

GOVERNMENT ARTS COLLEGE

(AUTONOMOUS) SALEM-7

Reaccredited with B Grade by NAAC

(Affiliated to Periyar University)



M.Sc Botany

Regulations and Syllabus

(Effective from the Academic Year 2021-2022)

M.Sc. Botany

For the candidates admitted from 2021-2022 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 M.Sc., Botany degree programme the students will be able to

PSO No.	Programme Specific Outcome
PSO-1	Procure updated and quality knowledge in the specialized areas of Botany.
PSO-2	Acquire practical skills in plant diversity and related topics.
PSO-3	Identify plants applying classical and modern taxonomical skills.
PSO-4	Evolve entrepreneurial skills related to advanced fields of Botany.
PSO-5	Equip with various computational skills applied in the field of Bioinformatics.
PSO-6	Gain knowledge in organization of plants at gene, molecular, cellular and tissue level.
PSO-7	Design and carryout biological experiments, projects and interpret data providing meaningful solutions and recommendations.
PSO-8	Beware of environmental issues and live-in harmony with nature.
PSO-9	Utilize bioresources without profiteering motives.
PSO-10	Become competent enough in various analytical and technical skills related to Plant Science.

4. Programme Educational Objective

Students will

- Become competent and proficient in the specialized areas of Botany.
- Develop bio-entrepreneurial skills related to applied field of Plant Sciences.
- Emerge as a responsible citizen exhibiting social, cultural, environmental and moral values.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS)
SALEM -636007
M.Sc., BOTANY
Choice Based Credit System – Course Pattern
(For the students admitted from the year 2021-22 onwards)

S. No	Course Code	Title of the Course	Hours to be handled	Credits	Marks		
					I.A.	S.E.	Max
SEMESTER I							
1	21PBY01	Core Course – I : Algae, Fungi, Lichens and Bryophytes	5	5	25	75	100
2	21PBY02	Core Course – II : Pteridophytes, Gymnosperms & Palaeobotany	5	5	25	75	100
3	21PBY03	Core Course – III : Microbiology and Plant Pathology	5	5	25	75	100
4	21PBYP1	Core Practical – I : Extended to II semester	4	-	-	-	-
5	21PBYP2	Core Practical – II : Extended to II semester	4	-	-	-	-
6	21PBYM1	Major Based Elective Course-I: Plant Resources Utilization and Conservation	5	5	25	75	100
	21PBYM2	Major Based Elective Course-II: Agribusiness					
7	21RAC01	Research Acumen Course I: Intellectual Property Rights*	2	-	-	100	100
Total			30	20			500
Cum. Total				20			500
SEMESTER II							
1	21PBY04	Core Course – IV : Anatomy, Embryology and Microtechniques	5	5	25	75	100
2	21PBY05	Core Course – V : Cell, Molecular Biology and Genetics	5	5	25	75	100
3	21PBY06	Core Course – VI : Environmental Biology	5	5	25	75	100
4	21PBYP1	Core Practical – I : Extended from I semester	4	4	40	60	100
5	21PBYP2	Core Practical – II : Extended from I semester	4	4	40	60	100
6	21PBYM3	Major Based Elective Course-III: Forest Technology	5	5	25	75	100
	21PBYM4	Major Based Elective Course-IV: Horticulture					
7	21RAC02	Research Acumen Course II: Research Writing*	2	-	-	100	100
Total			30	28			700
Cum. Total				48			1200

***Non- credit course**

S. No.	Course Code	Title of the Course	Hours to be handled	Credits	Marks		
					I.A.	S.E.	Max
SEMESTER III							
1	21PBY07	Core Course - VII: Taxonomy of Angiosperms	5	5	25	75	100
2	21PBY08	Core Course - VIII : Plant Physiology & Biophysics	5	5	25	75	100
3	21PBY09	Core Course - IX : Plant Biotechnology	5	5	25	75	100
4	21PBYP3	Core Practical - III: Extended to IV semester	4	-	-	-	-
5	21PBYP4	Core Practical - IV: Extended to IV semester	4	-	-	-	-
6	21PBYCS	Interdisciplinary Course : Bioinformatics	2	2	25	75	100
7	21PBYPR	Project Work (to be continued in Semester IV)	5	-	-	-	-
Total			30	17			400
Cum. Total				65			1600
SEMESTER IV							
1	21PBY10	Core Course - X : Biochemistry and Biostatistics	5	5	25	75	100
2	21PBY11	Core Course - XI : Bioinstrumentation	5	5	25	75	100
3	21PBY12	Core Course - XII : Biofertilizer	5	5	25	75	100
4	21PBYP3	Core Practical - III : Extended from III semester	4	4	40	60	100
5	21PBYP4	Core Practical - IV : Extended from III semester	4	4	40	60	100
6	21RAC03	Research Acumen Course III: Research and Publication Ethics*	2	-	-	100	100
7	21PBYPR	Project Work	5	12	50	150	200
Total			30	35	-	-	800
Cum. Total				100			2400

Enrollment in a minimum of one PG Non-Engineering MOOC Courses relevant to their subject offered through SWAYAM platform is mandatory. The students can enroll after getting permission from the Head of the Department. The students must obtain 40% marks in internal assessment. Besides, a student who wishes to get course completion certificate must necessarily enroll and pass in the examination conducted through SWAYAM platform.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-I

CORE COURSE I - PAPER CODE : 21PBY01

ALGAE, FUNGI, LICHENS AND BRYOPHYTES

Objectives

1. To understand the salient features of Algae, Fungi, Lichens and Bryophytes
2. To study the structure and reproduction of various genera mentioned in the syllabus

UNIT I

ALGAE: Introduction - classification of algae (F.E.Fritsch and P.C.Silva) criteria used in algal classification (pigmentation, reserve food, fine structure of eyespot and flagella). Evolutionary trends in algae - Economic importance of Algae - Fossil Algae.

UNIT II

Occurrence, thallus organization, reproduction and life cycle of the following genera of Algae; Cyanophyceae – *Lyngbya*, Chlorophyceae – *Codium*, Charophyceae – *Nitella*, Xanthophyceae – *Botrydium*, Bacillariophyceae – *Cyclotella*, Phaeophyceae – *Padina*, Rhodophyceae – *Gracilaria*.

UNIT III

FUNGI: General characteristics of Fungi with reference to their occurrence and reproduction. Classification of Fungi by C.J. Alexopoulos and Mims (1979), spore dispersal mechanism in Fungi – Mycorrhizae fungi. Economic importance of Fungi.

UNIT IV

Detailed study of the following genera of Fungi; Mastigomycotina- *Phythium*, Zygomycotina - *Pilobolous*, Ascomycotina – *Erysiphe*, Basidiomycotina - *Ustilago* and Deuteromycotina – *Cercospora*.

LICHENS : General features, classification, distribution, thallus organization, reproduction and economic importance.

UNIT V

BRYOPHYTES : General features , origin, vegetative structure , reproduction and classification (Proskauer 1957) of bryophytes. A detailed study of the following genera ; Marchantiales – *Marchantia*, Jungermaniales – *Pellia*, Anthoceratales – *Anthoceros*, Sphagnales – *Sphagnum*, Funariales – *Funaria*. Economic importance of Bryophytes.

PRACTICALS

Study of Morphology and Anatomy of the vegetative and reproductive structure of the types mentioned in the syllabus. Certified record of work done in the laboratory to be submitted in the practical examination.

TEXT BOOKS

ALGAE

- 1.Fritsch F.E. The structure and reproduction of the Algae .vol .1 and 2 Vikas publications, New Delhi.
- 2.Pandey B.P 2001 College Botany volume 1 S.Chand & company Ltd New Delhi.
- 3.Sharman O.P 1989. Text book, Tata McGraw Hill of Algae publishing co- Ltd New Delhi.

FUNGI

- 1.Sharman O.P 1989. Text book, Tata McGraw Hill of Algae publishing co- Ltd New Delhi.
- 2.Rajni Gupta 2004. A Text book of Fungi , A.P.H. Publishing corporation , New Delhi.

LICHENS

- 1.Pandey, S.N. and Trivedi, P.S. A text book of Botany. 11th edition. Vikas Publishing House, New Delhi.
- 2.Sambamurthy, A.V.S.S. 2005. Text book of Algae. IK International, Publications, New Delhi.

BRYOPHYTES

1. Reddy, S.M. 1996. University Botany. I: Algae, Bryophyta and Pteridophyta. New Age International Publishers, New Delhi.
2. Chopra, R.N. 1998. Biology of Bryophytes. New Age International Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. Smith, G.M., 1986. Cryptogamic Botany - Algae and Fungi (I). Tata McGraw Hill Publishing Co. Ltd, New Delhi.
2. Smith, G.M., 1989. Cryptogamic Botany - Bryophytes and Pteridophytes (II). Tata McGraw Hill Publishing Co. Ltd, New Delhi.
3. Vashishta B.R. and A.K.Sinha., 2005. Fungi. S.Chand& Co. Ltd, NewDelhi.
4. Vashishta B.R., 1991. Algae. S.Chand& Co, New Delhi.
5. Vashishta B.R., 2001. Bryophytes. S.Chand& Co, New Delhi.

WEB RESOURCES

<https://www.easybiologyclass.com/algae-phycology>

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Identify various algae and understand the economic uses of algae	Understand
CO2	Understand the structure and life cycle of different group of algae	Remember
CO3	Classify different fungi based on morphology and reproduction	Apply
CO4	Differentiate different lichens	Apply
CO5	Classify various bryophytes and understand their economic uses	Apply

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

MODEL QUESTION PAPER - THEORY

M.Sc, Degree Examinations

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER -1 - PAPER CODE : 21PBY01

PAPER –I: ALGAE, FUNGI, LICHENS AND BRYOPHYTES

Time: 3 hrs

Maximum: 75 Marks

PART – A

(15x1 = 15 Marks)

1. Pigments Phycocyanin and Phycoerythrin present in the algae belongs to the class
(a)Cyanophyceae (b) Rhodophyceae (c) Both (d) None
2. Heterokontae is the characteristic feature of
(a) Cyanophyceae (b) Rhodophyceae (c) Phaeophyceae(d) Bacillariophyceae
3. Alginic acid is obtained from
(a) Red algae (b) Brown algae (c) Diatoms (d) Green algae
4. Naked Pyrenoid present in
(a) *Lyngbya* (b) *Codium* (c) *Nitella* (d) *Botrydium*
5. Secondary Protonema is produced in
(a) *Lyngbya* (b) *Codium* (c) *Nitella* (d) *Botrydium*
6. Tetraspores produced by
(a)*Gracilaria* (b) *Botrydium* (c) *Padina* (d) None of the above
7. The following is an example of Facultative Parasite
(a) *Pythium* (b) *Erysiphe* (c) *Ustilago* (d) *Fusarium*
8. Example of Ectomycorrhizal fungus
(a)*Glomus* (b) *Leccinum* (c) *Pythium* (d) *Ustilago*
9. Example of a Secondary metabolite produced by fungus
(a) Citric acid (b) Amylase (c) Penicillin (d) Protease
- 10.The following fungus is known as “shot gun fungus”
(a) *Pilobolus* (b) *Phythium* (c) *Fusarium* (d) *Ustilago*
- 11.Powdery mildew disease is caused by
(a) *Pythium* (b) *Erysiphe* (c) *Ustilago* (d) *Fusarium*
- 12.The following lichen produces Apothecium
(a) *Lecidea* (b) *Parmelia* (c) Both (d) None
- 13.Characteristic feature of *Marchantia* Thallus
(a) Gemma cup (b) Photosynthetic filaments (c) Dichotomous branching
(d) Homothalic origin of sex organs
- 14.Anthocerosaporophyte has the following distinctive feature
(a) Elater (b) Columella (c) Archesporium (d) Involucre
- 15.The following Bryophyte is used as ecological indicator
(a) *Atrichum* (b) *Ceratodon* (c) Both (d) None

PART - B
(Answer any TWO questions)
(Draw diagrams wherever necessary)

(2x5=10 Marks)

16. Write a short note on the fine structure eyespot.
17. Write about the structure of *Codium*
18. Give a brief account on the nutrition in fungi.
19. Describe the structure of conidia in *Cercospora*.
20. Describe the structure of capsule in *Funaria*.

