3 Hrs

Maximum :75 Marks  
**(15 x 1 = 15 marks)**

**Part – A**

(Answer ALL Questions)

1. Mushroom is a \_\_\_\_\_.  
a) Parasite    b) Saprophyte    c) Autotroph    d) Symbiont
2. Toadstools cannot manufacture their own food because  
a) they do not have roots                      b) they do not have leaves  
c) they do not have chlorophyll    d) they do not need food for their growth
3. The spawn is also known as  
a) Mushroom    b) seed                      c) gills                      d) buttons
4. The method of mushroom harvesting is  
a) machine lifting    b) cutting with scissors    c) hand picking                      d) lifting with trowels
5. For oyster mushroom cultivation beds are prepared in \_\_\_\_\_.  
a) Plastic bags                      b) Trays                      c) Pots                      d) Bucket
6. The mushroom spawn preparation needs addition of calcium carbonate because it \_\_\_\_\_.  
a) Maintains the pH    b) Absorbs excess water  
c) Helps in keeping grains separate                      d) All of these
7. Mushrooms have \_\_\_\_\_ protein content in dry weight.  
a) 20-30%    b) 30-40%    c) 40-50%    d) 50-60%
8. Removal of water is called \_\_\_\_\_.  
a) sterilization                      b) dehydration    c) refrigeration    d) pickling
9. Mushroom cultivation is not useful in  
a) Recycling of agricultural waste    b) Biogas production  
c) Biological control of crop disease    d) Preventing cancer
10. What should be the temperature of compost when spawning is done?  
a) 10 -15°C    b) 22 - 25°C    c) 35 - 40°C    d) 40 - 50°C
11. On the lower side of Pileus number of vertical plates like structure is present called \_\_\_\_\_.  
a) spores                      b) organelles    c) operculum    d) gills
12. Mycelium produce white or coloured umbrella shaped fruiting bodies called \_\_\_\_\_.  
a) Hyphae    b) Basidiocarp    c) Annulus    d) Seta

13. The process of making an object free from living organisms including bacterial and fungal spores and viruses is known as \_\_\_\_\_.  
 a) Pasteurization    b) antiseptics    c) disinfection    d) sterilization
14. Mushroom is a good source of \_\_\_\_\_ vitamin.  
 a) A    b) K    c) C    d) B5
15. Which one of the following is not a long term storage method for mushroom  
 a) Canning    b) Pickling    c) Refrigeration    d) Drying

**PART – B**                                  **(2 X 5 =10 marks)**  
**(Answer any TWO Questions)**

16. Describe the morphology of edible mushrooms.  
 17. Write short notes on milky mushroom cultivation.  
 18. Write down the species of edible and non-edible mushrooms.  
 19. How to control fungal attack on mushrooms?  
 20. Give a brief note on the vitamins and minerals of mushrooms.

**PART – C**                                  **(5X 10 =50 marks))**  
**(Answer All Questions)**

- 21 (a) Trace the history of edible mushroom cultivation.  
 (Or)  
 (b) Explain the factors affecting mushroom cultivation.
- 22 (a) Describe the cultivation methods of White Button mushroom.  
 (Or)  
 (b) Explain the cultivation methods of Oyster mushroom.
- 23 (a) Highlight the steps involved in paddy straw mushroom cultivation.  
 (Or)  
 (b) Analyze the cultivation methodology of winter mushroom.
- 24 (a) Write an account on control of diseases and pests of mushrooms.  
 (Or)  
 (b) Give an account on storage methods for mushrooms.
- 25 (a) Discuss the uses and advantages of mushrooms.  
 (Or)  
 (b) Write an essay on medicinal value of mushrooms.

## SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY04	PTERIDOPHYTES, GYMNOSPERMS and PALAEOBOTANY			-	4

### OBJECTIVES

1. To impart the diversity of plant kingdom.
2. To understand the importance of early life forms of fossil plants in tracing evolution.

### PTERIDOPHYTES

#### Unit I

General characteristics of Pteridophytes- Classification of Pteridophytes by Reimers (1954); Stellar types and evolution in Pteridophytes- Heterospory and origin of seed habit.

#### Unit II

Economic importance of Pteridophytes. Morphology, Anatomy, Structure and Reproduction of the following genera: *Lycopodium* and *Selaginella*

#### Unit III

Morphology, Anatomy, structure, Reproduction and life-history of *Equisetum*, *Marsilea* and *Adiantum*

### GYMNOSPERMS

#### Unit IV

General characteristics and classification of Gymnosperms by Pliger and Melchior (1954); Economic importance of Gymnosperms- Morphology, Anatomy, structure, reproduction of the following genera: *Cycas* and *Pinus*.

### PALAEOBOTANY

#### Unit V

Contributions by Prof. Birbal Sahni, Fossils and Types of fossilization – Geological time–scale –A brief study of the following fossil forms:-*Rhynia*, *Lepidodendron* and *Williamsonia*. Determination of Age of fossils.

### Practicals

Study of Morphology, Anatomy and structure of the spore bearing parts and gametophytes of the genera listed in the theory. Fossil slides listed in the theory

### TEXT BOOKS

1. Vashista, P.C. (1972). Botany for Degree Students. Vol. IV- Vascular Cryptogams (Pteridophyta) S. Chand and Co., Pvt Ltd., New Delhi.
2. Vashista, P.C. (1972). Gymnosperms. S. Chand and Co., Pvt Ltd., New Delhi.

3. Venkateswaralu, V. and Narashimhamurthy CVL. Text book of Pteridophyta. Maruti Book Depot, Hyderabad.
4. Pandey, B.P. (1977). A Text Book of Bryophyta, Pteridophyta and Gymnosperms. K. Nath and Co., Meerut.
5. Parihar, N.S. (1977). An Introduction to Embryology Vol. II., Pteridophyta and Gymnosperms. K. Nath and Co. Meerut.
6. Shukla, A.C. and Misra, S.P. (1975). Essentials of Paleobotany. Vikas Publishing House (P) Ltd., New Delhi.
7. Vidyarthi R.D. and Tripathi S.C. (2002). A Text book of Botany. S Chand & Co Ltd., New Delhi.
8. Singh V. Pande P.C. and Jain D.K. (2014). A Text book of Botany. Rastogi publications. Meerut.

#### REFERENCE BOOKS

1. Smith, G.M. (1955). *Cryptogamic Botany Vol. II Bryophytes and Pteridophytes* (2nd Edn.). Tata McGraw-Hill Publishing Co., New Delhi.
2. Earnes, A.J. (1936). *Morphology of Lower Vascular Plants*. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
3. Arnolds, C.A. (1947). *An Introduction to Paleobotany*, McGraw Hill Book Co., New York.
4. Sporne, K.R. (1977). *The Morphology of Gymnosperms*, B.I. Publications, Mumbai.
5. Skula, A.C. and Sharma M. (1992). Plant fossils. A link with the past, BirbalShani Institute Paleobotany, Lucknow, India.

#### WEB RESOURCES

[https://bio.libretexts.org/Bookshelves/Botany/Book%3A\\_Introduction\\_to\\_Botany\\_\(Shipunov\)/06%3A\\_Growing\\_Diversity\\_of\\_Plants/6.02%3A\\_Pteridophyta\\_-\\_the\\_Ferns](https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Introduction_to_Botany_(Shipunov)/06%3A_Growing_Diversity_of_Plants/6.02%3A_Pteridophyta_-_the_Ferns)

<https://www.easybiologyclass.com/pteriophytes-free-online-study-materials-tutorials-lecture-notes-ppts-mcqs/>

#### COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Classify the salient features of Pteridophytes.	Understand
CO2	Relate the economic importance and diversity of Pteridophytes.	Apply
CO3	Distinguish the morphology, anatomical structure and reproduction of Pteridophytes.	Evaluate
CO4	Classify and comprehend the morphological, anatomical and	Analyze



	reproduction of Gymnosperm plants.	
CO5	Correlate the Geological Time Scale along with the evidences of fossil life forms.	Analyze

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M	M	L	L	M			M	S
CO2	S	S	M	L	L	S	L		S	S
CO3	S	S	M		L	S			S	S
CO4	S	S	S	L	L	M			S	S
CO5	S	S	S		M	M		L	S	M

S- Strong; M-Medium; L-Low

B.Sc., BOTANY  
(For the candidates admitted from 2021-2022 onwards)

**MAJOR PAPER –IV-21UBY04**

**PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY**

**Time: 3 Hrs**

**Max.: 75 Marks  
(15x1=15 Marks)**

**Part A**

(Answer All the questions)

1. If all the spores are of same size and shape, the plant is said to be  
a) Aposporous b) homosporous c) heterosporous d) haplosporous
2. Amphiphloic Siphonostele is present in the rhizome of  
a) *Marsilea* b) *Pteris* c) *Gleichenia* d) *Hymenophyllum*
3. Actinostele is related to  
a) Dictyostele b) siphonostele c) solenostele d) protostele
4. Protocorm is found in  
a) *Lycopodium* b) *Selaginella* c) *Marsilea* d) *Equisetum*
5. Root hairs arise in pairs in  
a) *Equisetum* b) *Marsilea* c) *Lycopodium* d) *Dryopteris*
6. Ligule and cone are seen in  
a) *Selaginella* b) *Salvinia* c) *Psilotum* d) *Lyopodium*
7. A cavity formed by the disintegration of protoxylem in *Equisetum* stem is called  
a) Air chamber b) central cavity c) carinal canal d) vallecular canal
8. Sporocarp is present in  
a) *Marsilea* b) *Adiantum* c) *Lycopodium* d) *Selaginella*
9. *Adiantum* has sorus on  
a) Leaf b) Root c) Petiole d) Prothallus
10. The ovules in gymnosperms are  
a) Ategmic b) bitegmic c) unitegmic d) Both Uni and bitegmic
11. In gymnosperms, the pollination is effected by  
a) Water b) wind c) animals d) insects
12. Omega shaped vascular bundle is present in  
a) *Cycas* b) *Ephedra* c) *Pinus* d) *Araucaria*

13. The period in which gymnosperms were present in the form of dominant vegetation is  
a) Jurassic and Cretaceous b) Triassic and Jurassic c) Triassic and Cretaceous  
d) Triassic only
14. Prof. Birbal Sahni is a father of Indian  
a) Palaeobotany b) Palynology c) Histology d) Embryology
15. The wood of *Williamsonia* resembles with the wood of  
a) *Pinus* b) *Cycas* c) *Zamia* d) *Araucaria*

**Part B**

**(2x5=10 Marks)**

(Answer Any TWO Questions)  
(Draw diagrams wherever necessary)

16. Explain protostele.
17. Write short notes on ligule of *Selaginella*.
18. Describe the sporocarp of *Marsilea*.
19. Outline the anatomical characters of *Pinus* needle.
20. What is a fossil? Write a note on Impressions.

**Part C**

**(5x10=50 Marks)**

(Answer ALL the questions)  
(Draw diagrams wherever necessary)

- 21a. Enlist the distinguishing features of Pteridophytes.  
(or)  
b. Give an account on economic importance of Pteridophytes.
- 22a. Write an essay on stem anatomy of *Lycopodium*.  
(or)  
b. Explain the reproductive structures of *Selaginella*.
- 23a. Bring out the morphological and anatomical characters of *Equisetum* stem.  
(or)  
b. Describe the reproduction in *Adiantum*.
- 24a. Explain the anatomical characters of *Cycas* leaflet with diagram.  
(or)  
b. Explain the classification of Gymnosperms.
- 25a. Describe Geological Time Scale  
(or)  
b. Describe the structure of *Williamsonia*.

### SEMESTER – IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYS2 SKILL ENHANCEMENT COURSE-II	MUSHROOM CULTURE TECHNOLOGY				2

#### OBJECTIVES

1. To impart knowledge about the aspects of mushroom cultivation.
2. To make the students realize the importance of nutritional value of mushrooms.
3. To facilitate self-employment.

#### Unit I

Introduction- History of mushroom cultivation- classification, internal and external structure of mushroom. Types of mushroom-edible and poisonous, symptoms of mushroom poisoning.

#### Unit II

Pure culture-Preparation of growth medium (PDA and OAT MEAL AGAR), sterilization- Preparation of test tube slant to store mother culture-Culturing of *Pleurotus* mycelium on petri plates, Preparation of mother spawn in saline bottle and polypropylene bag and their multiplication.

#### Unit III

Infrastructure: Substrates (locally available) Polythene bags, vessels, Inoculation hood, 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. Factors affecting mushroom bed preparation-low cost technology.

#### Unit IV

Short term storage (Refrigeration-up to 24 hrs) Long term storage (Canning, Pickles, pappads), drying ,storage in salt Solution, Nutritive value-Protein, amino acid, carbohydrate, crude fibre content, vitamins- Medicinal values of mushroom.

#### Unit V

Types of food prepared from mushroom: Soup, Cutlet, Omelette, Samosa, Pickles, Curry, Value added products of mushroom-Mushroom soup powder, mushroom biscuit, mushroom nuggets, mushroom ketchup, Candy, Murabha, Chips, Research centers- National level and Regional level. Cost benefit ratio-marketing in India and abroad. Export value.

## TEXT BOOKS

1. Bahl,N.,( 2009) Handbook on mushrooms, 4<sup>th</sup> edition, oxford and IBH publishing Co. Pvt. Ltd, New Delhi,.
2. Manjit Singh, Bhuvneshvijay, Shwet Kamal, GC Watchaure (Eds.) (2011). Mushrooms- cultivation, marketing and consumption. Directorate of Mushroom research, ICAR, Chambaghat, Solan, HP-173213

## REFERENCE BOOKS

1. Marimuthu,T. Krishnamoorthy, AS. Sivaprakasam,K and Jayarajan R (1991).Oyster Mushrooms. Department of Plant Pathology, TNAU, Coimbatore.
2. Kapoor, J.N.,( 1989) Mushroom Cultivation, ICAR Publication, Krishi Anusandhan, Pusa, New Delhi

## WEB RESOURCE

<https://www.iihr.res.in/cultivation-technology-oyster-mushroom>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Discriminate between edible and non-edible mushrooms	Analyse
CO2	Explain cultivation methods of mushroom	Understand
CO3	Discuss infrastructure facilities needed for mushroom growth	Understand
CO4	Appraise the nutritional and medicinal values of mushrooms	Evaluate
CO5	Prepare different recipes of mushroom based foods.	Apply

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	L	L		L	L		L	S	S
CO2	S	L	M		L	L			S	S
CO3	S	L	L		L	L		M	S	S
CO4	S	L	L	L		L	L	L	S	S
CO5	S	L		L	L	M	L		S	S

B.Sc., Botany Degree Examination  
**SKILL ENHANCEMENT COURSE-I - 21UBYS2**  
MUSHROOM CULTURE TECHNOLOGY

Time: 3 Hrs

Maximum:75 Marks

**Part – A**                      **(15 x 1 = 15 marks)**  
(Answer ALL Questions)

- 1 What is the scientific name of button mushroom?  
a) *Funaria*    b) *Dryopteris*    c) *Agaricus*    d) Ferns
  
- 2 On the lower side of Pileus number of vertical plates like structure is present called  
a) Spores        b) Organelles    c) Annulus        d) Gills
  
- 3 . Mushroom belongs to  
a) Basidiomycetes    b) Pteridophyta        c) Bryophyta    d) Mollusca
  
- 4 Spawn is  
a) mycelium of fungus                      b) fruiting body of fungus  
c) making soil layer on mycelium        d) type of a compost
  
- 5 Mushrooms grows during  
a) Summer season    b) Winter        c) Rainy season        d) In all seasons
  
- 6 Some fungi are poisonous such as death angel (amanita) mushroom, they are termed as  
a) toad stools    b) veriline        c) bryophyte    d) toxic
  
- 7 Formaldehyde is used as a ----- in mushroom cultivation.  
a) binding        b) taste            c) pasteurization        d) disinfectant
  
- 8 Preparation of spawn is usually done in  
a) tray    b) glass bottles        c) tank            d) glass plates
  
9. The process of planting spawn on the mushroom bed materials.  
a) canning    b) steeping    c) blanching    d) spawning
  
- 10 Water is sprayed on mushroom bed 2-3 times in  
a) hot day        b) winter day            c) spring day        d) rainy seasons
  
- 11 Mushroom is a good source of ----- vitamin.  
a) A    b) K    c) C    d) B5
  
- 12 Mushroom are used in the preparation of  
a) Soups        b) Pizza        c) Pickle        d) All of these
  
- 13 Preservation of foods by using salts and sugars results in  
a) Raising pH                                      b) lowering temperature

c) Creating a hypertonic environment d) creating a hypotonic environment

14 The National centre for mushroom Research and Training is located in

a) Coimbatore b) Faizabad c) Solan d) Raipur

15 ICAR means

- a) Indian Council of Agricultural Research
- b) Indian centre for Agriculture Research
- c) International council for Agriculture Research
- d) International committee for Agriculture Research

**Part – B (2 x 5 =10 marks)**

(Answer any TWO Questions)

16 Write down the general characters of mushrooms.

17 How will you prepare Oat Meal Agar medium? Add a note on its composition.

18 Briefly describe about the substrates used in mushroom cultivation.

19 Give a brief note on the vitamins and minerals of mushrooms.

20 Write short note on the preparation of the following

- i) Mushroom Cutlet ii) Mushroom soup

**Part-C**

**(5x10=50 marks)**

(Answer all Questions)

21. (a) Explain the different types of edible mushroom available in India

(or)

(b) How will you identify poisonous mushroom? Explain in detail.