PART C
(Answer all the questions)
(Draw diagrams wherever necessary)

(5 X 10 = 50 Marks)

21. (a) Outline the classification of Fritsch. List out the criteria used in algal classification.
(or)
(b) Give an account on the ecology of Algae.
22. (a) Explain the structure and reproduction of *Gracilaria*.
(or)
(b) Explain the structure and life cycle in *Nitella*.
23. (a) Explain the different types of spore dispersal mechanisms in fungi.
(or)
(b) Write an essay on Heterothallism in fungi.
24. (a) Discuss the salient features of *Mastigomycotina*.
(or)
(b) Explain the structure and reproduction in *Pilobolus*.
25. (a) Enumerate the salient features of Jungermanniales.
(or)
(b) Give a general account of Lichens with reference to their structure and nutrition.

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(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-I

CORE COURSE II - PAPER CODE : 21PBY02

PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

Objectives

1. To study the salient features of plants belonging to Pteridophytes and Gymnosperms.
2. To study the fossilization process and formation of different types of Fossils.

UNIT I

PTERIDOPHYTES

Introduction general features – classification of Pteridophytes [REIMERS]-stelar evolution in Pteridophytes- apospory & apogamy - heterospory and seed habit – sporangial organization and evolution of sorus in fern in homosporous ferns – economic importance of Pteridophytes-gametophytes in pteridophytes –origin of Pteridophytes.

UNIT II

Detailed study of the following range in structure, reproduction and evolution of gametophyte and sporophytes in Psilotales – (*Psilotum*), Isoetales – (*Isoetes*), Ophioglossales – (*Ophioglossum*), Maratiales – (*Angiopteris*), Osmundales – (*Osmund(a)*), Salviniiales – (*Salvini(a)*)

UNIT III

GYMNOSPERMS

Classification of Gymnosperms (K.R.SPORNE 1969) – General Characters , Distribution and phylogeny of Gymnosperms – economic importance of Gymnosperms – evolution of male and female gametophytes in Gymnosperms - woods of Gymnosperms.

UNIT IV

Morphology , Anatomy , reproduction and Phylogeny of Cycadales –(Cycas), Coniferales – (*Pinus*), Ginkgoales –(Ginkgo) and Gnetales – (Gnetum)

UNIT V

PALEOBOTANY

Geological time scale – Types of fossils – Methods of fossilization – A study of the following fossils of Pteridophytes and Gymnosperms – Objectives of Palaeobotany, Techniques to study fossils, *Sphenophyllum* , *Calamites*, *Lagenostroma* , *Cordites* ; *Pentoxylon* and *Williamsonia*.

PRACTICALS

Study of Morphology and Anatomy of the vegetative and reproductive structure of the types mentioned in the syllabus. Certified record of work done in laboratory to be submitted in the practical examination. Identification fossils included in the syllabus with suitable fossil slides.

TEXT BOOKS

1. Vashista B.R.2001 Botany for degree students – Pteridophytes. S. Chand &CO.LTD 5th Edition.
2. Rashid A 1978. An introduction of Peridophytes. Vikas publishers.
3. Parihar N.S. 1959. An introduction of Peridophytes. Central Book Depot. Publishers.
4. Vashista P.C 1997. An introduction of Pteridophytes .Vikas publishing co .
5. Sambamurthy, A.V.S.S. 2005. A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. I.K. International Publishing House. New Delhi.

REFERENCE BOOKS

1. Sporne K.R. Morphology of Pteridophytes. B.I Publications, New Delhi.
2. Parihar, N.S 1967. An introduction to EmbryophytaPteridophyta. Vol. II Central Book Depot. Allahabad.
3. Rashid A. (1999). An introduction to Pteridophyta. Vikas Publishing Co., New Delhi.
4. Srivastava N. (1998) Gymnosperms. PradeepPublication, Jalandhar,
5. Arnold C.A.(1947) An introduction to Palaeobotany. McGraw Hill Book Co., New York.
6. Shuka, M.A. Sharma. M. (1992) Plant fossils. Birbal Sahni Institute of Palaeobotany Lucknow.

WEB RESOURCES

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

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	The knowledge of origin, classification, stelar evolution and economic importance of Pteridophytes.	Understand
CO2	The understanding of structure, reproduction and evolution of Pteridophytic orders.	Understand
CO3	Understand classification, general characters, distribution and phylogeny, economic importance of Gymnosperms.	Understand
CO4	Critically differentiate the characters of four orders of Gymnosperm i.e., Cycadales, Coniferales, Ginkgoales and Gnetales.	Analyse
CO5	Understanding the meaning of fossil and its use in the determination of age of plant materials, understanding the applied knowledge and different aspects of Palaeobotany.	Understand

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

MODEL QUESTION PAPER - THEORY

M.Sc, Degree Examinations

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER -1 - PAPER CODE : 21PBY02

PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

Time: 3 hrs

Maximum: 75 marks

PART –A

(Answer all the questions)

(15x1=15 Marks)

1. The process by which an embryo develops without involving gamete fusion
(a) apogamy (b) apospory (c) syngamy (d) isogamy
2. A stele without a central pith is called
(a) protostele (b) dictyostele (c) siphonostele (d) solenostele
3. The antheridial jacket in fern is composed by
(a) five cells (b) three cells (c) many cells (d) seven cells
4. Ferns the entire sporangium develops from a single superficial cell of sporophyll known as
(a) unisporangiate (b) eusporangiate (c) leptosporangiate (d) mesosporangiate
5. Heterosporous fern
(a) *Adiantum* (b) *Salvinia* (c) *Polypodium* (d) *Selaginella*
6. The following structure is absent in gymnosperms
(a) microsporangium (b) ovule (c) megasporangium (d) stigma
7. In gymnosperm endosperm
(a) haploid (b) diploid (c) triploid (d) none of the above
8. Number of neck canal cells in *Cycas* archegonium
(a) two (b) none (c) one (d) three
9. The nodes in *Gnetum* and *Ginkgo* are
(a) unilocular (b) uni & trilocular (c) bilocular (d) tri & unilocular
10. Largest egg produces in
(a) *Gnetum* (b) *Ginkgo* (c) *Araucaria* (d) *Cycas*
11. Jurassic period is
(a) 265 million years back (b) 165 million years back (c) 65 million years back (d) 365 million years back
12. The genus *Williamsonia* belongs to
(a) Cycadales (b) Coniferales (c) Bennittiales (d) Ginkgoales
13. Fossil beehives is the name associated with fossil
(a) Cycadales (b) Coniferales (c) Pteridophytes (d) Ginkgoales
14. Fossil bryophytes
(a) *Marchantia palmata* (b) *Riccia fluitans* (c) *Naiadita lanceolata* (d) *Marchantia polymorpha*
15. Geological time scale was first developed by
(a) Araduiana (b) Guivier (c) Wallae (d) Leonardo devenci

PART-B (2x5=10 Marks)

(Answer any TWO questions)

16. Economic importance of Pteridophytes?
17. Write short notes on anatomical structure of *Psilotum* stem?
18. Write a short on distribution of Gymnosperms?
19. Explain the anatomical structure of *Cycas* rachis?
20. Briefly describe the *Williamsonia*

PART-C (5x10=50 Marks)

(Answer all questions)

21. (a) Classification of Pteridophytes?
(or)
(b). Write an essay on evolution of sorus development?
22. (a). Write an essay about development of archegonium in *Ophioglossum*
(or)
(b). Explain the anatomical structure of *Pteris* rhizome?
23. (a). General characters of Gymnosperms?
(or)
(b). Describe the evolution of female gametophyte in Gymnosperms?
24. (a). Give a detailed account on phylogeny of Cycadales?
(or)
(b). write a essay on reproductive parts of *Gnetum*?
25. (a) Describe the various types of fossils with illustrations: -
(or)
(b). Give a detailed account on techniques of fossil study?

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SEMESTER-I

CORE COURSE III - PAPER CODE: 21PBY03

MICROBIOLOGY AND PLANT PATHOLOGY

Objectives

1. To study the salient features and classification of microbes and their importance.
2. To understand the microbial diseases in crop plants and its control measures.

UNIT I

Definition of Microbiology, Classification of microorganisms – Bacteria & viruses. Sterilization techniques. Culture media – types and preparation – pure culture and subculture methods. Decimal dilution technique. Microbiological stains and staining methods – simple, differential and special stains.

UNIT II

Types of soil microorganisms: Rhizosphere, Non- rhisosphere, Nitrogen fixers and Decomposers - Solid waste disposal, composting, recycling, biodegradation and bioremediation. Microorganism in air: Sources, types, air sampling techniques. Microbes in water: Microbial examination of water, waste water treatment and recycling.

UNIT III

Food Microbiology: food spoilage, food poisoning, methods of food preservation. Dairy microbiology: Microbes of milk, milk products and milk Pasteurization. Industrial microbiology: Alcoholic fermentation – process and recovery of products. Immobilization of microbes.

UNIT IV

Bacteria: structure, organization, types of reproduction, Genetic recombination methods - Transformation, Transduction and Conjugation. Mode of nutrition - Photosynthetic bacteria & Chemosynthetic bacteria, Classification (Bergey,1973) and economic importance of bacteria. Viruses: General properties, purification, transmission and structure - envelopes and viral genome, plant viruses - types, double stranded DNA and RNA viruses. Bacteriophages, cyanophages, mycophages and viroids.

UNIT V

Plant Pathology: definition, common terminology used in plant pathology. Pathogenesis, host - pathogen interaction. Defensive mechanism in plants. Enzymes and toxins in plant diseases

– environmental factors in plant diseases – management of plant diseases – distribution, symptoms, disease management and epidemiology of the following plant diseases

1. Little leaf of Brinjal (Mycoplasm(a))
2. Bunchy top of Banana (Virus)
3. Bacterial blight of Paddy, Black arm of cotton.
4. Damping off of Seedlings by *Pythium*, Red rot of sugarcane.

PRACTICALS

- I. Cleaning and sterilization methods (Laminar Air Flow Chamber, autoclave and Oven)
- II. Preparation of culture Media agar slant - agar plate.
- III. Isolation of microbes by streak and pour plate method.
- IV. Isolation of microbes by soil dilution techniques.
- V. Isolation of Bacteria and Fungi from spoiled food.
- VI. Gram staining of Bacteria.
- VII. Simple staining of bacteria (Methylene blue/crystal violet)
- VIII. MBRT of milk (Phosphatase test)
- IX. Plant Pathology - Plant disease mentioned in theory syllabus.

TEXT BOOKS

1. Alexander, 1978, Introduction to Soil Microbiology, Wiley Eastern.
2. Dargis, J. 1975. Bacteriophages. Chapman and Hall.
3. Ketchum, Paul, A. 1988. Microbiology - Concepts and Application, John Wiley and Sons.
4. Mandhakar, C.L. 1978. An Introduction to Plant Virus, S.Chand Co.
5. Peleazar Jr.M.J., E.C. S.Chand and Krieg N.R. 1986. Microbiology 5th Edition.
6. R.S.Mehrotra & Ashoka Agarwal, 2003. Plant Pathology. Tata McGraw Hill Publication.
7. Smith, K.M. Viruses, Cambridge University Press, London.

REFERENCE BOOKS

1. Freifelder. D. 1987. Microbial Genetics, Indian Edn. Narora Publishing House.
2. W.H. Freeman & Co., New Delhi Microbes in action. A Laboratory Manual of Microbiology
3. Purohit, 1990. Microbiology, Agrobotanical Publishers.
4. Rangasami, G. 1972. Diseases of Crop Plants in India, Prentice Hall India (Private) Ltd., New Delhi.
5. Subba Rao, N.S. 1977. Soil Microorganisms and Plant Growth. Oxford and IBH Publishing Co Pvt. Ltd., New Delhi.