22. (a) How will you prepare mother spawn in polythene bags? Explain.

(or)

(b) Explain the method of culturing *Pleurotus* mycelium on Petriplates.

23. (a) Enumerate the factors affecting mushroom bed preparation.

(or)

(b) Write an essay on the infrastructure facilities required for mushroom cultivation.

24. (a) Discuss in detail about the nutritive value of mushrooms.

(or)

(b) Give an account on “mushrooms as medicine”.

25. (a) Write an elaborate note on marketing of mushrooms in India and abroad.

(or)

(b) Give an account on national and regional level mushroom research centre.

## SEMESTER IV

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYN1	ORGANIC FARMING			-	2

### OBJECTIVES

1. To learn the basics of organic farming practices
2. To know the methods and application of various organic farming systems.

### UNIT – I

Organic farming – Concept of organic farming – Need of organic farming – Chemical fertilizers and pesticides and their disadvantages – Organic Agriculture in India - Status of rich and live organic soil – Advantages of organic farming – Organic products certification – Marketing of organic.

### UNIT – II

Green manure – plants used as green manure – benefits to crops – Application methods – Farm yard manure (FYM) – nutrients and uses; Composting methods – Raw materials for composting – Different methods of composting: Pit method and heap method – Factors affecting composting process – Nutrient status of composts.

### UNIT – III

Vermicomposting and vermiculture – Scope and objectives – Types of earthworms suitable for vermicomposting – Raw materials for vermicomposting – Method of vermicomposting – Pit, tank and heap method – Preparation and maintenance of vermicompost beds – Nutrient status of vermicompost.

### UNIT – IV

Biofertilizers – Types of biofertilizers – outline and application of the following biofertilizers – *Rhizobium*, *Azotobacter*, *Azospirillum*, Mycorrhiza (AM) , Blue Green Algae (BGA) – *Azolla* – *Anabaena* and Phosphate solubilizing microbes.

### UNIT – V

Biopesticides - Integrated pest management (IPM) – Concepts and benefits – Crop rotation – Biological control of insects and pests – Conservation and classical biological control – Agents of biological control; Biopesticides – Bacterial, fungal and viral agents – Advantages and disadvantages – Biological control of weeds – Panchakaavya – preparation and application.

### TEXT BOOKS

1. Natarajan, S., Devasenapathy, P., Kalpana, R., Sudhalakshmi, C., 2007. Organic Farming: An overview. Centre for Soil and Crop Management Studies, Tamil Nadu Agricultural University, Coimbatore.
2. Nair, M. R. G. K. 1986. Insects and Mites of Crops in India. Indian Council of Agricultural Research, New Delhi.



3. Joshi, M., Setty, T.K.P. and Prabhakarasetty (2006). Sustainability through Organic farming.1st Edition. Kalyani Publishers, Ludhiana, India.
4. Atwal, A. S. 1991. Agricultural Pests of India and South – East Asia.Kalyani Publishers, New Delhi.

### REFERENCE BOOKS

1. Kristensen, P., Taji, A. and Reganold, J. (2006). Organic Agriculture: A Global Perspective.CSIRO Press, Victoria, Australia.
2. Altieri, M. (1990). Agroecology: The Science of Sustainable Agriculture. Westview Press, Boulder, CO.
3. Bavec, F. and Bavec, M. (2007). Organic Production and Use of Alternative Crops.CRC Press, Boca Raton, FL.
4. David, B. V. 2001. Elements of Economic Entomology. Popular Book Depot, Madras.
5. Ghosh, S. K. Durbey, S. L. 2003. Integrated Management of Stored Grain Pests. International Book Distributing Company.
6. Nair, M. R. G. K. 1986. Insects and Mites of Crops in India. Indian Council of Agricultural Research, New Delhi.
7. Pradhan, S. 1983. Agricultural Entomology and Pest Control. Indian Council of Agricultural Research, New Delhi.
8. Rao, P. A., Mathur, K. C and Pasalu. L. C. 1987. Rice Storage and Insect Pest Management. B.R publishers. New Delhi.
9. Lampkin Nicolas.1990. Organic Farming. The University of Wisconsin – Madison. Farming Press.
10. Altieri Miguel. 1987. Agroecology: The Scientific Basis of Alternative Agriculture. Westview Press. Boulder, CO.
11. Soule, Judith D. and Piper, Jon K. 1992. Farming in Nature's Image: An Ecological Approach to Agriculture. Island Press, Washington, D. C.

### WEB RESOURCES

<https://www.biologydiscussion.com/organicfarming>

### COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Define and advantages of Organic farming	Remember
CO2	Discuss the Green manure and composting methods	Understand
CO3	Prepare of Vermicompost	Apply
CO4	Understand the application of Biofertilizers	Understand
CO5	Justify the benefits of various farm techniques	Evaluate

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	L	L	M		S	M	S	S	S
CO2	S	M		M		M	L	S	S	S
CO3	S		L	L		S		S	S	S
CO4	S	M		S	L	S		L	S	S
CO5	S	M		M		S	L	M	S	S

S- Strong; M-Medium; L-Low

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)

**NON-MAJOR ELECTIVE COURSE II – 21UNME2**

**ORGANIC FARMING**

Time : 3 hrs.

Maximum: 75 Marks

**Part A**

**(15x1=15 Marks)**

(Answer all the questions)

1. Organic farming does not include  
(a) Crop rotation (b) Chemical fertilizer (c) Green manures (d) Compost
2. Organic farming is the technique of raising crops through the usage of  
(a) Drought resistant varieties (b) Manures (c) Biofertilizers (d) All of the above
3. Appropriate use of cow dung is made in  
(a) Medicine (b) Fuel (c) Manure (d) Construction material
4. Green manure plants are mostly belonging to the family  
(a) Poaceae (b) Solanaceae (c) Leguminosae (d) Arecaceae
5. Which one of the following is used as green manure?  
(a) Maize (b) Rice (c) Sorghum (d) Sesbania
6. Find the correct statement  
(a) The waste from one process becomes the input for another process.  
(b) All the processes related to consumption and production produces some kind of waste  
(c) There is no real waste in nature  
(d) All of the above
7. The highly decomposed organic matter rich in minerals like nitrogen, phosphorus, and potassium, in particular, produced from the activity of earthworms is called \_\_\_\_\_.  
(a) Humus (b) Vermicompost (c) Vermiculite (d) Compost
8. Which of the following product/s cannot be used for vermicomposting?  
(a) Cow dung (b) Plant materials (c) Plastic wastes (d) All of the above
9. Commonly used earthworm species for the vermicomposting process  
(a) *Eisenia fetida* (b) *Eudrilus eugeniae* (c) Both (a) and (b) (d) None
10. Which of the following nitrogen fixers is found in rice fields associated with *Azolla*?  
(a) *Tolypothrix* (b) *Frankia* (c) *Anabaena* (d) *Spirulina*
11. Pick the correct statement  
(a) Legumes do not fix nitrogen.  
(b) Legumes fix nitrogen independent of bacteria.  
(c) Legumes fix nitrogen through bacteria in their roots.  
(d) Legumes fix nitrogen through bacteria in their leaves.

12. What is the full form of VAM?  
 (a) Vesicular-arbuscular mycorrhiza  
 (b) Venom *Azolla* mycorrhiza  
 (c) Venom-arbuscular mycorrhiza  
 (d) Vesicular-azollae mycorrhiza
13. IPM stands for  
 (a) Integrated Plant Management  
 (b) Integrated Pest Management  
 (c) Intellectual Property Management  
 (d) Intercropping and Plant Management
14. What are bio-insecticides?  
 (a) Insects  
 (b) Living organisms that kill specific insects  
 (c) Insects that kill other big insects  
 (d) Fungi
15. Which one of the following is not included in *Panchakavya*?  
 (a) Cow dung (b) Milk (c) Ghee (d) Tulsi

**Part B**

**(2x5=10 Marks)**

(Answer any TWO questions)

16. Write notes on disadvantages of using chemical fertilizers and pesticides.  
 17. Briefly write about farm yard manure.  
 18. What are the advantages of vermicomposting?  
 19. Write a brief account on blue green algae.  
 20. Write notes on crop rotation.

**Part C**

**(5x10=50 Marks)**

(Answer all the questions)

21. (a). Give an account on organic farming.  
 (or)  
 (b). Write an essay on organic products certification and marketing of organic products.
22. (a) Explain different methods of composting.  
 (or)  
 (b) What are green manure plants? Explain how they are useful in agriculture.
23. (a). Describe the method of vermicomposting.  
 (or)  
 (b) Discuss about the nutrient contents and application of vermicompost to different crop plants.
24. (a). Give a detailed account on biofertilizers and their application in agriculture.  
 (or)  
 (b) Explain how the microbial consortia are useful in crop production.
25. (a). Write an essay on biological control of insect pests.  
 (or)  
 (b). Describe the method of preparation and application of *Panchakavya*.

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7**

B.Sc., BOTANY

Choice Based Credit System

(For the candidates admitted from 2021-2022 onwards)

**SEMESTER - IV**

**CORE PRACTICAL – II; PAPER CODE- 21UBYP2**

(For Theory Papers III & IV)

**Time: 3 hrs**

**Max: 60 marks**

**Practical: 50 Marks**

**Record: 10 Marks**

1. Cut transverse sections of A, B and C. Stain and mount in glycerin. Identify giving reasons. Draw diagrams. Leave the slides for valuation. (24 marks)
2. Make a suitable micro preparation of D. Identify giving reasons. Draw diagrams. Leave the slides for valuation. (6 marks)
3. Dissect and mount any one of the stages of the given material E. (Diagram and notes not necessary). (4 marks)
4. Name the genus, group and morphology of given part of F and G. (6 marks)
5. Write notes on H, I, J, K and L (10 marks)

**KEY**

A. Angiosperm – Anatomy –Vegetative part.

B. Pteridophyte – Anatomy –Vegetative part.

C. Gymnosperm – Anatomy –Vegetative part.

D. Reproductive Part- Pteridophyte (or) Gymnosperm.

E. Embryo – dicot –*Tridax*

F & G. Macroscopic – Pteridophyte (or) Gymnosperm. H, I, J, K and L Permanent slides (Anatomy, Embryology, Pteridophytes, Gymnosperms, Fossil slides)

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY05	MORPHOLOGY & TAXONOMY			-	5

### CORE COURSE V: MORPHOLOGY AND TAXONOMY

#### Objectives

1. To observe the variations among plants, especially angiosperms.
2. To understand the way of description of a plant.
3. To study the floral characters with an aim to identify the taxa authentically.
4. To understand the economical values of the plants

#### UNIT I

Aim, Scope and Significance of taxonomy, Systems of Classification- Artificial (Linnaeus), Natural system (Bentham and Hooker) and Phylogenetic (Engler and Prantl), Modern system of classification (Cronquist). Only outline of Classification with merits and Demerits. Plant nomenclature- Binomial, ICBN - Principles- author citation. Herbarium technique- Preparation of herbarium, their preservation. Important; herbaria, Flora and uses.

#### UNIT II

Inflorescence: Racemose types - Cymose types - Special types. Morphology of flower- floral parts - their arrangement, relative position, symmetry, aestivation and placentation types- Floral diagram and Floral formula. Fruits: Types and classification

#### UNIT III

Parts of a plant. Root types and modifications. Stem –types- aerial and underground. Stem modifications. Leaf Morphology – Types, Venation, Phyllotaxy

#### UNIT IV

Detailed study of families: Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families,

Annonaceae, Capparidaceae , Rutaceae, Leguminosae (Fabaceae, Mimosaceae and Caesalpiniaceae), Myrtaceae, Cucurbitaceae and Apiaceae.

## UNIT V

Detailed study of families: Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families: Apocynaceae, Asclepiadaceae, Verbenaceae, Lamiaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Poaceae.

### PRACTICAL

Describe the plant parts with suitable plants-habit, habitat form...types of leaves, and phyllotaxy. Study the Types and modification of root and stem with suitable example.

Identify the following inflorescence and fruits:

- (a) Inflorescence - Simple raceme, Spike, Corymb, Head, Simple Cyme, Cyathium and Hypanthodium.
- (b) Fruits - Simple: - (Fleshy) – Berry, Drupe, Pepo, Hesperidium. (Indehiscent) – Nut. Dry- Legume, Capsule (loculicidal) and Aggregate.

Floral formula from floral description.

Identify the families mentioned in the syllabus by noting their vegetative and floral characters.

Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.

Study the products of plants mentioned in the syllabus of economic botany with Special reference to the morphology, botanical name and family.

Prepare herbarium of 20 plants with field notes (internal assessment).

Field Visit

### TEXT BOOKS

1. Lawrence, GHM. (1995). The Taxonomy of vascular Plants (Vol I-IV), Central Book, Dept., Allahabad
2. Heywood VH. (1967). Plant Taxonomy, Edward Arnold, London. Jeffery C. (1982). An introduction to Plant Taxonomy, J& A Churchill Ltd., London
4. Mathew, K.M. (1983). The Flora of Tamil Nadu Carnatic, The Rapinat Herbarium, Trichy

5. Sivaraajan ,V.V.(1989). Introduction to Principle of Plant Taxonomy, Oxford and IBH, New Delhi.
6. Pandey, B.P.(1997).Taxonomy of Angiosperms , S.Chand & Co., New Delhi.
7. Singh, V. & Jain, K.K. (1989). Taxonomy of Angiosperms – Rastogi, Meerut
8. Vashista, P.C. (1990). Taxonomy of Angiosperms – S.Chand & Co., New Delhi
- 9.Sharma, O.P. (1996). Plant Taxonomy. TATA McGraw Hill, New Delhi

### **REFERENCE BOOKS**

1. Hutchinson, J. (1973). The Families of Floweing plants, Oxford University press, London
2. Gamble,J.S , Fisher,L.E.F .(1967). The Flora of The presidency of Madras (Vol-III) BSI, Calcutta
3. Davis , P.H and Heywood ,V.M. (1965). Principles of Angiosperm Taxonomy, Oliver and Boyd Edinburgh
4. Simpson M.G.(2006). Plant systematics, Elsevier Academic Press,USA
5. Takhtajan, A.L. (1969). Flowering Plants – Origin and dispersal – Oliver & Boyed
6. Gangulee H.C ., Das ,K.S and Datta C.T (1964) college Botany –Vol I , basant Panchami ,Calcutta
7. Narayanaswamy R.V and Rao ,K.N (1976). Oultlines of Botany . S .Viswanthan printer and publisher, Chennai
- 8.Heywood V.H. 1967. Plant Taxonomy. London: Edward Arnold.
9. Hill A.F. 1982. Economic Botany.: Mc Graw Hill ,New York.
10. Jain S.K. and Rao R.R. 1976. A hand book of field and herbarium technique. Today and tomorrow’s Publishers, New Delhi.
11. Jeffery C. (1968) An Introduction to Plant Taxonomy, J and A Churchill. London.
12. Naik V.N. (1984) Taxonomy of angiosperms. Tata Mc Graw- Hill Publishing Company, New Delhi.
- 13.Sambamurthy A..S.S. 2005;Taxonomy of Angiosperms, International Pvt. Ltd,New Delhi.