WEB RESOURCES

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

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand microbial culture techniques and perform staining of different bacteria	Understand
CO2	Understand the role microorganisms in biodegradation and analyse drinking water quality	Evaluate
CO3	Understand the role of microbes in industry and perform food preservation	Apply
CO4	Describe the structure of bacteria and viruses	Understand
CO5	Compare various plant diseases and facilitate various control measures	Create

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

MODEL QUESTION PAPER - THEORY

M.Sc., Degree Examinations
(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER -1 - PAPER CODE : 21PBY03
MICROBIOLOGY AND PLANT PATHOLOGY

Time: 3 hrs

Maximum: 75 marks
(15x1 = 15 Marks)

PART- A
(Answer all the questions)

1. The following stain is used for staining bacterial flagellum
(a) Malachite green (b) Safranin (c) Crystal Violet (d) Acetocarmine
2. The following is not a Single colony isolation method
(a) Streaking technique (b) Pour plate technique (c) Spreading technique (d) Soil culture
3. All viruses are obligate endoparasites
(a) True (b) False (c) Some viruses are ectoparasites (d) Some viruses are saprophytes
4. The rhizosphere is rich in microorganisms, due to
(a) More water (b) pH variation is high (c) Rich in nutrients (d) Safe place to live
5. Potable water should have the following CFU number for coli forms
(a) 1×10^6 /ml (b) 1×10^3 /ml (c) 1-5/ml (d) less than 1/100 ml
6. Composting is carried out by
(a) Mesophilic bacteria (b) Thermophilic bacteria (c) Both groups (d) Psychrophilic bacteria
7. Putrefaction is a process of
(a) Protein synthesis (b) Carbohydrate degradation (c) Lipid synthesis (d) Protein degradation
8. Autoclaving is considered as a best sterilization technique because it kills
(a) Endospores (b) Vegetative cells (c) Both Endospores and vegetative cells (d) None is true
9. Alcohol fermentation is an
(a) Endothermic reaction (b) Exothermic reaction (c) Endothermic and Anaerobic reaction
(d) Exothermic Anaerobic reaction
10. Anoxygenic photosynthesis associated with
(a) Release of oxygen (b) Release of H_2S (c) Release of CO_2 (d) Release of Fe
11. The following statement/statements are true with plant viruses
(a) Most are RNA viruses (b) Most are rod or filamentous in shape (c) Both A and B (d) Only genetic material is released into a plant cell during infection
12. Viroids are
(a) Infectious DNA particles (b) Infectious RNA particles (c) Infectious protein particles
(d) Infectious Lipid particles
13. Toxins that affects only the host are
(a) Host specific toxins (b) General toxins (c) Phytoalexins (d) Enzymes
14. Environment plays a very important role in plant diseases
(a) True (b) False (c) Not yet proved (d) May be a coincident

15. Bunchy top of Banana can be controlled by
(a) Copper sulphate (b) Cefataxime (c) Both A and B (d) None

PART – B
(Answer any TWO questions)
(Draw diagrams wherever necessary)

(2X5=10 Marks)

16. Write short notes on nitrogen fixing organisms
17. Write in brief about Bioremediation
18. Give an account on milk Pasteurization
19. Write short notes on chemosynthetic bacteria
20. Write short notes on Bacteria Blight of paddy

PART C
(Answer all the questions)
(Draw diagrams wherever necessary)

(5 X 10 = 50 marks)

21. (a) Describe the types and preparation of various culture media.
(or)
(b) Explain the various sterilization techniques.
22. (a) List out the microbes present in the air. Explain the different techniques employed in Air sampling.
(or)
(b) Give an account on waste water treatment and recycling.
23. (a) Write an account on Microbes in water.
(or)
(b) Discuss the role of Bacteria in Dairy Industry.
24. (a) Give a detailed account of Bergey's classification of bacteria.
(or)
(b) Write a brief account on Cyanophages and Mycopages
25. (a) Write an essay on the occurrence, casual organism symptoms, disease management of little leaf of bringal and Damping off of seedlings
(or)
(b) Explain the interaction between the host and pathogen

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-I

MAJOR BASED ELECTIVE COURSE I - PAPER CODE : 21PBYM1

PLANT RESOURCES UTILIZATION AND CONSERVATION

Objectives

1. To understand the plant biodiversity and its utilization for the human welfare.
2. To learn the conservation of plant resources.

UNIT I

Plant biodiversity – Biodiversity at global level – Biodiversity at country level – Species diversity and Ecosystem stability. Loss of biodiversity – Introduction – Listing of threatened biodiversity – Causes – Useful aspects of lower plants, Algae, Fungi and Lichens.

UNIT II

Binomial, cultivation and uses of food crops, cereals (Rice, Pennisetum), pulses (gram, soyabean), vegetables (carrot, cabbage). Fibre and fibre plants, nature of fibre, classification of fibre, binomial and uses of cotton, jute.

Unit III

Medicinal plants: classification of drugs, drugs from various parts of plants – chemical constituents – alkaloids – therapeutic uses. Binomial, cultivation, medicinal properties and uses of: *Ashwagandha*, *Dioscorea*, *Aloe*, *Coleus*, *Azadirachta*, *Rauwolfia*, *Piper*, *Curcuma*, *Phyllanthus*, *Emblica*, *Trigonella foenum-graceum*.

Unit IV

Vegetable oil yielding plants: classification of vegetable oils – chemical constituents, nature of vegetable oils. Uses of corn oil, sunflower oil, vegetable fat - *Cocos nucifera*.

Forest resources: Wood – its importance and structure – types, properties and uses. A brief account of bio-diesel plants. Paper industry – raw materials, manufacturing process. Gums, tannins, dyes, resin yielding plants and uses.

Unit V

Strategies for Conservation:

In-situ Conservation: International efforts and Indian initiatives: Protected area in India – Sanctuaries, National parks, Biosphere reserves, Wet lands, Mangroves and Coral reefs for conservation of wild biodiversity.

Ex-situ Conservation: Principles and practices; Botanical gardens, field gene banks, in-vitro repositories, cryobanks. General account of the activities of National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT) for conservation, non-formal conservation and efforts.

TEXT BOOKS

1. Agarwal, 1985. Drug plants in India. Kalyani Publishers, Ludhiana.
2. Agrobios (Indi(a). A hand book of medicinal plants – A complete source.
3. Agrobios (Indi(a). Biodiesel and *Jatropha* cultivation. Agrobios, Jodhapur.
4. Bhat, Chemistry of natural products, Tamilnadu Book House, Triplicane, Chennai.
5. Kumar, U. 2004. Biodiversity: Principles and Conservation, Agrobios, Jodhpur.

REFERENCE BOOKS

1. Anonymous (1980). Forest research institute, Indian forest utilization, Vols. I & II. The manager of publications, Government of India Press, New Delhi.
2. Brown A. Edithi. Vegetable oils. A & C Black Ltd., London.
3. Frankel D.H. & Benneth, E. 1970. Genetic resources in plants – The Exploitation and
4. Gupta, P.K. 1996. Transgenic plants. Some current issues. Current Sci. 70.
5. Henry, The plants Alkaloids, Tirumalai Book House, Triplicane, Chennai.
6. Jayamaran, J. 1981. Laboratory manual in biochemistry. Wiley Eastern Ltd., New Delhi.
7. Shani, K.C. (2000). The Book of Indian Trees. Oxford University Press, Mumbai

WEB RESOURCES

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

COURSE OUTCOME

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

Sl. No.	COURSE OUTCOME	BLOOM'S VERB
CO1	Systematically understand biodiversity and its vital role in ecosystem function.	Understand
CO2	Understand the binomial, common cultivation methods and uses of food crops and fibre yielding plants.	Understand
CO3	Develop a basic knowledge of classification of medicinal drugs, drug yielding plants and its therapeutic uses.	Apply
CO4	Understand the common cultivation methods of vegetable oil yielding plants and resources of forest.	Understand
CO5	Developing critical thinking for the conservation of biodiversity and strategies used for the conservation of plant diversity	Analyse

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L – Low

MODEL QUESTION PAPER - THEORY

M.Sc., Degree Examinations
(For the candidates admitted from 2021-2022 onwards under CBCS pattern)
MAJOR BASED ELECTIVE COURSE I - PAPER CODE : 21PBYM1

PLANT RESOURCES UTILIZATION AND CONSERVATION

Time: 3 hrs

Maximum: 75 marks
(15×1=15 Marks)

Part-A

(Answer ALL Questions)

- In the studies on the atmospheric pollution, lichens are important as they
 - Can readily multiply in polluted atmosphere
 - Are very sensitive to pollutants
 - Efficiently purify the atmosphere
 - Can also be grown in greatly polluted atmosphere
- The upper part of an aquatic ecosystem contains
 - Nekton
 - Plankton
 - Benthos
 - both (1) and (2)
- Biodiversity
 - Increase towards the equator
 - Decrease towards the equator
 - Remains same throughout.
 - All of the above
- IR-36 was developed through breeding of
 - Six Rice varieties and *Oryza nivara*
 - Thirteen Rice varieties and *Oryza nivara*
 - Oryza sativa* and *Oryza indica*
 - Oryza indica* and *Oryza nivara*
- Which of the following is a pseudocereal ?
 - Echinochloa frumentacea*
 - Coix lacryma-jobi*
 - Fagopyrum esculentum*
 - All of the those
- A drug from roots that cures mental disorders and reduces blood pressure is obtained from
 - Rauwolfia serpentina*
 - Atropa belladonna*
 - Digitalis purpurea*
 - Colchicum luteum*
- Which of the following is a source of textile fiber?
 - Crotalaria juncea*
 - Gossypium herbaceum*
 - Hibiscus cannobinus*
 - Cassia occidentalis*
- The ability of wood to resist the forces that tends to change its shape is called its
 - Strength
 - Stiffness
 - Toughness
 - Cleavability
- The rate of replacement of species composition with the change in the environment constitutes
 - Gamma diversity
 - Beta diversity
 - Community diversity
 - Ecosystem diversity
- 'Gum tragacanth' is obtained from s a Species of
 - Sterculia*
 - Anogeissus*
 - Garcinia*
 - Astragalus*
- Which of the following plants yield oil and fiber both?
 - Cocos nucifera*
 - Brassica campestris*
 - Eucalyptus* sp
 - Euphorbia hirta*
- The number of biogeographical regions differentiated in the Indian sub-continent
 - Eight
 - Nine
 - Twelve
 - Ten
- The drug 'Santonin' is used as
 - Expectorant
 - purgative and anthelmintic
 - Insect repellent
 - Stimulant

14. The protected area include
(a) National parks and Sanctuaries (b) Sanctuaries and biosphere reserves
(c) National parks and biosphere reserves (d) All of these
15. Which of the following Indian state is not covered as hot spot for biodiversity?
(a) Madhya Pradesh (b) Maharashtra (c) Kerala (d) Karnataka

Part – B (2×5=10 MARKS)
(Answer any TWO Questions)

16. Discuss the biodiversity status in India
17. Give a brief account of Salient features of fodder crops
18. List out the drugs from *Coleus*
19. Write a description about bio-fuel producing plants
20. Write short notes on dyes yielding plants and their uses

Part – C (5×10=50 MARKS)
(Answer ALL questions)

21. (a) Classify the economic importance of lichens
(or)
(b) Write an essay on Species diversity
22. (a) Design on cultivation methods of *Oryza sativa* and uses
(or)
(b) Elucidate the classification of drugs from *Phyllanthus* and uses
23. (a) Categorize the cultivation and medicinal properties of *Aloe*
(or)
(b) Explain the cultivation methods of *Daucus carota* and *Brassica oleracea*
24. (a) Criticize the nutritional composition of vegetable oils and uses
(or)
(b) Elucidate the gums and tannins yielding plants and uses
25. (a) Enumerate the activities of DBT
(or)
(b) Write an essay on conservation of wild biodiversity

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-I

MAJOR BASED ELECTIVE COURSE II - PAPER CODE: 21PBYM2

AGRIBUSINESS

Objectives

1. To inculcate and impart an idea about the business opportunities in the field of plant sciences.
2. To develop an entrepreneurial among the Botany students
3. To harness the opportunities and potentials in the field of processing technology and food sciences

UNIT I

Entrepreneurship: Basic qualities of entrepreneur, Financial Assistance from Banks, Role of Institutions like MSME training Institute, Khadi and village industries board, self help groups, Co-operative sectors and microenterprises

UNIT II

Value added food products: Preparation of pickles, jam, jelly, syrups, sauce, dry fruits and dairy products – cheese, butter, yogurt and Paneer. Preservation methods of various foods – drying, thermal processing, pasteurization and canning. Use of preservatives

UNIT III

Nursery management: Preparation of potting mixtures, polybags. Plant growing structures – green houses and shaded houses. Modern strategies in propagation by cutting, layering technique, budding and grafting technique. Planting, transplanting and hardening of seedlings, aftercare of seedlings. Packing and transport of seedlings and plants.

UNIT IV

Floriculture : problems and prospects of floriculture in Tamilnadu. Scope of growing *Anthurium* and Orchids. Common cut flowers – Rose, *Gerbera*, *Gladiolus*, Aster, *Anthurium* and orchids. Common leaves used in flower arrangement – *Cyperus*, *Podocarpus*, *Asparagus*, Palms, Cycas and Ferns.

UNIT V

Types of flower arrangement– Western, Eastern (Japanese / Ikeban(a) and Modern. Vases, flower holders and floral foam. After care of flower arrangements- Bouquets. Packing and maintenance of flowers and leaves.

TEXT BOOKS

1. Jitendra Singh, 2002. Basic Horticulture. Kalyani Publishers, Hyderabad.
2. Prasad and Kumar, 2014. Principles of Horticulture 2nd Edn. Agrobios (Indi(a)
3. De S, Outlines of Dairy Technology, Oxford Publishers, 1980
4. Deman JM, Principles of Food Chemistry, 2nd ed. Van Nostrand Reinhold, NY 1990
5. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
6. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi, 1987
7. Meyer LH, Food Chemistry, CBS Publication, New Delhi, 1987
8. Potter NH, Food Science, CBS Publication, New Delhi, 1998
9. Srilakshmi, B. Food science, New Age Publishers,2002

REFERENCE BOOKS

1. Jenkins WA and Harrington JP, Packaging Foods with Plastics, Technomic Publishing Company Inc., USA, 1991
2. Meyer, Food Chemistry, New Age,2004
3. Bawa. A.S, O.P Chauhan et al. Food Science. New India Publishing agency, 2013
4. Crusess W B .2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India
5. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford. 2007.
6. Denisen E.L.,1957. Principles of Horticulture. Macmillan Publishing Co., New York.
7. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003
8. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd ed. TMH Education Pvt. Ltd, 1986

WEB RESOURCES

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

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand the role of various organizations in Entrepreneurship	Understand
CO2	Prepare different food products	Apply
CO3	Develop various nursery techniques	Create
CO4	Grow various ornamental flowering plants	Apply
CO5	Perform flower arrangements	Create

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

MODEL QUESTION PAPER – THEORY

M.Sc., Degree Examinations
(For the candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER – I
MAJOR BASED ELECTIVE COURSE II - PAPER CODE: 21PBYM2

AGRIBUSINESS

Time: 3 hrs

Maximum: 75 marks
(15X1=15 Marks)

PART – A

(Answer all the questions)

1. MSME means
(a) Ministry of Micro, Small & Medium Enterprises, (b) Minimum skill Management for Entrepreneurship (c) Ministry of Sea foods Marketing and Export (d) None of the above
2. A Microenterprise normally employ people of the following number
(a) Around 100 (b) Less than 10 (c) 10-100 (d) 100-1000
3. The KVIC by Solar Charka mission helps
(a) Village spinners (b) Corporate premises (c) own house individuals (d) None of the above
4. The following bacteria are used in milk fermentation
(a) Lactic acid producing bacteria (b) Ethanol producing bacteria (c) Acetone producing bacteria (d) Citric acid producing bacteria
5. In the preparation of Jam and Jelly, the following plant component of plant juice plays an important role
(a) Cellulose (b) Pectin (c) Hemicellulose (d) Starch
6. The following is an important food preservation method
(a) Slicing (b) Pressing (c) Pulping (d) Salting
7. The following is not a vegetative propagation method
(a) Cutting (b) Grafting (c) Layering (d) Hybridization
8. Protray are related to
(a) Post harvest (b) Nursery (c) Processing (d) Transport
9. Low-cost green house tunnels are suitable for
(a) Cucumber (b) Tomato (c) cabbage (d) pumpkin
10. Biggest cut flower market is located at
(a) Tokyo (b) Paris (c) New York (d) Aalsmeer
11. Who is pioneer Gladiolus breeder in India
(a) TM Rao (b) SPS Raghava (c) BK Banerji (d) Bajaran Bahadur Singh Bhadari
12. Umbrella grass is the common name of
(a) Cyperus (b) Bamboo (c) Cycas (d) Asparagus
13. Ikebana is the ----- flower arrangement
(a) Western (b) Japan (C) Eastern (d) Modern
14. Packing and export of cut flowers is done in
(a) Paper and paperboard (b) Wood (c) Plastic (d) All the above

15. Floral Foam is useful in
(a) Flower arrangement (b) plant growth (c) Both (d) None

PART B

(2X5=10 MARKS)

(Answer any TWO questions)

16. What are the basic qualities of an Entrepreneur?
17. Write about jelly preparation
18. Describe shaded houses
19. Write notes on the scope of growing orchids
20. Write short notes on vases and flower holders

PART C

(10X5=50 MARKS)

(Answer ALL Questions)

21. (a) Explain the contribution of Institutions on entrepreneurship development
(or)
(b) Write the role of self-help groups and cooperative sectors in entrepreneurship
22. (a) Write an essay on dairy products
(or)
(b) Outline the preservation methods of various food products
23. (a) Explain various plant propagation methods
(or)
(b) Describe the methods of packing and transport of seedlings and plants
24. (a) Write an essay on cut flowers
(or)
(b) Write notes on various leaves used in flower arrangement
25. (a) Describe the different methods of flower arrangement
(or)
(b) Discuss the methods of packing and maintenance of flowers and leaves

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

(Common to All PG Courses)

SEMESTER-I

RESEARCH ACUMEN COURSE I - PAPER CODE : 21RAC01

INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS

A. Objectives:

This course aims to provide an introductory study to the subject of Intellectual Property Rights, which is one of the basic pillars of modern Research and Development. The focus of the course will be the study of certain structures called Patents, Copyrights and related rights, Trademarks, Geographical Indications, Industrial designs, Layout Designs of integrated circuits, Trade Secrets and Plant Varieties. Introduction to IPR gives to student a good maturity and enables to build intellectual thinking and skill.

B. Learning Outcomes:

Students should achieve mastery of the topics listed below.

- This means that they should know all relevant definitions, correct statements of the major structures and examples and non-examples of the various concepts.
- The students should be able to demonstrate their mastery by solving problems related to these concepts

C. Syllabus:

UNIT-I

Introduction - International Intellectual Property Regime - New dimensions and issues for Resolution - IPR in developing countries - Impact of stronger IPR in developing countries

UNIT-II

Categories of intellectual property - Patents – Patentable invention – Novelty – Utility - Inventive step/non-obviousness - Not-patentable inventions - Inventions and discoveries

UNIT – III

Patent application - Form of application - Types of patent specification - Contents of specification

UNIT-IV

Procedure for obtaining patents – Publication - Request for examination – Examination - Search for anticipation by previous publication and by prior claim - Opposition proceedings to grant of patents - Grant of patents - Grant of patents to be subjected to certain conditions

UNIT-V

Rights of patentee - Register of patents - Renewal fee – Restoration - Drafting of patent specification in patent application - Parts of the complete specification -

C. BOOKS FOR SUPPLEMENTARY READING AND REFERENCE:

1. Open Source Book “Introductory **Intellectual Property Rights**” by Sakthivel Lakshmana Prabu, Timmadonu Narasimman Kuppusami Suriyaprakash and Rathinasabapathy Thirumurugan, (<http://dx.doi.org/10.5772/intechopen.69359>)
2. Open Source Book “HANDBOOK ON INTELLECTUAL PROPERTY RIGHTS IN INDIA” by Rajkumar S. Adukia (<http://rishabacademy.com>)
3. Open Source Book “HANDBOOK ON INTELLECTUAL PROPERTY RIGHTS - Basic information on concepts related to Intellectual Property Rights – 3rd Edition” by Origiin IP Solutions LLP (<http://www.origiin.com>, <http://www.origiinipa.com>)

D. Additional Web Resources:

1. en.wikipedia.org/wiki/, 2. wiki.answers.com

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007
(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-II

CORE COURSE IV - PAPER CODE : 21PBY04

ANATOMY, EMBRYOLOGY AND MICROTÉCHNIQUES

Objectives

1. To attain knowledge about various aspects of anatomical features of plants.
2. To understand the key aspects of embryology of Angiosperms

UNIT I

Tissue and Tissue Systems- Secondary xylem- structure-Distinction from primary xylem- vertical and horizontal system-storied and non-storied woods. Growth layers-sap wood and heart wood. Arrangement of vessels in secondary xylem of dicots- secondary phloem- structure and functions- Dendrochronology- compression wood and tension wood- phylogenetic trends of specialization of xylem and phloem- Nodal types and evolution.

UNIT II

Vascular cambium- origin- types- structure and Etiology. Division of fusiform and ray initials. Seasonal activity- part played by cambium in wound healing. Anomalous secondary thickening in dicot stems: *Bignonia*, *Amaranthus*, *Boerhaavia*, *Aristolochia* and Arborescent monocots. Leaf ontogeny.

UNIT III

Embryology – Structure and development of anther. Microsporogenesis; Ultrastructure of pollen wall; Pollen–stigma incompatibility, methods to overcome incompatibility, structure, development and types of ovules, megasporogenesis and female gametophyte (*Oenothera*, *Allium*, *Fritillaria* types of embryosac development), Nucellus - types

UNIT IV

Fertilization and its control. Endosperm – Nuclear, cellular, helobial and Ruminant types, Endosperm haustoria. Development of embryo – dicot and Monocot. Embryology in relation to taxonomy. Apomixis, Polyembryony and Parthenocarpy.

UNIT V

Microtechniques: A broad outline on steps involved in microtome sectioning (Fixation, dehydration, clearing, infiltration, embedding and block making), staining techniques, Types of Microtome, Camera lucida- Principle and their uses, Micrometry and Photomicrography.

PRACTICALS

Study of suitable specimens to understand the anatomy of the plants mentioned in the syllabus. Dissecting the shoot and root apices. Embryo development stages to be dissected out, Knowledge and working of microtomes. Measurement of macerated elements by micrometry. Demonstration of Paraffin microtome section cutting and staining.

ANATOMY

TEXT BOOKS

1. Esau, K. (1977). *Anatomy of Seed Plants*. Wiley Eastern Publications.
2. Pandey B.P. (1978). *Plant Anatomy* S. Chand & Co. Ltd., New Delhi.

REFERENCE BOOKS

1. Bailey IW., (1954). *Contributions to Plant Anatomy*.
2. Carquest S. 1961. *Comparative Plant Anatomy* Richard.
3. Cuter., EG. 1978. *Plant Anatomy*: Edward Arnold Pub. Ltd., London.
5. Fahn, A. (1989). *Plant Anatomy*. Mac Millan Publication. Singapore (P) Ltd.,

EMBRYOLOGY

TEXT BOOKS

1. 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.
2. Rogland, A. (2000). *Developmental Botany (Embryology of Angiosperms)*. Saras Publications, Nagercoil.