### **WEB RESOURCES**

<https://www.easybiologyclass.com/plantmorphology>



## COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO	COURSE OUTCOME	BLOOM'S VERB
CO1	Demonstrate the herbarium techniques	Remember
CO2	Explain the morphology of flower	Understand
CO3	Distinguish between root and stem modifications	Analyze
CO4	Familiarize the Bentham and Hooker system	Remember
CO5	Compare the Apocyanaceae and Asclepidaceae	Analyze

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	P10
CO1	S	S	S		S				S	L
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		L			
CO5	S	S	S		M		S		S	L

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**MORPHOLOGY AN TAXONOMY – 21UBY05**

Time : 3 hrs.

Maximum: 75 Marks

**Part A**

**(15x1=15 Marks)**

(Answer all the questions)

1. Species plantarum is written by
  - a) de candolle
  - b) A.L. de candolle
  - c) Engler and Prantl
  - d) Carl Linnaeus
2. Series Calyciflorae comes under which sub-class
  - a) Gamopetalae
  - b) Polypetalae
  - c) Monochlamydeae
  - d) Gymnospermae
3. Polynomial system of naming a plant is replaced by binomial system by
  - a) Bentham and Hooker
  - b) Linnaeus
  - c) Cronquist
  - d) Engler and Prantl
4. Which type of inflorescence present in Ficus spp.
  - a) Cyathium
  - b) Coenanthium
  - c) Hypanthodium
  - d) Verticillaster
5. Ovary bears ovules on a specialized tissue called
  - a) Carpel
  - b) Locule
  - c) Placenta
  - d) Septum
6. Legume is comes under
  - a) dry dehiscent fruit
  - b) dry indehiscent fruit
  - c) schizocarpic fruit
  - d) fleshy fruit
7. Beta vulgaris is the example for
  - a) Napiform root
  - b) Fusiform root
  - c) Conical root
  - d) None of these
8. Phylloclade is the adaptation in
  - a) Hydrophytes
  - b) Xerophytes
  - c) Mesophytes
  - d) None of these
9. Which type of venation mostly present in monocotyledons
  - a) Reticulate venation
  - b) Parallel venation
  - c) Both a and b
  - d) None of these
10. Fruit in Cucurbitaceae
  - a) Pome
  - b) Pepo
  - c) Hesperidium
  - d) Samara

11. Inflorescence in Apiaceae

- a) Umbel b) Panicle c) Corymb d) Spadix

12. Pulses are group of plants belonging to the family

- a) Leguminosae b) Myrtaceae c) Apiaceae d) Capparidaceae

13. Pollen grains of each half anther associated in tetrads are found in a sac like structure known as

- a) Corpusculum b) Translator c) Pollinium d) None of these

14. *Tectona grandis* is comes under the family

- a) Lamiaceae b) Verbinaceae c) Orchidaceae d) Apocynaceae

15. Cyathium inflorescence is present in

- a) Poaceae b) Liliaceae c) Euphorbiaceae d) Asclepiadaceae

**PART-B**

**(2X5 = 10 Marks)**

(Answer any two questions)

16. Write about principles of ICBN?

17. Describe the placentation types with diagrams

18. Explain the underground stem with suitable diagrams

19. Mention the economic importance of the family: Capparidaceae

20. Describe the family Euphorbiaceae with suitable diagrams

**PART –C**

**(5X10=50 Marks)**

(Answer all the questions)

21 a) Describe the natural system of classification

(or)

b) Briefly explain the herbarium techniques and its importance

22 a) Explain the types of inflorescence

(or)

b) Give an outline of classification of fruits

23 a) Detailed account on modification of root

(or)

b) Explain the types of stem

24 a) Write the morphological and floral characters of the family Annonaceae with economic importance

(or)

b) Compare the sub- families under Leguminosae with reference to the floral characters

25 a) Differentiate the morphological and floral characters of Apocynaceae and Asclepiadeaceae

(or)

b) Give the diagnostic characters of Liliaceae

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY06	BIOCHEMISTRY AND BIOPHYSICS				5

### CORE COURSE VI- BIOCHEMISTRY AND BIOPHYSICS

#### Objectives

1. To make students understand the structure and properties of the biomolecules.
2. To make students acquire knowledge about the reactions performed by the biological macromolecules.
3. To make students understand the principles of thermodynamics.

#### UNIT-I

A brief account of Solutions, Colloids - Enzymes - Nomenclature - Chemical nature, Properties - Classification - mode of action - factors affecting enzyme activity.

#### UNIT-II

Carbohydrates -classification and properties of monosaccharides, oligosaccharides and polysaccharides -structural analysis of starch and glucose -A brief account of carbohydrates present in plant cell wall -Biological significance of carbohydrates.

#### UNIT-III

Proteins -chemical structure -physical configuration -primary, secondary, tertiary and quaternary structure -properties of protein -determination of Amino acid sequence of protein - Biological significance.

#### UNIT-IV

Lipids -simple, compound and derived lipids -phospholipids -fat metabolism -Biological significance of lipids.

## **UNIT-V**

Thermodynamic principles -First Law of Thermodynamic -isolated system, closed system and open system -Enthalpy -second Law of Thermodynamics -Entropy -Living systems and Entropy -Free energy -Living systems and equilibrium state.

### **PRACTICALS**

1. Estimation of pH using pH meter and pH paper of suitable soil or water samples.
2. Identification different kinds of carbohydrates of different plant materials with suitable stains.
3. Using suitable stains identify the proteins of different kinds of plant materials.
4. Identification of different kinds of lipids with suitable stains of the given plant materials.

### **TEXT BOOKS**

1. Goodwin & Mercer (1986 )Introduction to Plant Biochemistry, Pergamon Press.
2. Jain, J.J (2007) Fundamentals of Biochemistry, S.Chand & Co, New Delhi.
3. Srivastava, H.S. ( 2006 ) Elements of Biochemistry, Rastogi Publications, Meerut.
4. Dr. S.Thiravia Raj( 2006 ) Biophysics, Saras Publications

### **REFERENCE BOOKS**

1. Appa,( 1982),Plant Biochemistry. ELBS.
2. Arumugam, N. (1990), Elements of Biochemistry, Saras Publications.
3. Borner F.J. ( 2000 ) , Plant Biochemistry Academic Press, New York.
4. Conn and Stumpf (2000), Outlines of Biochemistry. 5<sup>th</sup> edition. John Wiley & Sons, Singapore.

### **WEB RESOURCES**

<https://www.easybiologyclass.com/biochemistry>

## **COURSE OUTCOME**

On successful completion of the course, students will be able to

<b>S.NO.</b>	<b>COURSE OUTCOME</b>	<b>BLOOM'S VERB</b>
CO1	Explain the role of enzymes in biological systems.	Understand
CO2	Describe the classification, structure and properties of carbohydrates	Understand
CO3	Explain the properties, structure and biological significance of proteins.	Understand
CO4	Relate the types and biological significance of lipids	Apply
CO5	Apply the thermodynamic principles in biological systems	Apply

## **MAPPING WITH PROGRAMME SPECIFIC OUTCOME**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S		M	S	S		M		M	S
CO2	S		M	S	S		M			S
CO3	M		M	S	S		M		S	S
CO4	S		M	S	S				M	S
CO5	S		M	S	S	M			M	S

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**CORE COURSE -VIII- 21UBY06 BIOCHEMISTRY AND BIOPHYSICS**  
Time: 3 hrs Max:75marks

**PART – A** **(15X1=15 Marks)**  
**(Answer all the questions)**

1. Which one of the following is a biocatalyst  
a) Aluminium Oxide b) Silicon dioxide  
c) Enzyme d) Hydrogen Peroxide
  
2. The nature of enzyme is  
a) Vitamin b) Lipid  
c) Carbohydrate d) Protein
  
3. Colloidal solution find application in  
a) Milk industry b) Chemical industry  
c) Crystallography d) textiles
  
4. Which of the following is an aldotriose  
a) Dihydroxyacetone b) Glyceraldehyde  
c) Ribulose d) Erythrose
  
5. Maltose is a disaccharide of  
a) Glucose & Galactose b) Glucose & glucose  
c) Glucose & lactose d) Fructose & lactose
  
6. Number of stereoisomers in an aldohexose is  
a) 8 b) 10  
c) 14 d) 16
  
7. The bond between amino acid is called as  
a) ionic b) Acidic  
c) Peptide d) Hydrogen
  
8. Which of the following factor is NOT responsible for denaturation of proteins  
a) Heat b) pH change



- c) Charge  
d) Organic solvent
9. Which of the following techniques is used to determine protein structure  
a) X-ray crystallography  
b) Kryptonics X-ray vision  
c) Magnetic resonance imaging  
d) None of the above
10. Rancidity of lipids in lipid rich food stuff is due to  
a) Hydrogenation of unsaturated fatty acid  
b) Reduction of fatty acid  
c) Oxidation of fatty acid  
d) Dehydrogenation of saturated fatty acid
11. Which one of the following is an example of derived lipids  
a) Steroids  
b) Terpenes  
c) Carotenoids  
d) All of the above
12. Carnauba wax is an example for  
a) liquid wax  
b) Soft wax  
c) Hard wax  
d) Solid wax
13. Which one of the following thermodynamic quantities is NOT a state function?  
a) Gibbs free energy  
b) enthalpy  
c) Work  
d) entropy
14. Chemical dissociation is  
a) exothermic  
b) reversible and exothermic  
c) endothermic  
d) reversible and endothermic
15. Which of the following is the largest unit of energy  
a) electron volt  
b) Joule  
c) Calorie  
d) erg

**PART – B**  
**Answer any two questions.**

**(2X5=10 Marks)**

16. Give a brief account on solutions.
17. Give a brief account on monosaccharide
18. Discuss the chemical nature of proteins.
19. Write notes on simple lipids
20. With suitable example explain Enthalpy.

**PART –C**  
**Answer All three questions**

**(5X10=50 Marks)**

21a) Write an essay on factors affecting enzyme activity.

(OR)

b) Write a detailed account on physical and chemical properties of enzymes.

22 a) Explain in detail the classification and properties of carbohydrates.

(OR)

b) Discuss in detail the biological significance of carbohydrates.

23 a) Explain in detail the structure of proteins.

(OR)

b) Explain the Biological importance of Proteins.

24 a) Explain in detail different types of phospholipids.

(OR)

b) Discuss in detail the biological significance of lipids.

25 a) Explain in detail the thermodynamic principle with reference to its first law.

(OR)

b) Discuss the free energy concept and its application in Biology.

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY07	PLANT ECOLOGY AND PHYTOGEOGRAPHY			-	5

### CORE COURSE –VII: PLANT ECOLOGY AND PHYTOGEOGRAPHY

#### Objectives

1. To learn the underlying principles of plant environment and Ecosystem
2. To study the various types of vegetations and its distribution

Plant Ecology

#### UNIT I

Ecosystem Concept: Definition - Components (Abiotic and Biotic), autotrophic producers and heterotrophic consumers. Ecological pyramids. Productivity: primary, secondary and gross, food chain, food web and energy flow. Pond ecosystem

#### UNIT II

Approaches to the study of ecology (Autecology and Synecology). Plant environment: climatic and edaphic factors.

#### UNIT III

Vegetation –Development of vegetation –migration, colonization. Plant succession: Hydrosere and Xerosere. Ecological classification of plants and their correlation to the habitat factors.

#### UNIT IV

Pollution Ecology- Pollution and its control, Atmospheric pollution. Air Pollution –Particulate matter, chemicals and acids rain. Soil pollution - Industrial effluents, Agricultural pollution, plant residues, insecticides, pesticides, fungicides and herbicides. Water pollution - domestic waste and sewage - Noise pollution and Radioactive pollution Phyto geography

## **UNIT V**

Approaches to phytogeography –vegetation types of Tamilnadu: Evergreen, deciduous, scrub and mangrove vegetation. Approaches to Biodiversity - conservation in situ and ex situ methods. Mega centers of Bio-diversity – hot spot.

## **PRACTICALS**

Study of the morphological and structural adaptation of locally available hydrophytes, Mesophytes, xerophytes, parasites and epiphytes to correlation to the particular habitat.

## **TEXT BOOKS**

1. Sharma, P.D 1990 Ecology and Environment, Rastogi Publications.
2. Shukla, R.S and Chande I.P.S Plant Ecology and Soil Science, S.Chand & Company Ltd.,
3. Vasishta, P.C,1979 Plant Ecology, Vishal Publication.
4. Verma, V.A 1981 Text book of Plant Ecology, Emkay Publication.
5. Sharma,J.P. 2004 Environmental Studies, Laxmi Publications (p) Ltd. New Delhi.

## **REFERENCE BOOKS**

1. Ambash R.S.,1978. The book of Plant Ecology, Students friends Co.,.
2. Willings W.D.1964 Plants and Ecosystem, Wasworti Publishing Co.,.
3. Daubenmire R.F,1973 Plant and Environment. John willey.
4. Gopal, B and Bhardwaj, 1979 Elements of Ecology, Vikas Publishing House Pvt Ltd.
5. Kellman, CM, 1980 Plant Geography, Methuen.

## **WEB RESOURCES**

<https://www.easybiologyclass.com/plantecology>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO	COURSE OUTCOME	BLOOM'S VERB
CO1	Demonstrate the edaphic factors	Remember
CO2	Explain abiotic and biotic components	Understand
CO3	Distinguish between hydrosere and xerosere	Analyze
CO4	Familiarize the pollution ecology	Remember
CO5	Compare the in situ and ex situ methods	Analyze

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		S				S	L
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		L			
CO5	S	S	S		M		S		S	L

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)

**CORE COURSE VII – 21UBY07 – PLANT ECOLOGY AND  
PHYTOGEOGRAPHY**

**PART –A**

**(15X1 = 15 Marks)**

(Answer the following)

1. The father of Indian Ecology
  - a) Alexander von Humboldt
  - b) Eugene P. Odum
  - c) R. Mishra
  - d) Reiter
2. Ecology is the study of an individual species is called
  - a) Community ecology
  - b) Autecology
  - c) Species ecology
  - d) Synecology
3. Which of the following is not abiotic component of the ecosystem
  - a) Bacteria
  - b) Humus
  - c) Organic components
  - d) Inorganic components
4. The movement of energy from producers up to top carnivores is known as
  - a) Food web
  - b) Food chain
  - c) Energy flow
  - d) Ecological pyramids
5. The first invaded plants in a barren area called
  - a) Several communities
  - b) Allogenic communities
  - c) Pioneers
  - d) Succession
6. The succession in a freshwater ecosystem is referred to as
  - a) Xerosere
  - b) Hydrosere
  - c) Halosere
  - d) Psammosere
7. It is an undesirable change that occurs in air and water
  - a) Recycling
  - b) Reuse
  - c) Pollution
  - d) Reduce
8. Usage of chemical pesticides and fertilizers causes pollution
  - a) Land pollution
  - b) Water pollution
  - c) Noise pollution
  - d) Both a and b
9. Wildlife protection act was implemented in
  - a) 1986
  - b) 1972
  - c) 1973
  - d) 1971
10. Tropical wet evergreen forests also called
  - a) Tropical rain forest
  - b) Tropical semi ever green forests
  - c) Moist tropical forests
  - d) Both a and b
11. The climatic factor includes
  - a) Light
  - b) Temperature
  - c) Water
  - d) All the above
12. The number of food chain from web like arrangement is called
  - a) Food web
  - b) Food chain
  - c) Ecological pyramids
  - d) None of the above
13. Which ecosystem controlled by biotic components

- a) Autogenic succession    b) Allogenic succession
- c) Autotrophic succession    d) Heterotrophic succession

14. Which of the following is not a way to conserve water

- a) Replace    b) Reduce    c) Reuse    d) Recycle

15. Which method of conservation where species are protected outside their natural environment

- a) *In-situ* conservation    b) *Ex-situ* conservation
- c) Both a and b    d) None of the above

**PART-B      (2X5= 10 Marks)**

(Answer any two questions)

16. Write an essay on Edaphic factors

17. Differentiate abiotic and biotic components

18. Explain plant succession and its types

19. How do you control water pollution

20. Give an account on vegetation types of Tamil Nadu

**PART- C**

**(5X10= 50 Marks)**

(Answer all the questions)

21a) Definition of Ecology? Explain Autecology and Synecology

(or)

b) Explain Climatic factors

22a) Explain Pond ecosystem

(or)

b) Explain Ecological pyramids

23a) Differentiate Hydrosere and Xerosere

(or)

b) Detail accounts on Ecological classification of plants

24 a) Explain in details

i) Soil pollution

ii) Agricultural pollution

(or)

b) Write a brief account on Radioactive pollution

25 a) Write an essay on *In-situ* conservation

(or)

b) Write an essay on *Ex-situ* conservation

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM1	BIOTECHNOLOGY			-	5

### BIOTECHNOLOGY

#### Objectives

1. To understand the basics of plant tissue culture and its uses
2. To understand Genetic engineering
3. To understand the uses of biotechnology in industry and environment

#### Unit I

Biotechnology – Definition, scope and significance. Plant tissue culture – History, totipotency. Tissue culture laboratory setup, medium preparation (MS medium) and sterilization techniques. Explants preparation and inoculation. Callus induction, subculture and maintenance. Suspension culture.