REFERENCE BOOKS

1. Johri, B.M. (1982). *Experimental Embryology of Vascular Plants*. Springer –Verlag, Heidelberg.
2. Maheswari, P. (1985). *An Introduction to the Embryology of Angiosperms*. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Maheswari, P. (1963). *Recent Advances in the Embryology of Angiosperms*. International Society of Plant Morphologists, University of Delhi.

MICROTECHNIQUES

1. Johanson D.A. 1940. *Plant Microtechnique*. Mac - Graw Hill, New Delhi.
2. Purvis M.J.et al 1966. *Laboratory Techniques in Botany*, Butter Worths, London.
3. Sas. Joe E. 1964. *Botanical Microtechnique* Oxford and IBH.

WEB RESOURCES

<https://www.easybiologyclass.com/plantanatomy>
<https://www.easybiologyclass.com/plantembryology>

COURSE OUTCOME

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

Sl. No.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand various internal structures of the plant and their Dendrochronology	Understand
CO2	appreciate the wound healing process and analyze the anomalous secondary growth in plants	Apply
CO3	understand Microsporogenesis and Megasporogenesis	Remember
CO4	compare different types of embryo and endosperm development	Analyse
CO5	perform microtome sectioning and prepare permanent slides	Create

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L – Low

MODEL QUESTION PAPER – THEORY

M.Sc., Degree Examinations
(For the candidates admitted from 2020-18 onwards Under CBCS Pattern)
Choice Based Credit System
Paper Code : 21PBY04
ANATOMY, EMBRYOLOGY AND MICROTCHNIQUES

Time: 3 Hrs

Maximum: 75 Marks

Part - A
(Answer ALL questions)

(15x1=15 Marks)

1. Where do the casparian bands occur
(a) epidermis (b) endodermis (c) pericycle (d) phloem.
2. Vascular cambium produces
(a) primary xylem and primary phloem (b) secondary xylem and secondary phloem
(c) primary xylem and secondary phloem (d) secondary xylem and primary phloem
3. Pith and cortex do not differentiate in
(a) monocot stem (b) dicot stem (c) monocot root (d) dicot root.
4. Which gives rise to the cork tissue?
(a) Periblem (b) Phellogen (c) Phelloderm (d) Periderm
5. In angiosperms, xylem is made up of
(a) Tracheids and fibres (b) Tracheids and vessels (c) Vessels and fibres (d) All of the above
6. Which of the following has a perforated cell wall?
(a) Vessel (b) Fibre (c) Tracheid (d) Sclereid
7. The two nuclei at the end of the pollen tube are called
(a) Tube nucleus and a generative nucleus (b) Sperm and ovum (c) Generative nucleus and stigma
(d) Tube nucleus and sperm
8. Embryo sac is located inside the
(a) Stigma (b) Ovule (c) Micropyle (d) Style
9. One nucleus of the pollen tube and secondary nucleus of the ovum grow into
(a) Stigma (b) Endosperm (c) Anther (d) Stamen
10. Functional megaspore in a flowering plant develops into
(a) Endosperm (b) Ovule (c) Embryo-sac (d) Embryo
11. Functional megaspore in an angiosperm develops into
(a) Endosperm (b) Ovule (c) Embryo-sac (d) Embryo
12. The fusion of female reproductive nucleus with the male reproductive nucleus is known as
(a) Adoption (b) Excretion (c) Fertilization (d) Regeneration
13. Paraffin embedded sections of tissue are cut by:
(a) Electron beams (b) Sharp knife (c) Laser (d) Microtome

14. 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
15. 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

Part B **(2x5=10 Marks)**
(Answer any TWO questions)
(Draw diagrams wherever necessary)

16. What is a secondary xylem? Explain the structure of secondary xylem.
17. Write short notes on vascular cambium and its origin.
18. Define Incompatibility. Explain the methods to overcome incompatibility.
19. Write a note on polyembryony.
20. Explain the importance of photomicrography in sectioning.

Part C **(5x10=50 Marks)**
(Answer All the questions)
(Draw diagrams wherever necessary)

- 21 (a) Differentiate between compression wood and tension wood.
(OR)
(b) Describe the types of nodes and its evolution.
- 22 (a) Explain the anomalous secondary structures in dicots.
(OR)
(b) Bring out the salient features of arborescent monocots.
- 23 (a) Describe the structure of mature anther.
(OR)
(b) Describe Polygonum type of embryo sac.
- 24 (a) Explain the types of endosperm.
(OR)
(b) Write an account on development of monocot embryo.
- 25 (a) Outline the various processes involved in microtome sectioning.
(OR)
(b) Explain the principles and uses of Camera lucida.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-II

CORE COURSE V - PAPER CODE : 21PB05

CELL, MOLECULAR BIOLOGY AND GENETICS

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 at molecular level , the structure and functions of genetic materials

UNIT I

Origin and development of Cell Biology as a separate branch. Structure and organization of prokaryotic and eukaryotic cells. Plasma Membrane – Molecular structure, chemical structure and functions. Cell wall – Primary, secondary and tertiary at submicroscopic and molecular levels. Chemistry of cell wall – polysaccharides, lignin, chitin, suberin , cutin and wax. Detailed study of cytoplasmic organelles (Morphology, Ultra structure, chemical composition, origin and function) Mitochondria, Plastids, Ribosome, Dictyosome, Sphaerosome, Glyoxisome and Peroxisome, Endoplasmic reticulum

UNIT II

Structure and functions of Nucleus, Nuclear envelope and Nucleus. Chromosomes – general account, detailed morphology and ultra structural organization. Special types of Chromosomes – cell cycle (brief account only). Cell divisions: Mitosis – Mitotic apparatus and its physicochemical characteristics and biochemical composition. Meiosis – process of meiosis in detail, theories on crossing over and chiasma formation and their significance

UNIT III

Macromolecules – major classes, proteins, nucleic acids, and polysaccharides (detailed structure not necessary). Nucleic acid – physical and chemical structure of DNA, Types of DNA, Watson & Crick model of DNA, viral DNA, bacterial DNA, Mitochondrial and Chloroplast DNA. DNA as genetic material, DNA synthesis, replication and its types, Enzymes of DNA replication – Methylation of DNA and mismatch repair , C-value paradox- A,B,C and Z forms of DNA. Synthesis of RNA – different types of RNA, DNA dependent RNA and Polymerase, Initiation of transcription, post transcriptional changes in RNA . Genetic code.

UNIT IV

Mendel's Law of inheritance – interaction of genes, Multiple alleles and pseudo alleles. quantitative inheritance. Sex determination in plants, theories of sex determination. Sex linked characters – primary, secondary and permanent, non-disjunction of Sex chromosomes in *Drosophila*. Chromosome theory of inheritance. Chromosome mapping. Gene mutation – detection of mutation CLB method, Muller 5 method, Biochemical mutants in Bacteria and *Neurospora*. Detection of mutation in Bacteriophages and higher plants. Molecular basis of mutation, physical and chemical mutagen Cochicine and its mode of action

UNIT V

Modern concept of genes. Fine structure of the gene – IS element – transposons. Extrachromosomal inheritance, genome of mitochondria and plastids and their role in inheritance. Uniparental inheritance in *Chlamydomonas* and *Paramecium* – Male sterility. Population genetics – gene frequencies, mutation selection, migration, genetic drift, genetic disorder of chromosomal and genetic origin. Regulation of gene expression in Eukaryotes and Prokaryotes

PRACTICALS

Study of the structure of plant cell organelles and giant chromosomes from electron micrographs in standard publications. Study of mitosis by squash and Meiosis by smear techniques. Solving genetic problems - Interaction of factors and three point test cross.

TEXT BOOKS

1. Powar C.B 2005 (Third Edition). Cell Biology, Himalaya Publishing, Mumbai.
2. Brown T. A., 1999. Genomics. John Wiley & sons Inc New York
3. Miglani G.S. 2002 Advanced Genetics, Narosa publishing house
4. Peter J Russel 1994. Fundamentals of Genetics, HarperCollins college Publishers, UK

REFERENCE BOOKS

1. Presscott D.M. 1988. Cells – Principles of molecular structure and functions, Jones and Barlett Publishers, Boston U.S.A
2. De Robertis E.D.P & De Robertis E.M.F., 1980 – Cell and Molecular Biology, Holtsauders International Editions, Philadelphia
3. Gerald Karp 1999 Cell and Molecular Biology- Concept and Expts. John Wiley and Scne Ine., USA.
4. Cooper G.M and Hausman R.E 2007 (Fourth Edition). The Cell molecular approach Sinauer associate, Inc, Suderland (US(A).
5. Strickberger M. W. 1976. Genetics , Mac Millan Publishing Co. Inc., New York
6. Gardner E.J. Simmons M.J. and Snustad D.P. 1996 Principles of Genetics, John Wiley & sons Inc New York
7. Lewin B. 1998 Genes VI, oxford University press
8. Friefelder D. 1985. Molecular Biology, Jones and Barlett Publishers, Boston U.S.A

WEB RESOURCES

<https://www.easybiologyclass.com/plantcytology>
<https://www.easybiologyclass.com/plantcytology>
<https://www.easybiologyclass.com/plantmolecularbiology>

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the structure and functions of various cell organelles	Remember
CO2	identify and differentiate the Mitosis and reduction types of cell division	Understand
CO3	understand the structure, types and replication of DNA	Remember
CO4	appreciate the Inheritance, interaction of genes and Chromosome structure and will be able to do Chromosome mapping	Apply
CO5	understand the structure of gene and its regulation in expression	Understand

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

M.Sc., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER – II
CORE COURSE V – PAPER CODE 21PBY05

CELL, MOLECULAR BIOLOGY AND GENETICS

Time: 3 hrs

Maximum: 75 marks
(15X1 =15 marks)

PART A

1. The enzyme which repairs the irregularities or breaks in the backbone of double stranded DNA molecules
(a) Ligase (b) Restriction endonuclease (c) Lipase (d) DNA polymerase
2. A submicroscopic factor or determiner reported to be present in the plastids in plant cells which influence physiological and hereditary phenomena of the plastids
(a) plasmids (b) cosmids (c) plastogene (d) jumping gene
3. The process of copying the gene's DNA sequence to make an RNA molecule is
(a) transgenic (b) translation (c) capping (d) transcription
4. The small particles in the cytoplasm that preferentially associated with the endoplasmic reticulum membrane is
(a) ribosome (b) lysosome (c) peroxisome (d) plastome
5. A network of membranous tubules within the cytoplasm of a eukaryotic cell, continuous with the nuclear membrane
(a) Ribosome (b) Chloroplast (c) Endoplasmic reticulum (d) Mitochondria
6. The type of plastid that produce and store starch within internal membrane components
(a) Chloroplast (b) Amyloplast (c) Chromoplast (d) Gerontoplast
7. The basic proteins found in eukaryotic cell nuclei that package and order the DNA into structural units is called
(a) Chaperones (b) Histones (c) Membrane proteins (d) Globular proteins
8. The Phase in which the process of duplication of genome taking place in the cell cycle is
(a) G₁ phase (b) S phase (c) Interphase (d) G₂ phase
9. The cell division in which the number of chromosomes in daughter cells is reduced to half than that of parent cell is
(a) Meiosis (b) Amitosis (c) Mitosis (d) Binary division

10. The agent that induces the changes in the genetic material resulting in mutation is termed as
 (a) Mutagen (b) Mutant (c) Mutation (d) Chromatid
11. The alternative form or the variant form of a given gene is
 (a) Genome (b) Factor (c) Chromatid (d) Allelomorphs
12. The genetic disorder caused when abnormal cell division results in an extra full or partial copy of chromosome 21.
 (a) Klinefelters syndrome (b) Down's syndrome (c) Cri-du-chat syndrome
 (d) Turner syndrome
13. The DNA sequence that can change its position within a genome, sometimes creating or reversing mutations and altering the cell's genetic identity and genome size
 (a) transposons (b) retroposons (c) pleiotropism (d) Migration
14. A form of inheritance wherein the traits of the offspring are due to the expression of extranuclear DNA present in the ovum during fertilization
 (a) Uniparental inheritance (b) Complementary factors (c) Maternal inheritance
 (d) Split genes
15. The transfer of genetic variation form one population to another is
 (a) Genetic drift (b) Genetic migration (c) gene frequency (d) Gene pool

PART B

(5 X 2 = 10 marks)

(Answer any TWO questions)

(Draw labelled sketches wherever necessary)

16. Write short notes on prokaryotic and eukaryotic cell.
17. Explain the various theories on the crossing over: -
18. Describe the structure of DNA with illustrations.
19. Complementary genes – Explain:-
20. CMS – Discuss

PART C

(5 X 10 = 50 marks)

(Answer all the questions)

(Draw diagrams wherever necessary)

21. (a) Write an essay on the structure, models and functions of plasma membrane.
 (or)
 (b) Give an account on structure, genome organization and function of Mitochondria.
22. (a) Describe the stages of the mitotic division with diagrams:-
 (or)
 (b) Describe Chromosome structure:-
23. (a) Describe the enzymes involved in DNA replication :-
 (or)
 (b) Explain the RNA :- add a notes on its types :-

24. (a) Explain Non- disjunction :- add a brief notes on (i) Down's syndrome (ii) Klinefelter's syndrome (iii) Turner's syndrome :-
(or)
(b) Explain Sex determination in detail:-
25. (a) Describe Hardy- Weinburg's law with an example:-
(or)
(b) Transposons – Discuss:-

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-II

CORE COURSE VI - PAPER CODE : 21PBY06

ENVIRONMENTAL BIOLOGY

Objectives

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

UNIT I

Ecosystem - concept - structure and function - producers, consumers and decomposers - energy flow - food chain, food web and ecological pyramids -types of ecosystem - characteristic features, structure and function of Grassland, Forest, Desert and Aquatic (lake, river, oceans), ecosystems. Stahalavriksha, Sacred grooves, chipko movement

UNIT II

Ecological succession - organismic and individualistic views of succession -succession mechanisms - process of succession - hydrosere - Xerosere and lithosere - climax concept in, succession-theories of climax concept.

UNIT III

Populations ecology and population growth - community - Biotic community concept -Groups of community - classification of communities - origin and development of communities - composition, structure, theories and characteristic of communities.

UNIT IV

Environmental pollution - Air pollution - definition, causes - carbon monoxide, dioxides, acid rain, ozone, hydrocarbon- effect and control - Water pollution - signs of polluted water - classification of foreign substances in water - BOD and COD -Eutropication - sewage disposal treatment - prevention and control.

UNIT V

Soil Pollution, Noise pollution - sources - physical properties and measurement of sound - reasons of noise pollution - effects - natural disasters - flood, earthquake, cyclone, Tsunami, landslides their effects and management.

PRACTICALS

1. Estimation of soil moisture and humus contents.
2. Determination of soil pH.
3. Quadrat method of studying frequency, density and abundance of species .
4. Determination of minimum size of quadrats by species area curve method.
5. Estimation of dissolved oxygen by winklers method.
6. Estimation of dissolved CO₂.

TEXT BOOKS

1. Kumar, H.D. 1997. Modern concepts of Ecology. Vikas Publishing House Pvt. Ltd., New Delhi.
2. Ostler, N.K. 1996. Introduction to Environmental technology. Prentice Hall, Inc New Jersey.
3. Pitman. 1980. Environmental Studies. Pitman Educational Ltd, London.

REFERENCE BOOKS

1. Bhaskaran, T.R. 1989. Environmental pollutions. Journal IAEM, Vol. 16, 1-15.
2. Bishop P.L. 2000. Pollution prevention, fundamentals and practice. McGraw Hill Series, New York.
3. Bodkin Keller. 2000. Environmental Science. John Wiley & Sons, New York.
4. Canter L.W.1996. Environmental impact assessment. McGraw Hill International Edition, New York.
5. Duncan Maraand Nigel Horon. The Handbook of Water and Wastewater microbiology. Academic Press, London.
6. Eckenfelder Jr.W.W.1999.Industrialwaterpollutioncontrol.McGrawHill International edition. New York.
7. Gayle Woodside, 1999. Hazardous materials and Hazardous waste management. John Wiley and Sons, New York.
8. Jorgensen S.E. and Johnson, I. Principles of Environmental Science and Technology. Elsevier Publications, Tokyo.
9. Liu, D.H.F. and Liptake, B.G. 2000. Air pollution. Lewis Publishers, Washington.
10. Liu, D.H.F, and Liptake, B.G. 2000. Hazardous waste and Solid waste. Lewis Publishers, Washington.
11. Nemerow V.L. 1963. Theories and Practice of Industrial Waste Treatment. Addison - Wesley M.A. New Delhi.
12. Odum E.P. 1996. Fundamentals of Ecology, Nataraj Publishers.
13. Selka, S.E.M. 1990. Packing and Environmental technomic publishing co, USA.
14. Sharma P.D. 1999. Ecology and Environment. Rastogi Publications, Meerut.
15. US Environmental Protection Agency, 1989. Glossary of Environmental terms and Acronym list, Washington, D.C.

WEB RESOURCES

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

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	Analyze various types of ecosystems and correlate different ecosystems.	Analyse
CO2	Know about how changes take place during ecological succession.	Analyse
CO3	Understand the vegetative organization in plant populations and plant communities.	Understand
CO4	Understand the effect of air and water pollution in environment.	Understand
CO5	Understand the effect of soil, noise pollution and natural disasters in environment.	Understand

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

M.Sc, BOTANY

MODEL QUESTION PAPER- THEORY

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-II –

CORE COURSE VI - PAPER CODE : 21PBY06

ENVIRONMENTAL BIOLOGY

Time: 3 hrs

Maximum: 75 marks

PART - A

(15X1 = 15 Marks)

(Answer all the questions)

1. Which of the following requires maximum energy?
(a) Secondary consumer (b) Decomposer (c) Primary consumer (d) Primary producer
2. In an ecosystem, the energy flow is always
(a) Always unidirectional (b) Always bidirectional (c) In any direction (d) Always down directional
3. Which trophic level has the most energy?
(a) Producers (b) Primary consumers (c) Secondary consumers (d) Predators
4. The final stable community in an ecological succession is called
(a) Climax community (b) Stable community (c) Final community (d) Seral community
5. The pioneering community in a xerosere is
(a) Mosses (b) Foliose lichen (c) Crustose lichen (d) Shrubs
6. An early seral community possesses this characteristic
(a) high species diversity (b) open mineral cycling (c) narrow niche specialization
(d) low community production
7. The rate at which the new individuals are added to a population in a unit time is
(a) Density (b) Natality (c) Mortality (d) Dispersion
8. The sampling unit used for the quantitative study of plant communities:
(a) Transect (b) Strip (c) Quadrat (d) Line
9. A group of people coexist within space and time and interact with each other is known as
(a) Keystone species (b) Community (c) Guild (d) Population
10. Which of the following is the best indicator of SO₂ pollution?
(a) Algae (b) Lichen (c) Bryophyte (d) Pteridophyte

11. Minamata disease was caused by pollution of water by
(a) Mercury (b) Lead (c) Tin (d) Methyl iso-cyanate
12. BOD stands for
(a) Biotic oxidation demand (b) Biological oxidation demand (c) Biochemical oxidation demand (d) Biological oxygen demand
13. Noise is measured using sound meter and the unit is
(a) Hertz (b) Decibel (c) Joule (d) Sound
14. International Tsunami information Center is located in
(a) Honolulu (b) Goa (c) Jakarta (d) Puducherry
15. In India National Institute of Disaster Management is located at
(a) Manipur (b) Punjab (c) Hyderabad (d) New Delhi

PART - B

(2X5 = 10 Marks)

(Answer any TWO questions)

16. Write notes on decomposers.
17. Explain ecological succession.
18. Explain population ecology.
19. Write note on BOD.
20. Explain Cyclone.

PART - C

(5 X 10 = 50 marks)

(Answer all the questions)

(Draw diagrams wherever necessary)

21. (a) Write an essay on forest ecosystem.
(or)
(b) Explain aquatic ecosystem.
22. (a) Give an account on Xerosere.
(or)
(b) Write an essay on Hydrosere.
23. (a) Write an essay on biotic community concept.
(or)
(b) Explain population growth.
24. (a) Write an essay on Air Pollution.
(or)
(b) Give an account on Water Pollution.
25. (a) Write an essay on Noise pollution.
(or)
(b) Explain Soil pollution.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-III

MAJOR BASED ELECTIVE COURSE III - PAPER CODE : 21PBYM3

FOREST TECHNOLOGY

Objectives

1. To know about the principles and scope of forest management
2. To study about the forest biotechnology

UNIT I

Forestry-Definition, Classification, scope of forestry, forest utilization, major and minor forest products. Forest types of India - social forestry, village forestry, farm forest and avenues.

UNIT II

Principle and scope of forest management, elements of measurements and quantification - sampling use of diameter (Girth) height and area spacing rotation. Concept of sustained yield – conservation strategies and sustainable development.

Wild life- Important animals of South India, preservation – sanctuaries, endangered species, causes for destruction and need for protection- wild life preservation act.

UNIT III

Elements of silviculture - silviculture of the following species:-

- a. *Tectona grandis*
- b. *Casuarina equisetifolia*
- c. *Eucalyptus*
- d. *Bombosa sp*
- e. *Santalum album*

Silvicultural systems - clear felling, simple coppice and selection felling.

UNIT IV

Wood structure , physical, chemical and mechanical properties of wood. Wood preservation, wood seasoning and wood preservatives.

UNIT V

Tree Improvement -Genetic variation, geographic variation, genotype and phenotype, Tree improvement methods -species introduction, hybridization, Individual tree selection, vegetative propagation and grafting.

TEXT BOOKS

1. Kamal Kishor Sood and Vishal Mahajan.2018. Forests: Climatic Change and Biodiversity. Kalyani Publishers, New Delhi
2. Shrivastava,M.B. 1998. Introduction to Forestry. South Asia Books; 1 edition, New Delhi
3. Sudhir,M. 2000.Applied biotechnology and plant genetics, Dominant Publishers, New Delhi
4. Vinod Kumar .1995.Nursery and Plantation practices in Forestry, Jodhpur. Scientific publishers.

REFERENCE BOOKS

1. Agarwal A, 1985. Forest of India. as cited in P. Leelakrishnan, Environmental Law in India, Butterworths India, New Delhi
2. Champion ,H.G and Griffith. 1967. Manual of General silviculture for India, 3rd edition, New Delhi.
3. WWF.2007. Timber Identification Manual. TRAFFIC, New Delhi.