#### Unit II

Micropropagation, Organogenesis, Somatic embryogenesis, Haploid culture- Anther and Ovule culture, Somaclonal variation. Artificial seed production. Protoplast isolation and culture. Applications of plant tissue culture.

#### Unit III

Microbial genetics and gene regulation (Lac Operon). Genetic engineering –enzymes- nucleases and ligases, cloning vectors, gene transfer methods, screening and selection of recombinants. Ti plasmid and *Agrobacterium* mediated gene transfer into plants. Applications of genetic engineering in agriculture and medicine.

#### Unit IV

Industrial biotechnology – uses of microbes in industry – alcohol fermentation, acetic acid fermentation, milk products (Cheese) and enzymes production using microbes. Microbes as single cell protein (SCP), Immobilization of microbial cells and enzymes.



## Unit V

Environmental biotechnology- waste management-solid waste- biogas technology. Waste water treatment- nature of waste water (BOD, COD, suspended and dissolved solids), primary, secondary and tertiary treatment. Recycling of waste water. Monitoring of environmental pollution – Biosensors.

### TEXT BOOKS

1. Ignacimuthu S., (1998), Basic biotechnology, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Dubey R.C., (2001), A Text book Biotechnology, S. Chanad & Co. (P) Ltd., New Delhi, India.
3. Palaniyappan S., (1995), Biotechnology (in tamil), T.K. Publishing house, Chennai, India.

### REFERENCE BOOKS

1. Trivedi, P.C. 2000 –Plant Biotechnology, Panima Publishing Corporation, New Delhi.
2. Lewin, B.2003 –Genes VI, Allied Publishers, Chennai.
3. Kalian Kumar.D. 1999 –An introduction to plant tissue culture, New Central Book Agency, Calcutta.

### WEB RESOURCES

<https://www.easybiologyclass.com/plantbiotechnology>

### COURSE OUTCOME

On successful completion of the course, students will be able to

S.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	System of plant tissue culture and uses	Remember
CO2	Getting knowledge different mode of cell development	Understand
CO3	Gathering knowledge about genetic engineering	Analyze
CO4	Drug preparation by biotechnology	Analyze
CO5	Role of biotechnology in environment	Remember

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		M				S	M
CO2	S	S	S		S				M	
CO3	S	S	S		S				S	
CO4	S	S	S		S		M			
CO5	S	S	S		S		S		S	M

(For the Candidates admitted from the academic year 2021 – 2022 onwards)

**MAJOR ELECTIVE COURSE I – 21UBYM1- BIOTECHNOLOGY**

Time : 3 Hrs

Max: 75 Marks

**PART – A**

(15 x 1 = 15 Marks)

(Answer all the questions)

1. Cellular totipotency is the property of
  - a) Plants
  - b) animals
  - c) bacteria
  - d) higher animals
2. The common solidifying agent used in micropropagation is
  - a) Dextran
  - b) Mannan
  - c) Agar
  - d) Lignin
3. The culturing of cells in liquid agitated medium is called
  - a) Liquid culture
  - b) Micropropagation
  - c) Meristem culture
  - d) Suspension culture
4. The variation in *invitro* culture is called as
  - a) Mutation
  - b) *invitro* variation
  - c) Somaclonal variation
  - d) artificial seeds
5. Synthetic seeds are produced by the encapsulation of somatic embryos with \_\_\_\_\_
  - a) Sodium alginate
  - b) Sodium nitrate
  - c) Sodium alginate
  - d) Sodium chloride
6. Which type of medium is used for protoplast culture
  - a) Natural
  - b) Synthetic
  - c) Nutritional media
  - d) None of the above
7. The Ti is referred to as
  - a) Translocating inducing
  - b) Transfer inducing
  - c) Tumour inducing
  - d) Translation inducing
8. Cosmid vectors are
  - a) Phages that lack cos site
  - b) Plasmids that have no selection marker
  - c) Plasmids that contain fragment of  $\lambda$ DNA including the cos site
  - d) Cryptic plasmids
9. Microinjection involves
  - a) Injecting of large amount of DNA
  - b) Injection of DNA into bigger cells
  - c) Injection with needle having diameter greater than cell diameter
  - d) All the above
10. The first transgenic plant is
  - a) Rice
  - b) Maize
  - c) Cotton
  - d) Tobacco
11. The reaction of enzyme mobility in fixed space is known as
  - a) enzyme immobilization
  - b) enzyme inhibition
  - c) enzyme kinetics
  - d) biosensor
12. SCP stands for
  - a) Stress cultivated plant
  - b) Somatic cultivated plantlet
  - c) Single cell protein
  - d) Soma clonal plants

13. Biosensors are used in food industry to
- |                         |                       |
|-------------------------|-----------------------|
| a) Sense taste          | b) deduct mustard gas |
| c) detect acid alcohols | d) dermine fatigue    |
14. Which process is employed to gain sufficient head for the wastewater?
- |              |                 |
|--------------|-----------------|
| a) Screening | b) Pumping      |
| c) Oxidation | d) Fermentation |
15. What is the most common coagulant agent?
- |              |                    |
|--------------|--------------------|
| a) Alum      | b) Ferric Sulphate |
| c) Limestone | d) Coal            |

**PART – B**

**(2 x 5 = 10 Marks)**

(Answer any TWO questions)

16. Briefly explain the tissue culture laboratory setup.
17. Write short notes on synthetic seeds production.
18. Listout the applications of genetic engineering in agriculture.
19. Explain briefly about uses of microbial in industry.
20. What biosensors? explain.

**PART – C**

**(5 x 10 = 50 Marks)**

(Answer ALL the questions)

- 21a) Write an essay on preparation of MS medium.  
(or)  
b) Describe the methods of sterilization.
- 22 a) Give an account on Protoplast isolation and culture.  
(or)  
b) Listout the application of tissue culture in various fields.
- 23 a) Write an essay on gene transfer methods.  
(or)  
b) Explain in detail about Lac operon concept.
- 24 a) Discuss about microbes as single cell protein.  
(or)  
b) Write an essay on immobilization of enzymes.
- 25a) Explain how the waste water recycling process occur.  
(or)  
b) Give an account on solid waste management.

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM2	PLANT TISSUE CULTURE AND PLANT MEDICINE			-	5

### MAJOR BASED ELECTIVE COURSE II : PLANT TISSUE CULTURE AND PLANT MEDICINE

#### Objectives

- 1.To acquire knowledge in recent developments in Plant Tissue Culture
- 2.To understand the concepts in plant propagation.
3. To study about production of Secondary metabolites

#### UNIT I

Scope and History of Plant Tissue Culture –Status of Plant Tissue culture in India - Introduction Plant cell – Totipotency – Culture of plant cells, tissue and organs. Organization of Plant tissue culture laboratory – Aseptic techniques. Culture media – Nutritional components.

#### UNIT II

Preparation of explants – Callus initiation types and maintenance –Hardening. Root culture – Cell suspension cultures- Meristem culture- Organogenesis .Maintenance of culture. vitrification.

#### UNIT III

Micro-propagation – Shoot apex culture – Somatic embryogenesis – Isolation, purification and culture of protoplasts. Protoplast fusion and somatic hybridization, Artificial seed.

#### UNIT IV

Application of Tissue Culture- Tissue culturing of medicinal plants-Production of secondary metabolites- Secondary metabolism in tissue cultures with emphasis on production of medicinal agents

#### UNIT V

Biological Screening of Herbal Drugs- Introduction and Need for Phyto-Pharmacological Screening- In vitro evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs

## BOOKS

1. Baker. F.N.G.1992. Rapid propagation of fast growing woody species CAB International. London.
2. Bhojwani,S.S. and M.K.. Razdan.2013. Plant Tissue Culture , theory and Practices. Panima book Distributors.
3. Reinert.J and M.M .Yeoman.1983. Plant Cell and Tissue Culture – Laboratory manual. Narosa Publishing House. New Delhi
4. Narayanaswamy.S.2005. Plant Cell and Tissue Culture. Tata Mc.Graw Hill, New Delhi
5. Farooqi, A.A. and B.S.Sreeramu, 2004. Cultivation of medicinal and aromatic crops. Revised edition, Universities Press (India) Private Limited, Hyderabad
6. WHO, 2002. Quality control methods for medicinal plant materials, World Health Organization, Geneva, A.I.T.B.S., Publishers and Distributors, New Delhi.

## WEB RESOURCES

<https://www.easybiologyclass.com/planttissueculture>

## COURSE OUTCOME

On successful completion of the course, students will be able to

COs	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the various types of cells and culture	Remember
CO2	initiate Callus	Apply
CO3	distinguish between somatic embryogenesis and somatic hybridization	Analyze
CO4	familiarize the tissue culture and the information about techniques	Create
CO5	compare the in-vitro evaluation techniques, Anti oxidants, Antimicrobial, Anticancer drugs	Analyze

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		S				S	L
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		L			
CO5	S	S	S		M		S		S	L

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**MAJOR BASED ELECTIVE COURSE II – 21UBYM2- PLANT TISSUE CULTURE  
AND PLANT MEDICINE**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. Cell wall possesses  
a) cellulose b) hemicellulose c) protein d) all of these
2. Plant cells differ from animal cells having  
a) mitochondria b) rough endoplasmic reticulum c) cell wall d) Golgi apparatus
3. Auxins are required for  
a) Callus culture b) suspension culture c) both a and b d) none
4. Genetic mutation is one of the limiting factors in  
a) protoplast culture b) cell culture c) callus culture d) all the above
5. Leaves grow due to presence of  
a) apical meristem b) diffused meristem c) intercalary meristem d) secondary meristem
6. The term meristem was given by  
a) Nagali b) Cohn c) Hanstein d) Schmidt
7. Meristem helps in  
a) absorption of water b) absorption of minerals c) translocation of food d) growth of plants
8. Micropropagation involves  
a) small explants used for vegetative multiplication of plants  
b) Microbes used for vegetative multiplication of plants  
c) Microspores used for vegetative multiplication of plants  
d) Megaspores and microspores used for non vegetative multiplication of plants
9. Benefits of clonal propagation  
a) multiplication of sexually derived sterile hybrids  
b) Multiplication of disease-free plants  
c) Rapid multiplication of superior clones  
d) All the above
10. In artificial media, the growth of plant tissues is  
a) gene expression b) transgenesis c) plant tissue culture d) cell hybridization
11. Somatic embryogenesis is based on  
a) sexual reproduction b) asexual reproduction c) both d) none
12. Which of the following types of plant cells can be used for somatic embryogenesis  
a) palisade parenchyma b) epidermis c) parenchymatous cell of xylem d) medullary cell of stem
13. Which of the following can be done in different plant species  
a) somatic embryogenesis b) protoplast fusion c) somatic hybridization d) all the above

14. Which of these is a secondary metabolite  
a) protein b) lipids c) vitamins d) steroids
15. Which of these is a primary metabolite  
a) diterpene b) codeine c) anthocyanin d) triacylglycerol

**PART – B**

**(2 x 5 = 10 Marks)**

(Answer all the questions)

16. Write an essay on plant cell with suitable diagram
17. Details about hardening
18. Explain artificial seeds
19. Write about production of secondary metabolites
20. Explain about - Antioxidants and Anticancer drugs

**PART – C**

**(5 x 10 = 50 Marks)**

(Answer all the questions)

- 21a) Detail about organization of plant tissue culture  
(or)  
b) Explain about culture media
- 22a) Describe callus initiation and maintenance of hardening  
(or)  
b) Explain meristem culture
- 23a) Describe somatic embryogenesis  
(or)  
b) Explain about somatic hybridization
- 24a) Explain secondary of secondary metabolites  
(or)  
b) Describe application of tissue culture
- 25a) Details account on need for pharmacological screening  
(or)  
b) Explain *invitro* evaluation techniques.



## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM3	SEED TECHNOLOGY			-	5

### MAJOR BASED ELECTIVE COURSE – III- SEED TECHNOLOGY

#### **Objectives**

1. To gain the knowledge about the seed formation, sampling and viability
2. To facilitate self-employment

#### **UNIT I**

Study of floral Biology –Types of Pollination, seed formation. Seed morphology and structural details of Dicot (Castor) and Monocot (Paddy) seeds- Roles and goals of seed technology - importance of quality seed in agriculture - characteristic of quality seed.

#### **UNIT II**

Seed dormancy : causes and methods of breaking dormancy- Seed sampling –method of sampling –Seed Purity –Seed Germination –methods of Seed Germination using paper, Sand or Soil –Standard Germination Test.

#### **UNIT III**

Seed viability –Topographical tetrazolium or TZ test, embryo excision method. Seed moisture –importance –methods of moisture determination basic methods.

#### **UNIT IV**

Foundation and certified seed production of the following Paddy, bean, groundnut and cotton.

#### **UNIT V**

Seed certification –Objectives –fundamental concepts of seed certification –sources and classes of seed: Breeder’s seed, certified seed. Phases of certification –Verification of seed source -field inspection –seed analysis –tagging of seedlings –field standards.

### TEXT BOOKS

1. Agarwal, R.L. Seed Technology Oxford and IBH Publishing Co. Pvt. Ltd., 2019.
2. Joshi A.K. & Singh B.D. Seed Science And Technology, 2004.
3. Rajeev Kumar, Sunil Kumar Singh, Sushil Kumar Swarnkar, Sumati Narayan, A Text Book of Seed Technology, Kalyani Publishers, 2016.

### REFERENCE BOOKS

1. Agrawal P.K. Principles of Seed Technology, 2010.
2. Bewley J.D. and Black M (Edn) –Seed physiology of development and germination, Plenum Press, New York, 1985.
3. Kowalsky. Seed Biology, Vol. I, Vol. II. Academic Press, New York, 1972.