WEB RESOURCES

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

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	appreciate the scope and classification of forestry	Remember
CO2	get familiarize with the forest management	Apply
CO3	understand the silviculture	Remember
CO4	get an idea of Wood structure and wood preservation	Evaluate
CO5	get familiarize with the tree improvement methods	Apply

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

M.SC., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER – II
MAJOR BASED ELECTIVE COURSE III – 21PBYM3
FOREST TECHNOLOGY

Time: 3 hrs

Maximum: 75 marks

PART A **(15x1=15 Marks)**
(Answer ALL questions)

1. According to Forest Act 1878 which of the following were called best forest?
(a) Protected forest (b) Village forest (c) Reserved forest (d) None of these
2. Which one of the following types of vegetation has commercially important trees like ebony, mahogany, rosewood and rubber?
(a) Montane Forest (b) Tropical Rain Forests (c) Tropical Deciduous Forests
(d) Tropical Thorn Forest.
3. Most widespread vegetation in India is:
(a) Coniferous forests (b) Tropical Rain forests (c) Tropical Deciduous forests
(d) Mangrove forests.
4. Which one of the following movement was carried out for the conservation of forests and the environment?
(a) Forest movement (b) Ganaga Action Plan (c) Tehri Andolan
(d) Chipko Andolan
5. What is the full form of JFM with related to Forest Management?
(a) Junior Forest Management (b) Joint Forest Management (c) Jury Forest Management
(d) Jharkhand Forest Management
6. Which one of the following is not the best way to stop deforestation?
(a) Planting trees (b) Eat vegetarian meals as often as possible (c) Go paperless
(d) Not encouraging for recycling the used products
7. In which system that the regeneration of the compartment is started form natural foci or groups of advance growth?
(a) Uniform system (b) Group system (c) Clear strip system (d) None of these
8. What is coppice system?
(a) A systems where the crop originates from coppice and where the rotation of the coppice is short
(b) A systems where the crop originates from coppice and where the rotation of the coppice is long.
(c) Both a & b
(d) None of the above

9. A clear-felling with a forest protection over wood and regeneration from coppice is called:
 (a) Simple coppice system (b) Shelterwood coppice system (c) Uniform system (d) None
10. Seasoning of timber is the process of
 (a) Burning timber (b) Adding preservatives (c) Removing water (d) Adding glaze
11. The quality of timber does not depend upon
 (a) Maturity of tree (b) Time of felling (c) Type of tree (d) Size of tree
12. Tracheid percentage is 90-95% in
 (a) Heart wood (b) Soft wood (c) Hard wood (d) None
13. Tissue culture is a good technique to
 (a) Cross two varieties (b) Rapidly increase the size of a trees by strengthening the stem (c) Eliminate virus (d) Improve yield of crops
14. Advantages of Artificial Methods of Vegetative Reproduction include
 (a) Crops with better quality (b) Crops with more yield
 (c) Ability to produce plants with desirable qualities (d) All of these
15. Excision and insertion of a gene is called
 (a) Biotechnology (b) Genetic engineering (c) Cytogenetics (d) Gene therapy

PART B

(2x5=10 Marks)

(Answer any TWO questions)

16. Describe the various layers of Forest:-
17. Write a brief account on the need for Wild life protection act:-
18. What do you know about the Tending in silviculture?
19. Describe the early wood and late wood briefly:-
20. Write a brief account on the genetically modified tree:-

PART C

(5x10=50 Marks)

(Answer ALL questions)

- 21(a) Describe the various types of Forest :-
 (or)
 (b) Explain the societal significance of the forests:-
- 22(a) Describe the strategies in the maintenance of forest ecosystem:-
 (or)
 (b) Write an essay on the Wildlife sanctuaries of India and their importance:-
- 23(a) Explain in detail about the silvicultural systems:-
 (or)
 (b) Describe the Silviculture of *Santalum album*:-
- 24(a) Write a detailed account on the properties of wood:-
 (or)
 (b) Explain the various methods of wood preservation: -
- 25(a) Describe the role of tree improvement in intensive forest management:-
 (or)
 (b) Explain the various methods in the tree improvement in detail:-

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(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-II

MAJOR BASED ELECTIVE COURSE IV - PAPER CODE : 21PBYM4

HORTICULTURE

Objectives

1. To understand the main principles and importance of horticulture
2. To develop skill in horticulture techniques
3. To know the various methods of plant propagation
4. To develop potential for self-employment

UNIT I

Importance of scope of horticulture – Divisions of horticulture – Climate, soil and nutritional needs – Water irrigation – Plant propagation method – Cutting, layering, grafting, budding. Stock – scion relationship, micropropagation by induction of rooting. Glass houses and green houses.

UNIT II

Principles and methods of designing outdoor garden – hedges, edges, fences, trees, climbers, rockeries, arches, terrace garden – Lawn making and maintenance – Water garden – cultivation of water plants-common water plants. Layout for a model college garden.

UNIT III

Indoor gardening – Foliage plants, flowering plants, hanging basket, Bonsai plants – Training, watering and pruning. Floriculture – Cultivation of commercial flower crops – Rose, Jasmine and Chrysanthemum, Flower decoration – Dry and wet decoration.

UNIT IV

Classification of vegetables, cultivation of important vegetable – Tomato, potato, brinjal, onion, cabbage and snake guard. Layout for a model kitchen garden.

UNIT V

Fruit crops – Induction of flowering, flower thinning, fruit setting, fruit development. Cultivation of important fruit crops - Mango, Grapes, Sapota and Guava. Cultivation of tree species – Eucalyptus and Teak.

TEXT BOOKS

1. Chandha, K.L., (2001) Hand book of Horticulture. ICAR Publications, New Delhi.
2. Edmond Senn, Arews, Halfacre. (1987). Fundamentals of Horticulture, Tata McGraw Hill book Co., Ltd. New Delhi.
3. Kumar, N., (2014) Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.

4. Manibhushan Rao, K., (2009) Text book of Horticulture, Macmillan India Ltd.
5. Prasad, S. and Kumar, U., (2010) Principles of Horticulture, Agrobios (Indi(a).
6. Sheela, V.L., (2011) Horticulture, MJP Publishers, Chennai.
7. Tiwari, A.K., (2012) Fundamentals of Ornamentals, Horticulture and Landscape Gardening. Publisher: Nipa (2012) ISBN-10: 9381450072; ISBN-13: 978-9381450079.

REFERENCE BOOKS

1. Bailey L.H. (1901). The Standard Cyclopaedia of Horticulture Volume 1,2 and 3, Macmillan Publications.
2. Edman, J.B. T.L. Senn, F.S. Andrews and R.G. Halfacre, 1988. Fundamentals of Horticulture, Tata MacGraw Hill Publishing house company, New Delhi.
3. Janick. J.W.H. 1988. Horticulture Science. Freeman and Co., Sanfrancisco.
4. Yawalkar, K.S., (1961) Vegetable crops of India, Agri Horticultural Publishing House, Dharmapath, Nagpur.
5. Randhava, G.S., (1973) Ornamental horticulture in India, Today and Tomorrow Printers and Publishers, New Delhi.
6. Bose, T.K. and Mukherjee, D (1972). Gardening in India, Oxford & 1BH Publishing Co., Kolkatta, Mumbai, New Delhi.
7. Shujnroto, (1982), The Essentials of Bonsai, David & Charles.
8. Pratibha, P. Trivedi. (1987). Home gardening, ICAR Publication, New Delhi.
9. Arora J.S. (1990). Introductory Ornamental Horticulture, Kalyani Publications.

WEB RESOURCES

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

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	Understand Horticulture and Plant Propagation methods.	Understand
CO2	Know the outdoor garden, water garden and lawn making.	Create
CO3	Learn indoor garden, floriculture and Bonsai cultivation.	Apply
CO4	Learn the cultivation of vegetables and kitchen garden.	Create
CO5	Learn the cultivation of fruit crops and tree species.	Apply

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

M.SC., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER-II
MAJOR BASED ELECTIVE COURSE IV - PAPER CODE : 21PBYM4
HORTICULTURE

Time: 3 hrs

Maximum: 75 marks

PART A **(15x1=15 Marks)**
(Answer ALL questions)

1. Horticulture is the study that includes
(a) Fruits, vegetables and flowers (b) All food crops (c) Vegetable gardens and lawns near hotels only (d) Some bush crops and apples
2. In cutting method of vegetative propagation, cuttings are mainly taken from
(a) Leaves of parent plant (b) Roots or stems of parent plant (c) Shoots of parent plant (d) Buds of parent plant
3. Layering can be done on plants such as
(a) Bulbs (b) Lime (c) Sugar cane (d) Oleander
4. Which irrigation method is most suitable for lawns?
(a) Furrow (b) Drip (c) Basin (d) Sprinkler
5. Zen garden is also known as
(a) Italian garden (b) Mughal garden (c) Japanese garden (d) English garden
6. In a formal garden the imaginary central line is known as
(a) Focal point (b) Hedges (c) Axis (d) Edges
7. Following garden type is also known as 'alpine garden'.
(a) Water garden (b) Terrace garden (c) Sunken garden (d) Rock garden
8. The term 'sours' related with wick flower plant?
(a) Gudhal (b) Lilly (c) Jasmine (d) Tulip
9. What does the word 'Bonsai' mean?
(a) Slow to grow (b) Small tree (c) Planted in a tray (d) Dwarf and tiny
10. Vegetables are rich source of
(a) Vitamins (b) Carbohydrates (c) Protein (d) Fat
11. Tomato variety RKMT is evolved through
(a) X-rays (b) Gamma rays (c) EMS (d) MMS
12. Potato is a rich source of Vitamin
(a) A (b) B (c) C (d) D
13. The national fruit of India is
(a) Apple (b) Banana (c) Mango (d) Grapes

14. 'Pusa Urvashi' is a variety of
(a) Mango (b) Grapes (c) Guava (d) Jack fruit
15. Bronzing in Guava is caused due to the deficiency of
(a) Copper (b) Manganese (c) Phosphorus (d) Magnesium

PART B
(Answer any TWO questions)

(2x5=10 Marks)

16. Describe various methods of cutting with suitable examples.
17. Explain principles and methods of designing outdoor garden.
18. Discuss the cultivation methods of Jasmine.
19. Plan and make a layout of a model kitchen garden.
20. Comment on flower induction.

PART C
(Answer ALL questions)

(5x10=50 Marks)

- 21 (a) Highlight the importance and explain in detail various scopes of horticulture.
(or)
(b) Explain the different methods of grafting. Also add a note on stock-scion relationship.
- 22 (a) Write an essay on different types of lawn making and its maintenance.
(or)
(b) Plan and make a layout of a model garden in your college campus.
- 23 (a) Enumerate the various steps involved in Bonsai technique. Add a note on its importance in horticulture
(or)
(b) Write an essay on Indoor Gardening:-
- 24 (a) Discuss in detail about the cultivation of i) Tomato and ii) Onion
(or)
(b) Explain the cultivation methods of i) Brinjal and ii) Cabbage
- 25 (a) Discuss in detail about the cultivation of i) Mango and ii) Grapes
(or)
(b) Explain the cultivation methods of i) Teak and ii) Eucalyptus

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-II

RESEARCH ACUMEN COURSE II : RESEARCH WRITING

PAPER CODE : 21RAC02

Course Objectives

- ❖ Introduce students to the discipline of Research Writing and its specific purposes.
- ❖ Educate students in the basics of research writing.
- ❖ Provide students with the critical faculties necessary in an academic environment and in an increasingly complex, interdependent world.

Course Learning Outcomes

- ❖ Generic: The learner is required to have a basic understanding of research
- ❖ Adaptive: Assist students in the development of intellectual flexibility, creativity, and research ethics so that they may engage in life-long learning.

Learning Outcome

- ❖ Exposure to varied approaches to research.
- ❖ The student gets a fair understanding of the politics of human interactions and to work for a peaceful co-existence of all living beings in the world.
- ❖ The student gets an analytical skill in taking up research.
- ❖ The student understands the different tools of research.
- ❖ The student gets a clear understanding of the format of research paper.

Unit I

Basics of Research Writing : Research and its Characteristics -The Purpose of Research - proper placement of elements in a sentence - Structuring the paragraph - breaking up long sentence - word choice - proper use of punctuation - Avoiding Ambiguity, Repetition, and Vague Language.

Unit II

Steps Involved in Research : Topic of Research - Data Collection – Primary Source and Secondary Sources - Topic selection – narrowing the topic through (peer discussion, online forum, library, electronic data base, periodicals.

Unit III

Research Writing Styles : Basic components of a research paper – Abstract introduction, body, conclusion and references - Pagination - Margin - Fonts - Spacing – Spelling - Punctuation - Documentation Styles (MLA Style, APA Style and CMS Style)

Unit IV

Dissertation Writing : Comparison between term paper and dissertation - Title - Cover Page – Declaration – Certificate – Acknowledgement – Contents - Introduction - Statement of Problem – Methodology - Review of Literature - Main Body - Conclusion - Bibliography - Works Cited – References

Unit V

Research Proposal Writing : Types of funding agencies in India – proposal writing (summary of research, background literature, research question, research methodology, anticipatory problems and limitations, significance of research, ethical considerations, resources required, budget cost, references) Definition of plagiarism – UGC regulation for plagiarism – plagiarism detection programs – plagiarism free writing.