### WEB RESOURCES

<https://seednet.ap.nic.in/Stl/htmlpages/GerminationTesting.htm>

[http://www.sfri.nic.in/pdf\\_files/Seed%20Technology.pdf](http://www.sfri.nic.in/pdf_files/Seed%20Technology.pdf)

### COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand the Importance of quality seed and its structure	Understand
CO2	Apply the ways to break dormancy and its germination	Analyse
CO3	Determine the moisture content and seed viability	Apply
CO4	Examine the methods of seed production in different crops	Apply
CO5	Explain the steps in Certified seed production	Understand

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M	S	L		M	L	M	S	S
CO2	S	M	M		L	M		M	S	S
CO3	M	S	S		M	S	M	S	S	S
CO4	S	M	S			S	M	L	S	S
CO5	M	M	S			M	S	S	S	S

S- Strong; M-Medium; L-Low

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**MAJOR BASED ELECTIVE COURSE – III – 21UBYM3 - SEED TECHNOLOGY**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 X 1=15 Marks)**

(Answer ALL the questions)

1. Father of seed technology is  
a) Mendel    b) Paul berg    c) Fredrick Nobbe    d) Morgan
2. Scutellum is found in which part of the Monocot seed?  
a) Embryo    b) Endosperm    c) Seed coat    d) None of these
3. Cotyledons constitute the first pair of leaves in  
a) Castor    b) Paddy    c) Maize    d) Gram
4. The hormone which can break seed dormancy is  
a) Coumarin    b) Ferulic acid    c) ABA    d) Giberillic acid
5. Dormancy caused by seed coat impermeability to water and gases can be broken by  
a) Scarification    b) Stratification    c) Low temperature    d) Absciscic acid
6. Which part of the embryo comes out first during seed germination?  
a) Plumule    b) Radicle    c) Cotyledons    d) Epicotyl
7. Tetrazolium test was first formulated by  
a) Robert, 1953    b) Woodstock, 1952    c) Lakon, 1942    d) Hiltner, 1976
8. The enzyme associated with Tetrazolium test is  
a) Amylase    b) Catalase    c) Dehydrogenase    d) Methanogenase
9. The moisture content for safe storage of cereals is  
a) 10 – 12%    b) 12 – 14%    c) 14 – 16%    d) 16 – 18%
10. The inflorescence of rice plant is  
a) Capitulum    b) Umbel    c) Panicle    d) Cymose
11. Certified seed is the progeny of  
a) Nucleus seed    b) Foundation seed    c) Breeder seed    d) Registered seed
12. Foundation seed is the progeny of  
a) Nucleus seed    b) Foundation seed    c) Breeder seed    d) Registered seed
13. The colour of certified seed tag is  
a) Blue    b) Red    c) Green    d) White

14. Which state first to establish official seed certification agency during 1970?

- a) Maharastra b) Kerala c) Tamilnadu d) Orissa

15. Head quarters of international seed testing association is located at

- a) China b) Switzerland c) Australia d) India

**PART – B**

**(2X5= 10 Marks)**

(Answer any TWO questions)

16. Write about types of pollination.

17. Briefly explain the methods of seed sampling.

18. Comment on the importance of seed moisture.

19. Describe the foundation and certified seed production of Groundnut.

20. Explain the phases of seed certification.

**SECTION – C**

**(5X10 = 50 Marks)**

(Answer ALL the questions)

21a) Describe the seed morphology and structural details of dicot seed.

(or)

b) Explain the roles and goals of seed technology.

22 a) Define seed dormancy. Explain causes and methods of breaking the seed dormancy.

(or)

b) Describe the methods of seed germination using paper, sand and soil.

23a) Explain the seed viability test using tetrazolium and embryo excision methods.

(or)

b) Describe the methods of determination of seed moisture.

24a) Explain the foundation and certified seed production of Paddy.

(or)

b) Explain the foundation and certified seed production of Cotton.

25a) Describe the fundamental concepts of seed certification and write about breeder's and certified seed.

(or)

b) Enumerate and explain the standards need for seed certification.

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM4	AGRICULTURAL AND HORTICLUTRAL PRODUCTS			-	5

### MAJOR BASED ELECTIVE COURSE IV : AGRICULTURAL AND HORTICLUTRAL PRODUCTS

#### Objectives

1. To study the various types of Agriculture crops and its distribution
2. To understand the economical values of the Agriculture plants
3. To impart knowledge about the nutritional values of Agriculture and their cultivation.
4. To Know the Nutrients values of the Agriculture plants

#### UNIT I

Definition and scope of Agriculture- Classification of Crops- General principles of Crop production – Climate-soil and its preparation - seed and seed sowing - post-sowing tillage - water management- plant protection measures- harvesting.

#### UNIT II

A brief account of, cultivation and utilization of Cereals, pulses, nuts, Commercial crops- Wheat, Cotton and Sugarcane, fibres, timbers - Drug yielding plants- Spices and condiments.

#### UNIT III

Brief account of Binomial, sources and uses - Fruits– Mango, Papaya, Guava and Banana and vegetables – Brinjal- Raddish and cabbage

#### UNIT IV

Introduction to Human Nutrition: Orientation to human nutrition, an integrated approach, a conceptual framework for the study of nutrition, relationship between nutrition and health

#### UNIT IV

Important nutrients from Agriculture products –vitamins-proteins- minerals carbohydrates- dietary fibre-and Fats.

## UNIT V

Plant nutrients and human health- Functions of food, food groups, food exchange system, food in relation to health- Food technology and future foods- Energy Metabolism

### BOOKS

- 1.Kochhar.2009. Economic Botany in the tropics. Macmillan publishers
- 2.Singh, Pandey and Jain.2009. Diversity of Systematics of seed plants. Rastogi publications, Meerut
- 3.Singh,S.K and Seema Srivastava. 2009. Economic Botany. Campus Book International, New Delhi
4. Pooja.2010. Economic Botany. Discovery Publishing House, New Delhi
- 5.Sumati R. Mudambi, M.V. Raja gopal – Fundamentals of Foods and Nutrition 4 edition, New Age International (P) Limited, Publishers, 2001.

### WEB RESOURCES

<https://www.easybiologyclass.com/agriproducts>

### COURSE OUTCOME

On successful completion of the course, students will be able to

COs	COURSE OUTCOME	BLOOM'S VERB
CO1	Demonstrate the crop production	Remember
CO2	Explain drug yielding plants	Understand
CO3	Distinguish between fibres and timbers	Analyze
CO4	Familiarize the relation between nutrition and health	Remember
CO5	Compare the plant nutrient and human health	Analyze

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	P10
CO1	S	S	S		S				S	L
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		L			
CO5	S	S	S		M		S		S	L



B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)

**MAJOR BASED ELECTIVE COURSE – IV – 21UBYM4 –**  
**NUTRIENT STATUS IN AGRICULTURE PRODUCTS**

**Time : 3 Hrs**

**Max: 75 Marks**  
**(15 X 1=15 Marks)**

**PART – A**

(Answer ALL the questions)

1. The process of loosening and turning of the soil is called
  - a) Sowing
  - b) Drill
  - c) Tiling
  - d) Hoe
2. The supply of water to crops at regular intervals is called
  - a) Manure
  - b) Irrigation
  - c) Sprinkler method
  - d) Tilling method.
3. Farmers with small holdings of land do the separation of grain and chaff by
  - a) Threshing
  - b) Silos
  - c) Harvesting
  - d) Winnowing
4. Sugar cane comes under
  - a) Cereal crops
  - b) Commercial Crops
  - c) Fibres
  - d) timbers
5. Mention the commercial crops
  - a) Nuts
  - b) Spices
  - c) Pulses
  - d) Cotton
6. Jute is comes under
  - a) Hard fibre
  - b) Soft fibre
  - c) Bast fibre
  - d) Both A & C
7. Which of the following food components give energy to our body
  - a) Proteins
  - b) Vitamins
  - c) Minerals
  - d) Carbohydrates
8. Which of the following food items is the best source of plant proteins?
  - a) Milk
  - b) Egg
  - c) Legumes
  - d) Cheese
9. Guava is rich in
  - a) Vitamin A
  - b) Vitamin B
  - c) Vitamin C
  - d) Vitamin D
10. Pulses are a good source of \_\_\_\_\_
  - a) Carbohydrates
  - b) Proteins
  - c) Fats
  - d) Vitamins

11. The queen of spices is \_\_\_\_\_
- a) Cardamom    b) Pepper    c) Ginger    d) Chilli
12. Spices are \_\_\_\_ of plants
- a) Root    b) Bark    c) Fruit    d) All of these
13. Jute fibre is obtained from which part of the jute plant
- a) Root    b) Stem    c) Leaves    d) Flowers
14. The nutrient that helps in the growth and repair of our body is
- a) Carbohydrates    b) Minerals    c) Proteins    d) Fat
15. The system of irrigation where in water is supplied drop by drop near the roots of plants is called
- a) Pulley system    b) Drip system    c) Sprinkler system    d) Lever system

**PART-B**

**(2X5=10 Marks)**

(Answer any TWO questions)

16. Give an outline of classification of Crops
17. Briefly explain the cultivation of cereals and its utilizations
18. Describe the Binomial source & Uses of Vegetables - Brinjal and Raddish
19. Explain the relationship between nutritions and health.
20. Mention the functions of food.

**PART-C**

**(5X10=50 Marks)**

(Answer any two questions)

- 21a) i). Write the general principles of Crop Production  
 ii). Explain the Scope of Agriculture  
 Or  
 b) Describe the classification of crops
- 22a) Describe the cultivation and Utilizations of Commercial Crops.  
 Or  
 b) Write about drug yielding plants
- 23a) Give an brief account of Binomial Sources and uses of Fruits  
 Or  
 b) Give an brief account of Sources and uses of vegetables
- 24a) Explain the Conceptional frame work for the Study of nutrition  
 Or  
 b) Mention the important nutrients from Agriculture Products
- 25a) Explain the Food groups and food exchange

Or

b) Describe food technology and future foods - Energy metabolism

### SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYS3	HORTICULTURE			-	2

### SKILL BASED ELECTIVE COURSE III: HORTICULTURE

#### Objective

This course is designed to provide theoretical knowledge about the gardening to enable them to be self reliant and to facilitate self employment.

#### UNIT I

Fundamentals of horticulture: Definition, Branches, Importance and Scope. Classification of horticultural crops-fruits and vegetables. Gardening: Definition, objectives and scope- different types of gardening-Formal, Informal, Mixed and Kitchen garden.

#### UNIT II

Plant Propagation: Cutting, Layering, Budding and Grafting. Selection and significance of stock and scion. Role of plant growth regulators in horticulture. Induction of rooting, flowering, Fruit set and Fruit development.

#### UNIT III

Seed bed preparation, Potting, Repotting, weeding, Pruning, Topiary. Lawn making, Types of lawn grasses, maintenance of lawn, Hedge plant and its importance.

#### UNIT IV

Importance and scope of floriculture. Cultivation of commercial flowers such as Chrysanthemum, Rose and Jasmine. Production and packaging of cut flowers. Flower arrangement and Ikebana

#### UNIT V

A brief knowledge on annuals, biennials and perennials with respect to ornamental gardens, green house, water garden, rockery plants, Bonsai technique, hydroponics, storage of vegetables and fruits.

## **TEXT BOOKS**

1. Kumar N., Introduction to Horticulture, oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2010, 7th edition.
2. Edmond Musser & Andres. Fundamentals of Horticulture, Mc Graw Hill Book Co., New Delhi, 1994.
3. Chadha K.L . Handbook of Horticulture, ICAR Publication, NewDelhi, 2003

## **REFERENCE BOOKS**

1. Philip M., Plant Propagation, Mitchell Beazley Publishers Ltd., New York. 1992.
2. Randhava, GS. Ornamental Horticulture in India. Today and Tomorrow Printers and Publishers, NewDelhi, 1973.

## **WEB RESOURCES**

<https://www.easybiologyclass.com/horticulture>

## **COURSE OUTCOME**

On successful completion of the course, students will be able to

<b>S.NO</b>	<b>COURSE OUTCOME</b>	<b>BLOOM'S VERB</b>
CO1	Demonstrate the gardening	Remember
CO2	Explain plant propagation	Understand
CO3	Distinguish between lawn making and hedge plants	Analyze
CO4	Familiarize the floriculture	Remember
CO5	Compare the bonsai technique and hydroponics	Analyze

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		S				S	L
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		L			
CO5	S	S	S		M		S		S	L

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**SKILL BASED ELECTIVE COURSE – III – 21UBYS3 - HORTICULTURE**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 X 1=15 Marks)**

(Answer ALL the questions)

1. The term Horticulture is derived from \_\_\_\_\_ word?  
a) Greek b) Latin c) Greek & Latin d) All of the above
2. \_\_\_\_\_ is the cultivation of fruit crops  
a) Floriculture b) Olericulture c) Pomology d) gardening
3. \_\_\_\_\_ refers to the cultivation of vegetable crops?  
a) Olericulture b) floriculture c) gardening d) Pomology
4. Vegetative propagation is carried out by which method?  
a) Cutting b) budding c) layering d) all of the above
5. The propagation of plant by layering is called as \_\_\_\_\_?  
a) layering b) cutting c) budding d) grafting
6. Vegetative propagation in which a bud is inserted on the root stock plant is called as \_\_\_\_\_?  
a) Grafting b) budding c) T-budding d) layering
7. The first weeding should be done in \_\_\_\_\_ days after transplantation.  
a) 10-15 b) 20-25 c) 8-10 d) 12-15
8. Plant growing in earthen or concrete pots are called \_\_\_\_\_?  
a) Hanging baskets b) bonsai c) potted plants d) terrarium
9. The plant transfer from one pot to another pot called as \_\_\_\_\_?  
a) Potting-on b) Repotting c) hanging basket d) none of these
10. \_\_\_\_\_ is suitable for packaging cut flowers?  
a) Wooden box b) Carboard boxes c) plastic boxes d) all of the above
11. Rose petals and sugar ratio of gulkand is  
a) 1:1 b) 2:2 c) 3:1 d) 1:4
12. Rose is classified as \_\_\_\_\_?  
a) Flowering tree b) flowering edge c) flowering shrubs d) all of these
13. A mound of large stones planted with rock-loving plants is known as \_\_\_\_\_?  
a) Rockery b) annuals c) biennials d) shrubs
14. Herbaceous plants that grow in one season and bloom and die in the next season are known as \_\_\_\_\_?  
a) Shrubs b) rockery c) biennials d) annuals

15. Dwarfing trees and shrubs by growing them in shallow containers is called \_\_\_\_\_?

- a) Bonsai b) bottle garden c) terrarium d) dish garden

**PART – B**

**(2 X 5=10 Marks)**

(Answer ALL the questions)

16. Importance of horticulture?

17. Write a short note on cutting.

18. Define hedge plant and its importance.

19. Explain about flower arrangement?

20. Write short notes on hydroponics?

**PART – C**

**(5 X 10=50 Marks)**

(Answer ALL the questions)

21a) Give a brief account of classification of horticulture crops?

or

b) Detailed about kitchen garden.

22a) Explain about plant propagation.

or

b) Describe role of plant growth regulator in horticulture.

23a) Give a brief account on soil bed propagation?

or

b) Types of lawn grasses?

24a) Importance and scope of floriculture?

or

b) How do you cultivate commercial flowers?

25a) Explain in detail i) Annuals ii) Biennials iii) Perennials

b) Describe green house.

## SEMESTER-VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY08	PLANT PHYSIOLOGY				5

### CORE COURSE-VIII – PLANT PHYSIOLOGY

#### Objectives

1. To make students learn the underlying principles of the various physiological processes of plants.
2. To make students acquire knowledge about the various physicochemical and morphogenetic processes taking place during the various stages of plant growth.

#### UNIT I

Diffusion, gaseous exchange, osmosis, plasmolysis, absorption of water, ascent of sap (cohesion – tension theory), transpiration – types, factors affecting transpiration, guttation, mineral nutrients- role of micro and macro nutrients, passive and active transport of ions, translocation of organic solutes. Munch hypothesis.

#### UNIT II

Photosynthetic pigments, action and absorption spectra, Red drop, Emerson enhancement effect, photosystem I and II, light reactions, cyclic and non cyclic photophosphorylation, dark reaction, C4 cycle, photorespiration (Brief study), factors affecting photosynthesis.

#### UNIT III

Respiration-Aerobic and anaerobic respiration, Glycolysis, kreb's cycle, electron transport system, oxidative phosphorylation. Pentose phosphate pathway– factors affecting respiration.

#### UNIT IV

Nitrogen fixation- *Legume-Rhizobium* symbiosis – nitrification and denitrification. Nitrate assimilation- synthesis of amino acids(outline)- reductive amination and transamination. Stress physiology- definition – water and salt stress.



## UNIT V

Plant growth regulators- types of plant hormones- auxins, gibberellins, cytokinins, abscisic acid, ethylene, phytochrome, photoperiodism, Vernalization, senescence and tropic movements – phototropism, geotropism and thigmotropism.

### PRACTICALS

1. Determination of DPD using *Rhoeo* leaf by Plasmolytic method.
2. Effect of chemicals and temperature on membrane permeability.
3. Study of relative rate of Transpiration by different plants.
4. Separation of pigments by paper chromatography method.
5. Study of relative rates of photosynthesis under varying conditions of CO<sub>2</sub> Concentrations.
6. Study of rate of photosynthesis under different light intensities.
7. Measurement of rate of respiration in germinating seeds, flower bud using Respiroscope.

### DEMONSTRATION EXPERIMENTS

1. Determination of RQ by using Respirometer.
2. Dilatometer.
3. Osmoscope.

### TEXT BOOKS

1. Pandey, SN and Sinha, BK (2001). Plant physiology. Third revised edition, Vikas Publishing House Pvt. Ltd, New Delhi..
2. Jain, VK (2007). Fundamentals of Plant Physiology, S. Chand & company Ltd, New Delhi.
3. Verma, V (2008). Textbook of Plant Physiology, Ane's student edition, New Delhi.

### REFERENCE BOOKS

1. Noggle, GR and Fritz GJ (1976). Introductory Plant Physiology, Prentice-Hall, India.
2. Devlin, PM (1974). Plant Physiology, affiliated East West Press Pvt. Ltd.
3. Salisbury B and Ross F (2007). Plant Physiology, CBS Publishers and Distributors, New Delhi, 4<sup>th</sup> edition.

### WEB RESOURCES

<https://www.easybiologyclass.com/plantphysiology>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand the types and factors affecting transpiration.	Understand
CO2	appreciate the mechanism of photosynthesis	Remember
CO3	Compare the mechanism of respiration	Evaluate
CO4	Illustrate nitrogen fixation and nitrate assimilation	Apply
CO5	Correlate the role of plant growth regulators in the physiological effects of plants.	Analyze

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	M		M	S	S	M	M		M	S
CO2	M		M	S	S	M	M		M	S
CO3	M		M	S	S	M	M		S	S
CO4	S		M	S	S	M	M		M	S
CO5	S		M	S	S	M	M		M	S

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**CORE COURSE – VIII – 21UBY08 – PLANT PHYSIOLOGY**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. The movement of particles or molecules from a region of higher concentration to a region of its lower concentration is known as  
a) Osmotic diffusion    b) Imbibition    c) Diffusion    d) None of the above
2. In some angiosperms, watery drops ooze out from uninjured margins of leaves. This phenomenon is called as  
a) transpiration    b) root pressure    c) guttation    d) None of above
3. An important copper deficiency symptom in plants is  
a) interveinal chlorosis    b) die-back of citrus trees    c) necrotic spots on stems    d) None of the Above
4. A plot of the intensity of a certain phenomenon such as rate of photosynthesis as a function  
a) absorption spectrum    b) action spectrum    c) spectrum of light    e) None of the above
5. Dimorphic chloroplasts are found in leaves of  
a) C<sub>3</sub>-plants    b) C<sub>4</sub>-plants    c) both (a) and (b)    d) None of the above
6. Photorespiration is also known as  
a) Glycolate Cycle    b) C<sub>2</sub>-Cycle    c) both (a) and (b)    d) None of the above
7. Net gain of ATP molecules in complete aerobic break down of one molecule of glucose in most eukaryotes is  
a) 32    b) 36    c) 38    d) 40
8. Oxidative phosphorylation takes place  
a) in mitochondrial matrix    b) in thylakoids of grana in chloroplasts  
c) on cristae in mitochondria    d) all of the above
9. Value of R.Q is less than one when respiratory substrates are  
a) carbohydrates    b) organic acids    c) Fats or proteins    d) None of the above
10. Chief form of nitrogen taken up by majority of plants from soil is  
a) nitrates and nitrites    b) molecular nitrogen    c) ammonia    d) amino acids

11. Nif genes control the process of  
 a) biological nitrogen fixation      b) nitrate reduction      c) nitrite reduction      d) None of the above
12. The enzyme nitrogenous is extremely sensitive to  
 a) Hydrogen      b) Oxygen      c) nitrogen      d) None of the above
13. Response of plants to cold temperature treatment expressed in the form of flowering is called as  
 a) Vernalization      b) Photoperiodism      c) Stratification      d) none of the above
14. Tropical movements occur in response to  
 a) internal stimulus      b) external diffused stimulus      c) external unilateral stimulus      d) all of the above
15. Most important biological effect of kinetin in plants is to induce  
 a) cell enlargement      b) cell division      c) elongation of internodes      d) none of the above

**PART – B (2X5=10)**

**(Answer any TWO questions)**

16. Discuss on the different types of transpiration
17. Explain the role of photosynthetic pigments in photosynthesis
18. Explain the various factors affecting respiration
19. Explain the symbiotic relationship between Legume and *Rhizobium*
20. Give an account on Vernalization

**PART –C (5X10=50)**

**Answer ALL questions**

- 21a) Give an account on mechanism of ion transportation

( Or )

- b) Discuss in detail about the role of mineral nutrients.

- 22a) C<sub>4</sub> cycle – Discuss in detail

( Or )

- b) Elaborate in detail the various factors affecting photosynthesis.

23a) Explain the various steps of Glycolysis

(Or )

b) Describe in detail about Pentose Phosphate Pathway.

24a) Give an account on water stress.

(Or )

b) Discuss in detail about nitrate assimilation.

25a) Discuss the role of gibberellins in plant growth.

(Or)

b) Explain in detail about photoperiodism.

## SEMESTER-VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY09	CYTOLOGY AND GENETICS				5

### Objectives

1. To study the progress made in the field of cell, cell organelles and their functions.
2. To understand the principle, the hereditary mechanism, the structure and functions of genetic materials.

### CYTOLOGY

#### UNIT I

Ultra structure of a plant cell, cell wall, plasma membrane, cell organelles – endoplasmic reticulum, Golgi complex, chloroplast, mitochondria, nucleus, lysosome and ribosomes.

#### UNIT II

Chromosomes – morphology, polytene, giant chromosomes, salivary gland and lampbrush chromosomes. Nucleic acids – DNA and RNA, DNA structure, replication, RNA structure and types. Cell division – amitosis, mitosis and meiosis

### GENETICS

#### UNIT III

Mendel's Law of inheritance – Incomplete dominance, lethal factor, complementary factor and epistasis, multiple factor hypothesis, multiple alleles – blood groups, Polygenic inheritance (ear length in maize).

#### UNIT IV

Linkage and crossing over – three point crosses – construction of chromosomal map. Sex determination; Sex linked inheritance – eye colour in *Drosophila* and Colour blindness in humans. Extra chromosomal inheritance (plastid inheritance, male sterility in corn)

#### UNIT V

Identification of DNA as genetic material (Griffith's, Avery et al, Hershey & Chase experiments), forms of DNA. Population genetics: Gene frequency and Gene pool – Hardy & Weinberg law.

## PRACTICAL

1. Study of Plant cell organelles, Polytene and Giant chromosomes from electron micrographs and standard publications.
2. Study of mitosis by squash technique.
3. Simple problems of monohybrid, dihybrid ratios and factor interactions
4. Construction of chromosome map – three point test cross

## TEXT BOOKS

1. Singh S.P. & Tomar B.S 1996 – Cell Biology – Rastogi Publication Meerut
2. Rastogi S.C. 1992 – Cell Biology – Tata McGraw Hill Publishing Company, New Delhi.
3. Gupta P.K 2000 – Genetics – Rastogi Publication Meerut
4. Meyyan R.P. 2000 Genetics – Saras Publications, Nagarkoel
5. Sambamurthy A.V.S.S. 2005 – Genetics, Narosa Publications New Delhi

## REFERENCE BOOKS

1. Prescott. D.M – Cells , Jones and Bartlet Publishers
2. De Robertis E.D.P & De Robertis E.M.F., 1980 – Cell and Molecular Biology , Holtsauders International Editions, Philadelphia
3. Strickberger, M.W. 1976 – Genetics , Mac Millan Publishing Co. Inc., New York
4. Gardner, E. J. & Snusted, D.P 1984 – Principles of Genetics , John Wiley & Sons, New York
5. Winchester, A. M. 1958 – Genetics , Oxford & FBH Publishing house, New Delhi.

## WEB RESOURCES

<https://www.easybiologyclass.com/cytology>

<https://www.easybiologyclass.com/genetics>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand the different cell organelles	Understand
CO2	appreciate the structure of nucleic acids and identify the types of cell divisions	Analyse
CO3	understand the inheritance and interaction between genes	Apply
CO4	construct the chromosomal map	Apply
CO5	understand the gene frequency and gene pool in a population	Understand

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M		S	S		S		S	M
CO2	S	S	S	S	S		S		S	M
CO3	S	S	M	S	S		S		S	
CO4	S	S	S	S	S		S		S	S
CO5	S	S	S	S	S		S	M	S	S

S- Strong; M-Medium; L-Low



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(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**CORE COURSE IX – 21UBY09- CYTOLOGY AND GENETICS**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. Who coined the phrase “Power house of the cell”?  
(a) Albert von Kolliker                      (b) Philip Siekevitz.  
(c) Albert Szent-Gyorgyi.                  (d) Hans Adolf.
2. Which is precursor of chloroplast?  
(a) Etioplasts.                                  (b) Elaioplasts.  
(c) Proteinoplasts                              (d) Amyloplasts.
3. Cell envelope consists of which content?  
(a) Plasmodesmata.                              (b) Plasma membrane.  
(c) Cell wall.                                      (d) All of the above.
4. The term chromosome was coined by \_\_\_\_\_.  
(a) Sutton    (b) Boveri  
(c) Waldeyer                                      (d) Hoffmeister
5. Lampbrush chromosomes occur in \_\_\_\_\_.  
(a) Oocytes                                        (b) Cancer cells  
(c) Lymph glands                                (d) Salivary glands
6. The meiotic division takes place in  
(a) Meristematic cells                          (b) Conductive cells  
(c) Reproductive cells                          (d) Vegetative cells
7. The tendency of an offspring to resemble its parent is known as  
(a) Variation                                      (b) Heredity  
(c) Resemblance                                (d) Inheritance
8. Who is known as the “Father of Genetics”?  
(a) Morgan                                        (b) Mendel  
(c) Watson                                         (d) Bateson
9. Which of the following statements is true regarding the “law of segregation”?  
(a) Law of segregation is the law of purity of genes  
(b) Alleles separate from each other during gametogenesis  
(c) Segregation of factors is due to the segregation of chromosomes during meiosis  
(d) All of the above
10. Homozygosity and heterozygosity of an individual can be determined by  
(a) Back cross                                    (b) Self-fertilization  
(c) Test cross                                      (d) All of the above

11. Alleles are  
 (a) Alternate forms of genes (b) Linked genes  
 (c) Chromosomes that have crossed over (d) Homologous chromosomes
12. 9:7 ratio in the F<sub>2</sub> generation represents  
 (a) Incomplete dominance (b) Co-dominance  
 (c) Epistasis (d) Complementary interaction
13. Who proved that DNA was indeed the genetic material through experiments?  
 (a) Alfred Hershey and Maclyn McCarty  
 (b) Oswald Avery and Maclyn McCarty  
 (c) Oswald Avery and Martha Chase  
 (d) Alfred Hershey and Martha Chase
14. This condition is essential for a population to be in the Hardy-Weinberg equilibrium  
 (a) random mating (b) no mutations  
 (c) large population (d) all of these
15. This statement describes the Hardy-Weinberg law the best  
 (a) it is impossible to predict expected allele frequencies mathematically  
 (b) in large populations, dominant alleles become more prevalent  
 (c) allele frequency changes over a period of time in a large population  
 (d) mechanism of inheritance in a large population does not change allele frequency

**PART – B (2 X 5=10 marks)**  
**(Answer any TWO questions)**

16. Explain the fluid mosaic model of plasma membrane.
17. Describe the ultra structure of chloroplast.
18. Write short notes on Polytene chromosome.
19. Write a brief account on double helix structure of DNA.
20. Describe the Mendel's 1st law.

**PART –C (5X10=50 marks)**  
**(Answer Any three questions)**

21. (a) Write an essay on Mitochondria?  
 (or)  
 (b). Explain about Cell wall.
22. (a) What is Mitosis? Explain it.  
 (or)  
 b) Explain about Meiosis cell division.
- 23(a) DNA as genetic material - Justify.  
 (or)  
 (b) Write an account of Co-dominance

24(a) What is gene map? Explain it.

(or)

(b). Discuss –Multiple alleles.

25(a) Write an account on cytoplasmic inheritance

(or)

(b). Write an essay on Chromosomes.

## SEMESTER-VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBY10	ECONOMIC BOTANY				5

### Objectives

1. To learn the diverse flora and its products.
2. To learn the importance of certain plants in the daily life of human.
3. To study about the economic use of certain plants.

### UNIT I

Scope of Economic Botany; Plants and Human Welfare; Origin of Cultivated Plants, Foods from Leaves, Stems and Roots. Food Adjuncts, economic importance of lower plants (Algae, Fungi, Lichens and Bryophytes).

### UNIT II

Food Plants- Binomial, Family, Plant Part used and Cultivation of the following: Cereals (Wheat and Maize), Millets (Finger Millet and Pearl Millet), Pulses (Green Gram and Horse gram).

### UNIT III

Binomial, Family, Plant Part used and Cultivation of the following: Spices and Flavouring Materials: Turmeric and Pepper. Fumigatories and Masticatories: *Tobacco* and *Betelvine* Dye Yielding plants: *Henna* and *Indigofera*

### UNIT IV

Fibre Yielding plants: Origin, Binomial, Family, Morphology, Cultural Requirements, Uses of *Flax* and *Hemp*, Sugar Yielding Plants: Sugarcane, Processing of sugar from sugarcane.

### UNIT V

Oil Yielding Plants: *Pongamia*; Biodiesel from *Pongamia* oil, Forest Products: Importance of Wood, Structure of Wood, Uses of Wood, Timber Plants: Distribution, Binomial, Ecology and quality of wood: Teak and Rose wood. Important uses of Resins and Canada balsam.

## **TEXT BOOKS**

1. Annie & Kumaresan, Morphology of Angiosperms, Taxonomy and Economic Botany, Saras Publication, Nagercoil, 2018.
2. Pandey, B.P. Economic Botany, S. Chand & Comp. Ltd., New Delhi, 7<sup>th</sup> Edition 2007.
3. Dr. Pooja, Economic Botany, Discovery Publishing House, New Delhi, 2005.
4. Dr. V. Verma, A Textbook of Economic Botany, Ane Books Pvt Ltd., New Delhi, 2009.

## **REFERENCE BOOKS**

1. Albert F. Hill. Economic Botany, Mc Graw Hill. 1937.
2. Beryl Brintnall Simpson & Molly Conner- Ogoraly, Economic Botany, Plants in our World, Mc. Graw Hill International Editions, 1986.
3. Kochhar S.L. Economic Botany A Comprehensive Study, 5<sup>th</sup> Edition Cambridge University Press.2016.
4. Kochhar S.L. Economic Botany In the Tropics, 3<sup>rd</sup> Edition Macmillan Publishers India Ltd., Delhi.2009.
5. Krishnamurthy, T. Minor Forest Products of India, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi 1993.

## **WEB RESOURCES**

[http://www.surendranathcollege.org/new/upload/JAYANTA\\_SIKDARChapter%2012020-03-26Economic%20Botany%20Chapter%201.pdf](http://www.surendranathcollege.org/new/upload/JAYANTA_SIKDARChapter%2012020-03-26Economic%20Botany%20Chapter%201.pdf)

<https://greenharvest.com.au/Plants/Information/Turmeric.html>

## COURSE OUTCOME

On successful completion of the course, students will be able to

<b>S. NO.</b>	<b>COURSE OUTCOME</b>	<b>BLOOM'S VERB</b>
CO1	Generalize the concept of Economic Botany	Understand
CO2	Develop critical understanding of cultivation of food crops	Apply
CO3	Assess the diversity of important plants	Evaluate
CO4	Develop the idea of manufacturing process	Create
CO5	Determine the potentiality of forest products	Apply

## MAPPING WITH PROGRAM OUTCOME

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	L	M				S			M	S
<b>CO2</b>	M	S				S		L	S	S
<b>CO3</b>	M	S				S			S	M
<b>CO4</b>	L	S							M	S
<b>CO5</b>	S						L		S	S

S- Strong; M-Medium; L-Low

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**CORE COURSE X – 21UBY10 – ECONOMIC BOTANY**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. The major food producer of the world belongs to the family  
a) Gramineae b) Cruciferae c) Leguminosae d) Malvaceae
2. In lower forms, sea weeds represent  
a) Algae b) fungi c) Lichens d) Bryophytes
3. The vegetable obtained from root  
a) Beetroot b) Cauliflower c) Cabbage d) Onion
4. Maize referred as  
a) Root crops b) Legumes c) Cereal crops d) Fibre crops
5. Which of the crop is not a pulse  
a) cow pea b) cluster bean c) green gram d) horse gram
6. The common cereal millet crop grown in arid climate is  
a) sorghum b) maize c) pearl millet d) paddy
7. The useful part of tobacco is  
a) stem b) root c) leaf d) flower
8. The major constituent of Turmeric is  
a) Cineole b) Camphor c) Camphene d) Curcumin
9. The dye yielding plant *Indigofera* belongs to  
a) Malvaceae b) Piperaceae c) Fabaceae d) Solanaceae
10. The sugar cane residue after extraction of juice is  
a) Bagasse b) Molasses c) Alcohol d) Raw sugar
11. *Flax* fibres obtained from  
a) seeds b) fruit c) stem d) leaf

12. Sugar cane is a kind of  
a) grass b) orchid c) vine d) liana
13. The age of tree by counting the annual rings is called as  
a) chronology b) countology c) dendrology d) dendrochronology
14. The tree which produce soft wood is  
a) Shisham b) Teak c) Sal d) Chir
15. *Karanja* is the vernacular name of  
a) *Azadirachta* b) *Pongamia* c) *Melia* d) *Tectona*

**PART – B**  
**(Answer any TWO questions)**

**(2 X 5=10 marks)**

16. Write about food adjuncts.
17. Comment on the uses of cereals.
18. Briefly explain the botanical description of Pepper
19. What is flax? Explain its importance.
20. Describe the structure of wood.

**PART – C**  
**(Answer ALL the questions)**

**(5 X 10=50 marks)**

- 21 a) Give an account of economic aspects of Algae and Lichens.  
(or)  
b) Roots as source of food – Discuss.
- 22 a) Bring out the various cultural requirements needed for the cultivation of pearl millet.  
(or)  
b) Explain the Binomial, family, cultivation and use of Green gram.
- 23 a) Write an essay on cultivation practices followed in turmeric crops.  
(or)  
b) Describe the *Henna* cultivation with its useful part.
- 24 a) Explain the measures used in growing Hemp.  
(or)  
b) Elaborately describe the steps involved in sugar manufacturing.
- 25 a) Describe the binomial, quality and uses of Teak wood.  
(or)  
b) What is Biodiesel? Explain how they are produced from *Pongamia*.



## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM5	MEDICINAL BOTANY			-	5

### Objectives

1. To understand the various systems of Indian medicines.
2. To Know the pharmaceutical and curing various diseases.
3. To know the cultivation of medicinal plants.

### UNIT I

Scope and history of medicinal plants. Indian systems of medicines – Ayurvedha, Unani, Siddha and homeopathy . Classification of crude drugs.

### UNIT II

Drugs from roots (*Catheranthus roseues* and *Hemidesmus indicus*). Drugs from bark (*Cinchona officinalis*). Drugs from stem (*Santalum album*) and underground rhizome (*Zingiber officinale*)

### UNIT III

Drugs from leaves (*Aloe barbadensis*, *Eucalyptus globulus*, *Ocimum sanctum* and *Senna angustifolia*). Drugs from flower *Eugenia (Syzygium aromaticum)*. Drugs from fruit (*Limonia acidissima*).

### UNIT IV

Drugs from seeds (*Coriandrum sativum* and *Trigonella foenum graecum* ). Drugs used in Dengue fever (*Antdrographis paniculata* and *Carica papyra*). Drugs used in disorders of gastrointestinal tract (*Ricinus communis*) and cardiovascular drugs (*Digitalis purpurea*).

### UNIT V

Cultivation of medicinal plants in India. Breeding methods applied to medicinal herbs, Biomedicine through plant tissue culture - Drug adulteration - Methods of drug evaluation.

## TEXT BOOKS

1. Arumugam, K.R and N. Muruges Text Book of Pharmacognosy, Sathya publishers.
2. Bhattacharjee, S.K., 1988. Hand Book of Medicinal Plants, Pointer publishers, Jaipur.
3. Purohit and vya, 2004. Medicinal plant cultivation, Agrobios publication. Jodhpur.
4. Wallis, T.E. Text Book of Pharmacognosy. C.B.S. Publishers and Distributors.
5. Muligai Maruthuvam (Tamil) 1995 Thirugagnam. Selvi Pathipakam. Trichy.

## REFERENCE BOOKS

1. Dhavan, B.N. 1986, Ayurvedic Research on Medicinal Plants in India INSA, New Delhi.
2. Gokhale, S.B.,M C.K. Kokate and A.P. Purohit. Pharmacognosy Nirali Praksahan.
3. S.K.Jain, 1987. A Manual of Ethnobotany. Scientific Publishers –Jodhpur.
4. S.S.Handa & V.K. Kapoor. Pharmacognosy.
5. Agarwal, 1985 Drug plants in India, Kalyani. Publishers, Ludhiyana.
6. S.K. Jain, 2001, Medicinal Plants –National Book Trust –New Delhi.

## WEB RESOURCES

<https://www.easybiologyclass.com/medicinalplants>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S.NO	COURSE OUTCOME	BLOOM'S VERB
CO1	System and classification of medicinal plants	Remember
CO2	Explain drug yielding plants	Understand
CO3	Medicinal uses of plant parts	Analyze
CO4	Drug preparation of methods	Analyze
CO5	Cultivation of medicinal plant and commercial values	Remember

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S		S				S	S
CO2	S	S	S		S				S	
CO3	M	S	S		M				S	
CO4	S	S	S		S		M			
CO5	S	S	S		M		S		S	M

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**MAJOR BASED ELECTIVE COURSE V – 21UBYM5 – MEICINAL BOTANY**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. Tridosha theory is related to  
a) Unani                      b) Homeopathy                      c) Chinese                      d) Ayurveda
2. The word Ayurveda means  
a) Science of life                      b) History of people  
c) Science of medicines                      d) knowledge of crude drugs
3. Evaluation of crude drugs means  
a) Confirmation of identity                      b) Determination of quality of purity  
c) Detection of Nature of adulteration                      d) All the above
4. The botanical name of *Vinca* is  
a) *Brassica juncea*                      b) *Catharanthus roseus*  
c) *Rauwolfia serpentina*                      d) *Withania somnifera*
5. *Chinchona* is used to treat  
a) Dyspepsia                      b) Malaria                      c) Cancer                      d) Respiratory disorder
6. Ginger is propagated by  
a) Tuber                      b) Rhizome                      c) Corms                      d) Seeds
7. Eucalyptus belonging to the family  
a) Alseuasmaceae                      b) Myrtaceae  
c) Manchantiaceae                      d) Santalaceae
8. What is the chief chemical constituent of Aloe.  
a) Vincristine                      b) Protopine                      c) Strychnine                      d) Emodine
9. Useful part of the *Syzygium aromaticum* is  
a) Modified root                      b) seeds                      c) flower bud                      d) axillary bud
10. What is the binomial name of Coriander  
a) *Bicoriantum clint*                      b) *Cilontrum coriand*  
c) *Coriandrum sativum*                      d) *Trigonella foenum gracum*
11. *Ricinus communis* comes under the family  
a) Lamiaceae                      b) Myrtaceae                      c) Euphorbiaceae                      d) Acanthaceae
12. Which of the following is used for Dengue  
a) *Carica papaya*                      b) *Digitalis lanata*  
c) *Ricinus Communis*                      d) *Trigonella foenum gracum*
13. Substitution of a genuine crude drug with substandard one is called as  
a) Substitution                      b) Mixing                      c) Adulteration                      d) Allied drugs
14. An organoleptic evaluation the drugs are evaluated through  
a) Chemical constituents                      b) Therapeutic uses  
c) Gross morphology                      d) Histological characters

15. Adulteration of wood powder in red chilli powder is identified by

- a) Microtome
- b) Titrimetry
- c) Microscopy
- d) Loss on drying

**PART – B**

**(2 x 5 = 10 Marks)**

**(Answer any TWO questions)**

- 16. Write short notes on Ayurveda.
- 17. Briefly explain the morphology and therapeutic uses of Ginger.
- 18. List out the chemical constituent of *Aloe vera* and *Ocimum*.
- 19. Briefly write on drugs from seeds.
- 20. Explain about the plant tissue culture as source of biomedicine.

**PART – C**

**(5 x 10 = 50 Marks)**

**(Answer ALL the questions)**

- 21a) Give an account on classification of crude drugs.  
(or)
  - b) Write an essay on Indian system of medicine.
- 22a) Describe the drugs obtained from bark.  
(or)
  - b) Describe the pharmacological activities of *Catharanthus roseus*.
- 23 a) Explain the histology and the chemical composition of Eucalyptus.  
(or)
  - b) Write on account on the drugs from flowers and fruits.
- 24 a) Give a detail account on drugs for Dengue fever.  
(or)
  - b) Explain the drugs used in disorders of gastrointestinal tract.
- 25 a) Write an essay on cultivation of medicinal plants.  
(or)
  - b) Give a detailed account on methods of drug evaluation.

**SEMESTER - V**  
**SKILL BASED ELECTIVE COURSE – V -21UBYM6**

**BIOFERTILIZERS**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM6	BIOFERTILIZERS			-	5

**Objectives**

1. To understand the utilization of the microbes as fertilizers.
2. To expose students to apply biofertilizers in fields and to facilitate self-employment.

**UNIT I**

Biofertilizers- Definition and types, Importance of Biofertilizers. General account about the microbes used as Biofertilizer–*Rhizobium* –isolation, identification, mass cultivation, carrier based inoculants, Actinorhizal symbiosis.

**UNIT II**

*Azospirillum*, isolation and mass cultivation –carrier based inoculants, associative effect of different microorganisms.*Azotobacter* –classification, characteristics –crop response to *Azotobacter* inoculums, maintenance and mass cultivation.

**UNIT III**

Cyanobacteria (Blue green algae), *Azolla* and *Anabaena*- *Azolla* association, nitrogen fixation, Blue Green Algae and *Azolla* in rice cultivation.

**UNIT IV**

Mycorrhiza - Definition, AM-association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield –colonization of AM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

**UNIT V**

Organic farming –Green manuring and organic fertilizers, Recycling of Bio-degradable municipal, agricultural and industrial wastes –Biocompost making methods, types and method of vermicomposting –field Application.

### **TEXT BOOKS**

1. Dubey, R.C., 2005 A text book of Biotechnology S.Chand& Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.

### **REFERENCE BOOKS**

1. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
2. Subba Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
3. Vayas, S.C, Vayas, S and Modi, H.A. 1998 Bio-fertilizers and organic Farming AktaPrakashan, Nadiad.

### **WEB RESOURCES**

<https://www.biologydiscussion.com/essay/bio-fertilizers-types-and-importance-of-bio-fertilizers/1901>

<https://www.biologydiscussion.com/fungi/mycorrhiza-meaning-types-and-role/46596>

### **COURSE OUTCOME**

On successful completion of the course, students will be able to

<b>S. NO.</b>	<b>COURSE OUTCOME</b>	<b>BLOOM'S VERB</b>
CO1	Develop their understanding on the concept of bio-fertilizer	Apply
CO2	Compare the response and maintenance of Biofertilizers	Analyze
CO3	Identify the different forms of biofertilizers and their uses	Remember
CO4	Develop the integrated management for better crop production	Apply
CO5	Produce the Green manuring and organic fertilizers	Apply

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M				S	L	S	S	S
CO2	S	S		L	M	S	L	S	S	S
CO3	S	S	L		M	S		L	S	S
CO4	S	S	M		L	M	L	M	S	S
CO5	S	S	M		L	M	L	M	S	S

S- Strong; M-Medium; L-Low



B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**MAJOR BASED ELECTIVE COURSE VI – 21UBYM6 – BIOFERTILIZERS**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. Preparations with live cells for efficient strains of nitrogen fixing is known as  
a) Fertilizers b) Biofertilizers c) Synthetic fertilizers d) Chemical fertilizers
2. *Rhizobium* is a  
a) Bacterial biofertiliser b) fungal biofertiliser c) Algal biofertiliser d) Actinomycetes biofertiliser
3. The medium used to isolate *Rhizobium* from the nodule is  
a) PDA b) MS c) YEMA d) N6
4. Which of the following is commonly used as a Nitrogen fixer in paddy fields  
a) *Frankia* b) *Oscillatoria* c) *Azospirillum* d) *Rhizobium*
5. An aerobic nitrogen fixing bacterium is  
a) *Azotobacter* b) *Clostridium* c) *Rhodospirillum* d) *Rhodopseudomonas*
5. Carrier based inoculum are supplied to soil through  
a) seeds b) cuttings c) spraying d) sprouts
6. The most available source of nitrogen to plants are  
a) amide b) ammonia c) nitrate d) ammonia nitrate
7. BGA fix atmospheric Nitrogen due to the presence of enzyme  
a) Lipase b) Cholinestrace c) Nitrogenase d) Endonuclease
8. *Azollais*  
a) Algae b) Gymnosperms c) Angiosperms d) Pteridophyte
9. The symbiotic relationship between fungi and roots of higher plants is called  
a) Lichen b) Mycorrhiza c) Helotrism d) mutualism
10. The characteristic feature of VAM is it penetrates plant cell wall and form  
a) spores intracellularly b) arbuscules c) haustoria d) massive spore forming structures
11. The fungal partner in VAM belongs to the class  
a) Basidiomycetes b) Ascomycetes c) Zygomycetes d) Glomeramycetes

12. The practice of ploughing the soil using green plant parts and improving the fertility is  
a) green manuring b) FYM c) Inorganic manuring d) synthetic manuring
13. The use of earthworms in composting is  
a) vermicompost. b) compost c) garbage d) incineration
15. Decomposition of waste by Bacteria is  
a) Radioactive waste b) food c) Ash d) Nanoparticles

**Section –B (2X5=10 Marks)**  
**(Answer Any Two questions)**

16. Describe the isolation, identification and mass cultivation of *Rhizobium*.
17. Discuss the method of mass cultivation of *Azotobacter*.
18. What are the methods of applications of BGA in rice field?
19. How will you isolate VAM fungi from Rhizosphere soils?
20. Discuss about the methods of Biocompost making, types and method of Vermicomposting.

**Section –C (5X10=50 Marks)**  
**(Answer ALL the questions)**

- 21a) Give an account on soil microorganisms.  
(or)  
b) Briefly explain nitrogen –fixing organism.
- 22a) How will you isolate *Azospirillum* from paddy roots?  
(or)  
b) What are the carriers used for inoculum production of *Azospirillum*?
- 23a) Explain the characteristics of Blue green algae.  
(or)  
b) Write an account on morphological characteristics of *Azolla*.
- 24 a) Give an account on Taxonomy of VAM fungi.  
(or)  
b) Write short notes on phosphate mobilization.
- 25a) Write short notes on Green manuring and organic fertilizers  
(or)  
b) Briefly explain the recycling of biodegradable wastes

## SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYM7	AGRICULTURAL MICROBIOLOGY			-	5

### Objectives

1. To discuss the role of microbes in agriculture.
2. To understand the microbial diseases in crop plants and its control measures.

### UNIT I

General characterization and classification of soils – soil microflora –Bacteria, fungi, actinomycetes, algae, protozoa. Rhizosphere and Non-Rhizosphere concept. Role of Rhizosphere microorganisms in improving soil fertility.

### UNIT II

Biological Nitrogen fixation – Symbiotic and Non – Symbiotic bacteria – *Rhizobium* and *Azospirillum*, Blue Green Algae and Phosphate solubilizing bacteria and fungi.

### UNIT III

Bio-geochemical role of soil microbes – Carbon cycle –Nitrogen cycle and Phosphorous cycle. Microorganisms in air –sources –types. Microbes in water –waste water treatment and recycling.

### UNIT IV

Decomposers –Role of microorganisms in the decomposition of organic matter –solid waste disposal –composting, biodegradation, bioremediation, Genetically Engineered Microorganisms (GEMS)and Biopesticides.

### UNIT V

Microbial diseases in crop plants – Host, causal agent, symptoms, disease cycle and control measures of the following diseases. Bacterial disease: Wilt disease of potato, Fungal disease: Powdery mildew of cereals, Viral disease : Tungro disease of Paddy .

## **TEXT BOOKS**

1. Kumaresan, V. 2004-Biotechnology 2004 –Saras Publication, Nagercoil.
2. Rangaswami, G. & Bhagyaraj, D.J. 1993. Agricultural Microbiology –Prentice Hall of India (P) Ltd., New Delhi.
3. Chandrasekaran. P. 1993 –Nunnuriyal (Tamil) T.K. Pathipagam, Pudukkottai.
4. Sharam, P. 1996 –Plant Pathology –Rastogi Publications, Meerut.
5. Rangaswami, G. & Mahadevan, A. 2002 –Diseases of crop plants in India - Prentice Hall of India (P) Ltd., New Delhi.

## **REFERENCE BOOKS**

1. Pelzar M.J Chan, E.C.S.P. Kreig, N.P. 1993 Micro Biology Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Subbarao, N.S. 1999 –Microbiology –Oxford & IBH Publishing Co., (P) Ltd.,
3. Gunasekaran, 1995 –Laboratory manual in Microbiology –New Age International Publications, New Delhi, Bangalore, Madras.
4. Pandey B.P. 1999 –Plant Pathology (Pathogens & Plant disease) S. Chand & Co., New Delhi.
5. Chatterjee P.B. 1997 –Plant Protection Techniques –Bharathi Bhawan, Patna.

## **WEB RESOURCES**

[https://www.fehd.gov.hk/english/pestcontrol/images/Pestnews\\_45e\(text\).pdf](https://www.fehd.gov.hk/english/pestcontrol/images/Pestnews_45e(text).pdf)

<https://www.britannica.com/science/biogeochemical-cycle>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Classify the Soil microflora	Analyse
CO2	Demonstrate Nitrogen fixation by the action of Microbes	Apply
CO3	Develop critical understanding of cycling of minerals in ecosystem. Treatment of waste water	Create
CO4	Employ the Composting and bioremediation of organic matter	Apply
CO5	Identify the microbial disease associated with plants	Remember

## MAPPING WITH PROGRAMME SPECIFIC OUTCOME

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M	M		S	S		S	S	S
CO2	S	S			M	S		S	M	S
CO3	S	L	L		M	M		S	S	S
CO4	S			S		M	M	S	S	S
CO5	S	M	L		L	S		S	S	S

S- Strong; M-Medium; L-Low

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**MAJOR BASE ELECTIVE COURSE IV – 21UBYM7 – AGRICULTURAL  
MICROBIOLOGY**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. The Root Zone is known as
  - a) Phyllosphere b) Rhizosphere c) Non- Rhizosphere d) Atmosphere
2. *Rhizobium* is a
  - a) Bacterial biofertiliser b) fungal biofertiliser c) Algal biofertiliser
  - d) Actinomycetes biofertiliser
3. A large percentage of rhizosphere is made up of
  - a) short positive rods b) Gram positive rods c) spore forming bacteria d) Arthrobacter group
4. The nodule forming microorganism is
  - a) Actinomycetes b) *Escheria coli* c) *Salmonella typhii* d) *Rhizobium*
5. Diazotrophs fix atmospheric
  - a) nitrogen b) carbon c) sulphur d) phosphorous
6. Heterocysts are present in
  - a) *BGA* b) *Rhizobium* c) *VAM* d) *Anabaena*
7. Nitrogen is absorbed by plants in the form of
  - a) ammonia b) sulphates c) chlorites d) carbonates
8. Conversion of ammonia to nitrite and then to nitrates is called as
  - a) ammonification b) Denitrification c) Assimilation d) nitrification
9. Trickling filter is
  - a) Physical process b) Biological process c) chemical process d) abiotic process
10. The process of incineration of solid waste is
  - a) sedimentation b) flocculation c) burning d) landfilling
11. *Bacillus thuringiensis* is used for designing novel
  - a) Biofertilisers b) Biomineralization c) Bioinsectidal plants d) Biometallurgical techniques
12. Humus consist of
  - a) partially decomposed matter b) surfactants c) pollutants d) pesticides
13. Wilt disease of potato is caused by
  - a) *Pseudomonas solanocearum* b) *Aspergillus flavus* c) *Xanthomonas* d) *Azotobacter*

14. Powdery mildew is caused by

- a) Bacteria b) Fungi c) Lichen d) Mosses

15. Yellow spots appear on the leaf surface is due to

- a) Tungro disease b) Blight disease c) Whip smut disease d) Crown gall

**Section – B** (2X5=10 Marks)  
**(Answer Any Two questions)**

16. Bring out the various layers of soil profile.

17. Comment on VAM in phosphate solubilization.

18. Explain the cyclic process of Nitrogen between the biotic and abiotic components.

19. Describe the process of composting.

20. Describe the symptoms of viral disease with reference to paddy.

**Section C** (5x10=50 Marks)  
**(Answer ALL the Questions)**

21a) Explain the role of soil microflora in maintaining the fertility of soil.

(OR)

- b) List out the microbiota of Rhizosphere.

22a) Write an account on symbiotic Nitrogen Fixation.

(OR)

- b) Explain the action of Blue Green Algae on the growth of the plants.

23a) Discuss the steps involved waste water treatment process.

(OR)

- b) Enumerate the various sources of microbiology of air.

24a) Explain how solid waste is disposed in an environment?

(OR)

- b) Describe the usage of Biopesticides in combating various diseases.

25a) Give a detailed note on Causal agent, symptoms, disease cycle of Fungal disease of cereals.

(OR)

- b) What do you mean by Disease cycle of potato? Explain in detail.

## SEMESTER VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
21UBYS4	PLANT PROTECTION			-	5

### Objectives

1. To learn the symptoms, etiology and control measures of plant diseases in India
2. To protect the crops and enhance the yield production.

### UNIT I

Damage to crops of India by insects, Nematodes, Rodents, Fungi, Bacteria and viruses a general outline; weed control – physical and chemical methods

### UNIT II

Types of plant diseases and causal agents. Insect transmission of bacteria and viruses. A general account of preventive measures of plant diseases including plant protection and quarantine measures. Legislations in plant protection, Plant protection appliances –Sprayers, Dusters. Biological Control of Plant diseases.

### UNIT III

Study of symptoms, etiology and control measures of the following diseases: Damping off of seedling, Red rot of sugarcane, Blast of paddy, Black rust of wheat, Tikka disease

### UNIT IV

Study of symptoms, etiology and control measures of the following diseases : Wilt of cotton, Bacterial blight of rice, Canker disease of citrus, Boll rot, Leaf spot and Black arm diseases of Cotton.

### UNIT V

Nature of plant virus, causal organism, symptoms, control measures of viral diseases: - Tobacco mosaic, Bunchy top of banana, Vein clearing diseases of Bhendi.

### PRACTICAL

1. A detailed study of diseased specimens included in the theory.
2. Identification of various plant protection application mentioned in the syllabus.



## TEXT BOOKS

1. Bap Reddy 1968, plant protection in India. Allied publishers.
2. Chandhury & Majid's 1954, Handbook of plant protection, Department of agriculture Assam.
3. Mukundan , T.K, plant protection , principles and practice , Asia publishing house, Bombay.
4. Pandey ,B.P A text book of plant pathology, S.Chand and co, New Delhi.
5. P.Chandrasekar a textbook fungus , plant pathology, plant protection T.K.Publishers Pudukootai.
6. Tmt. R.Indira The tamilnadu text books of plant viruses.
7. பூஞ்சை தாவர நோயியல் பயிர் பாதுகாப்பு. பா. சந்திரசேகரன்

## REFERENCE BOOKS

1. Mukurdan T.K Plant protection, principles and practice Asia publishing house.
2. Krishnamurthy (1963) control pests and disease on fruit culture in India. I.C and K. Monograph.
3. Rangaswami.G(1972) Disease of crop plant of India prentice hall India.
4. Rangaswami.G(1974) Bacterial plant disease of India asia publishing house , Bombay.
5. Singh ,R.S. disease of vegetable crops , oxford and IBH publishing company New Delhi.

## WEB RESOURCES

<https://www.easybiologyclass.com/plantpathology>

## COURSE OUTCOME

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	control the weeds through physical and chemical methods	Analyse
CO2	understand the preventive and quarantine measures of plant diseases	Remember
CO3	understand the symptoms, etiology and control measures of fungal diseases	Understand
CO4	understand the symptoms, etiology and control measures of bacterial diseases	Understand
CO5	Identify the viral diseases associated with plants	Remember

### MAPPING WITH PROGRAMME SPECIFIC OUTCOME

<b>Cos</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	S		M	S		S	M	S	S	S
<b>CO2</b>	S		M	L		S	M	S	S	S
<b>CO3</b>	S		M	L		S	M	S	S	S
<b>CO4</b>	S		M	L		S	M	S	S	S
<b>CO5</b>	S		M	L		S	M	S	S	S

S- Strong; M-Medium; L-Low

B.Sc., Botany Degree Examination  
(For the Candidates admitted from the academic year 2021 – 2022 onwards)  
**SKILL ENHANCEMENT COURSE IV – 21UBYS4 – PLANT PROTECTION**

**Time : 3 Hrs**

**Max: 75 Marks**

**PART – A**

**(15 x 1 = 15 Marks)**

(Answer all the questions)

1. Which one of the following is a parasite?  
a) Virus b) Bacteria c) Nematodes d) Fungus
2. Choose an example for rodents.  
a) Rat b) Pig c) Butterfly d) Monkey
3. Which machine is used to spray fertilizer to cover large areas in short span of time?  
a) Tractor b) Helicopter c) Cylinder d) Duster
4. International plant protection organization was established in the year  
a) 1950 b) 1951 c) 1947 d) 1952
5. Which one of the following is duster?  
a) Rotary duster b) Hand sprayer c) Bucket d) Compression sprayer
6. 2,4-D is a  
a) Pesticide b) Fungicide c) Herbicide d) Bacteriocide
7. Red rot of sugarcane is caused by  
a) *Xanthomonas citri* b) *Pseudomonas crysae* c) *Colletotrichum falutem*  
d) *Cercospora personata*
8. *Pythium* species causes  
a) Red rot of sugarcane b) Blast of paddy c) Tikka disease d) Dampling off seedlings
9. Uredospores are produced by  
a) *Puccinia* species b) *Pythium* species c) *Pyrecloria* species d) *Pseudomonas* species
10. *Phyllocnistis citrella* is a vector that spreads  
a) Citrus cancer b) Blast disease of paddy c) Wilt of potato d) Wilt of cotton
11. Which of the following bacteria enters through hydathodes  
a) *Xanthomonas oryzae* b) *Pseudomonas solanacearum* c) *Xanthomonas citri*  
d) *Pseudomonas malvacearum*
12. Tyloses in plant causes  
a) rust b) smut c) wilt d) chlorosis
13. Tobacco mosaic disease caused by  
a) TMV b) Banana virus c) Hibiscus virus d) Tungro virus

14. Which of the following viral disease is transmitted by Aphids  
a) Vein clearing disease of Bhendi    b) Tungro disease of rice    c) Bunchy top of banana  
d) Tobacco mosaic disease

15. Bemisia tabaci causes  
a) Vein clearing disease of Bhendi    b) Tungro disease of rice    c) Bunchy top of banana  
d) Tobacco mosaic disease.

**PART – B**

**(2X5=25 Marks)**

(Answer any TWO questions)

- 16) Any two disease caused by nematodes.
- 17) Write a brief account on sprayers and its types
- 18) Give a brief account on Tikka diseases
- 19) Describe the bacterial blight of rice briefly
- 20) Write the causal organism and symptoms of Bunchy top of Banana

**PART –C**

**(5X10=50 Marks)**

(Answer ALL questions)

21a) Give an account of the fungal damages to crop in India.

(or)

b) Write an essay on damages in crop by viruses

22a) Give a brief account about preventive measures in plant diseases.

(or)

b) Explain the legislation in plant protection

23a) Write about the causal agent, disease spread, symptoms and control measures of paddy blast.

(or)

b) Discuss the symptoms etiology and control measures of red rot of sugarcane

24a) Explain citrus canker disease and its control measure.

(or)

b) Discuss the symptoms etiology and control measures of Wilt of potato

25a) Give an account of Tobacco mosaic disease.

(or)

b) Explain in detail about vein clearing diseases of Bhendi

**GOVT.ARTS COLLEGE, (AUTONOMOUS), SALEM-7**

**B.Sc., BOTANY**

(For the candidates admitted from 2021-2022 onwards)

Under CBCS Pattern

**MAJOR PRACTICAL III- 21UBYP3**

**(For the Theory Papers V, VI & VII)**

**Time: 3 hrs**

**Max: 60 Marks**

**Practical: 50 Marks**

**Record: 5 Marks**

**Herbarium: 5 Marks**

1. Refer 'A' and 'B' to their respective families point out the characters on which the identification is based at each level. (Diagram not necessary) (14 Marks)
2. Describe 'C' in technical terms. Draw diagram of the floral parts only Construct the floral diagram. Give the floral formula. (6 Marks)
3. Based on the morphological and anatomical characters assign D and E to their respective probable habitats. Draw suitable diagrams. Submit slides for valuation. (14 Marks)
4. Spot sight F and G (Name of the Genus and the family) (4 Marks)
5. Write the name of the genus, species, family and morphology of the useful parts of H and I. (8 Marks)
6. Write notes on J and K (4 Marks)

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**MAJOR PRACTICAL - IV- 21UBYP4**

**(For the Theory Papers VIII & IX)**

**Time: 3 hrs**

**Max: 60 Marks**

**Practical: 50 Marks**

**Record: 10 Marks**

1. Outline the procedure, apparatus and material required for investigating the physiological problem 'A' assigned. Set up the experiment. Tabulate the data obtained and report the results. Leave the set up for valuation. (15 Marks)
2. Make Acetocarmine preparation of 'B' squash (Any one stage). Draw diagram. (8 Marks)
3. Construct chromosome map with the data provided 'C' (8 Marks)
4. Solve the given genetic problems D & E (8Marks)
5. Draw and comment on the set up 'F' (5Marks)
6. Write notes on G & H and I (6Marks)