REFERENCE BOOKS

1. Adrian Wallwork, “English for Writing Research Papers”, Second Edition, Italy, Springer(2016).
2. Laurie Rozakis, “Schaum’s Quick Guide to Writing Great Research Papers”, Second Edition, India, McGraw-Hill (2007).
3. James D. Lester • James D. Lester, Jr. “Writing Research Papers-A Complete Guide” Fifteenth edition, New Delhi, Pearson(2015).
4. Jennifer Peat, Elizabeth Elliott, Louise Baur, Victoria Keena, “Scientific Writing Easy when you know how”, BMJ Books, London(2002).
5. Jean-luclebrun, “Scientific Writing; A Reader and writer’s guide”, Singapore, World Scientific Publishing Co. Pte. Ltd(2007).
6. Brian Paltridge and Sue Starfield , “Thesis and Dissertation Writing in a Second Language”, USA, Routledge(2007).
7. Subhash Chandra Parija, Vikram Kate, “Thesis Writing for Master's and Ph.D. Program”, Singapore, Springer(2018).

WEB RESOURCES

1. <https://www.casemine.com/>
2. <http://www.legalservicesindia.com/article/284/Plagiarism.html>

3. R. Saha ,”Plagiarism, research publications and law”, Current Science, VOL. 112, NO. 12, 25 JUNE 2017. <https://www.currentscience.ac.in/Volumes/112/12/2375.pdf>
4. <https://virtualwritingtutor.com/>

M.Sc., BOTANY DEGREE EXAMINATION

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

PRACTICAL -1 - PAPER CODE: 21PBYP1

(Algae, Fungi Lichens and Bryophytes, Pteridophytes, Gymnosperms & Palaeobotany,
Microbiology and Plant Pathology)

Time : 4 hrs.

Maximum : 60 Marks

Practical : 50 Marks

Record : 5 Marks

Viva - Voce : 5 Marks

1. Determine whether the given sample 'A' is contaminated with bacteria or not. Leave the slide for evaluation. (5 marks)
2. Make suitable micropreparations of B, C and D. Draw labeled sketches. Identify giving reasons. Leave the slides for valuations. (3x4=12 marks)
3. With suitable micropreparations, Identity E, F and G. Draw labeled sketches. Identify giving reasons. Leave the slides for valuation. (3x4=12 marks)
4. Draw diagrams and write notes of interest of H, I and J. (3x2=6 marks)
5. Name the Genus and group of the macroscopic specimens of K, L and M. (3x2=6 marks)
6. Name the causal organism, disease symptoms and control measures of the pathological specimen N. (9 marks)

Key

A	= Microbiology - Material / Sample to be given
B, C and D	= Algae, Fungi and Bryophytes
E, F and G	= Pteridophytes / Gymnosperms
H, I and J	= Microslides
K, L and M	= Macroscopic specimens
N	= Pathological specimen

M.Sc., BOTANY DEGREE EXAMINATION

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

PRACTICAL -II- PAPER CODE: 21PBYP2

(Anatomy, Embryology, Microtechniques, Cell, Molecular Biology & Genetics and Environmental Biology)

Time : 4 hrs.

Maximum : 60 Marks

Practical : 50 Marks

Record : 5 Marks

Viva - Voce : 5 Marks

1. Cut transverse section of A. Identify the anomaly with suitable diagram and reasons. Submit the slide for valuation (8 marks)
2. Dissect and Mount any 2 stages of embryo from the given material B. Submit the slide for valuation. Draw labeled diagrams. Notes not necessary (2x3=6 marks)
3. Identify any 2 stages of cell division each from the given material C and D. Draw labeled diagrams. Notes not necessary. (2x3=6 marks)
4. Construct a meter quadrat E. Analyse the vegetation. Record the data and interest the results. (8 marks)
5. Solve the Genetic problems F and G (2x3= 6marks)
6. Construct a chromosome map from the given data H. (8 marks)
7. Write notes on interest, I, J, K and L. (8 marks)

Key

A = Dicot stem showing anomalous structure.

B = Tridax flower

C,D = Root tip and flower Bud

E = Meter quadrat

F,G = Genetic Problems.

H = Chromosome map

I,J,K,L = Spotters I - Microtechnique

J – Molecularbiology

K - Environmental Biology

L – Cytology

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-III

CORE COURSE VII - PAPER CODE : 21PBY07

TAXONOMY OF ANGIOSPERMS

Objectives

1. To acquire the fundamental values of plant systematics.
2. To know about the basic concepts and principles of plant systematic
3. To establish a suitable method for correct identification and adequate characterization of plants
4. To be aware of the importance of taxonomic relationships in plant systematic studies.

UNIT I

Taxonomy and systematics – Basic components and goals of systematic; Advancement levels in systematics and systematics in internet revolution. Historical background of plant classification: Classification based on sexual system (Carlos Linnaeus), natural system and phylogenetic system. Major systems of classification: Bentham and Hooker, Engler and Prantl, John Hutchinson. Angiosperm Phylogeny Group (APG) – Outline of APG-IV plant classification.

UNIT II

Botanical nomenclature: History of botanical nomenclature, principles of ICBN, ICN, author citation, publication of valid names, principles of priority, names of hybrids, names of cultivated plants and draft biocode. Botanical Survey of India (BSI) – Organization, function and contribution. Process of Identification: Specimen preparation, herbarium methods, and identification methods (taxonomic literature, taxonomic keys and computers in identification); Botanical library; Botanical gardens. Hierarchical classification: taxonomic groups, categories and ranks (species concept, intraspecific ranks, genus and family).

UNIT III

Phylogeny of Angiosperms: Important phylogenetic terms and concepts; origin and evolution of angiosperms; Taxonomic evidence: Morphology, anatomy, embryology, chromosomal, chemotaxonomy and serotaxonomy. Phenetic and phylogenetic methods: Phenetic- numerical taxonomy, phylogenetic – cladistics. Variation and speciation.

UNIT IV

Study of the diagnostic characters, economic importance, systematics and phylogeny of the following families: Ranunculaceae, Menispermaceae, Papaveraceae, Brassicaceae, Polygalaceae, Sterculiaceae, Meliaceae, Oxalidaceae, Rhamnaceae, Sapindaceae, Anacardiaceae, Combretaceae, Passifloraceae.

UNIT V

Study of the diagnostic characters, economic importance, systematics and phylogeny of the following families: Lythraceae, Sapotaceae, Boraginaceae, Convolvulaceae, Acanthaceae, Bignoniaceae, Amaranthaceae, Aristolochiaceae, Loranthaceae, Commelinaceae, Typhaceae, Cyperaceae.

PRACTICALS

Taxonomy

Identification of specimens belonging to the families included in theory syllabus at family, generic and specific levels. Economic importance of the plant/plant parts from the families in theory. Familiarity with the use of floras. Preparation of dichotomous artificial keys using locally available plants. A field trip of not less than a week to a place of luxuriant vegetation within or outside the state to study the flora. Submission of a tour report and 30 herbarium sheets during practical examination.

TEXT BOOKS

1. Karuppusamy, S. and Pullaiah, T., 2018. Taxonomy of Angiosperms. 4th Revised Edn., Regency Publications, New Delhi.
2. Pandey, B. P., 2001. Taxonomy of Angiosperms. S. Chand & Co. Ltd., New Delhi.
3. Nair, R., 2010. Taxonomy of Angiosperms. APH Publishing Corporation, New Delhi.
4. Naik, V.N. 1984. Taxonomy of Angiosperms. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Sharma, O.P. 2017. Plant Taxonomy. 2nd Edn. Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Sinha, R. K., 2020. Practical Taxonomy of Angiosperms. I.K. International Publishing House Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. Bensen, L.D. 1957. Plant Classification. Oxford & IBH Publishing Co., New Delhi.
2. Cronquist, A. 1988. The Evolution and Classification of Flowering Plants. (2nd ed.), New York Botanical Garden, NY, USA.

3. Darlington, C.D. and Wylie, A.P. 1955. Chromosome Atlas of Cultivated Plants. Allen and Unwin, London.
4. Davis, P.H. and Heywood, V.M. 1963. Principles of Angiosperm Taxonomy. Oliver & Boyd, London.
5. Gamble, J.S. and L.E.F. Fisher 1967. The Flora of the Presidency of Madras vol - I, II, III, BSI, Calcutta.
6. Henry, A.N. and Bose, C. 1980. An aid to the International Code of Botanical Nomenclature, Today & Tomorrow's Printers & Publishers, New Delhi.
7. Hutchinson, J. 1973. The Families of Flowering Plants (3rd ed.), Oxford University Press, UK.
8. Lawrence, G.H.M. 1961. Taxonomy of Vascular Plants. MacMillan and Co., New Delhi.
9. Mathew, K.M. 1983. The Flora of Tamilnadu Carnatic. The Rapinat Herbarium, Trichy.
10. Davis, P.H. and Heywood, V.H., 2011. Principles of Angiosperm Taxonomy. Scientific Publishers, Jodhpur.

WEB RESOURCES

- Biodiversity Heritage Library – Biodiversity literature openly available to the world. <http://www.biodiversitylibrary.org/>
- BOLD SYSTEMS – The Barcode of Life Data Systems with DNA barcode library, taxonomy, identification, workbench, and other resources. <http://www.boldsystems.org/>
- Catalogue of Life – The online database of the world's known species of animals, plants, fungi and micro-organisms. <http://www.catalogueoflife.org/>
- ESABII – Taxonomy Training Manuals and species identification sheets for East and South East Asia. <http://www.esabii.org/training/index.html>
- Global Biodiversity Information Facility – Global species occurrences and specimen collections. <http://gbif.org/>
- Tropicos – Missouri Botanical Garden's databases. <http://www.tropicos.org/>
- NCBI Taxonomy Browser – Phylogenetic and taxonomic knowledge from a variety of sources, including the published literature, web-based databases, and the advice of sequence submitters to and outside taxonomy experts. <http://www.ncbi.nlm.nih.gov/Taxonomy/taxonomyhome.html/>
- Online Taxonomic Key Application – Royal BC Museum, Canada. <http://taxonomy.royalbcmuseum.bc.ca/Taxonomy/default.aspx>

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the major systems of classification	Remember
CO2	learn the botanical nomenclature, BSI and herbarium preparation	Apply
CO3	understand the phylogeny of angiosperms and taxonomical evidence	Understand
CO4	learn the diagnostic characters, economic importance, systematic and phylogeny of certain families	Remember
CO5	learn the diagnostic characters, economic importance, systematic and phylogeny of certain families	Remember

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

M.Sc., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER-II
CORE COURSE VII - PAPER CODE : 21PBY07
TAXONOMY OF ANGIOSPERMS

Time: 3 hrs

Maximum: 75 marks

PART A **(15x1=15 Marks)**
(Answer ALL questions)

1. Which one of the following is a sexual system of classification?
(a) Bentham & Hooker (b) Linnaeus (c) Engler & Prantl (d) APG-IV
2. Enneandria refers to the plants with _____ stamens.
(a) 6 (b) 12 (c) 9 (d) 10
3. The year of publication of “*Species Plantarum*” was
(a) 1853 (b) 1753 (c) 1773 (d) 1763
4. Experimental Botanic Garden & National Orchidarium under Southern Regional Centre of BSI is established at _____.
(a) Coimbatore (b) Yercaud (c) Trivandrum (d) Chennai
5. Crucifer type petals are seen in
(a) Brassicaceae (b) Fabaceae (c) Araceae (d) Acanthaceae
6. Tetradynamous condition is known in
(a) Brassicaceae (b) Ranunculaceae (c) Menispermaceae (d) Rutaceae
7. Dioecious is a characteristic of the family
(a) Ranunculaceae (b) Papaveraceae (c) Menispermaceae (d) Cruciferae
8. Which of the following is a liana?
(a) *Cardiospermum halicacabum* (b) *Linum usitatissimum* (c) *Anamirta cocculus*
(d) *Indigofera tinctoria*
9. The ‘Moon seed’ family is
(a) Brassicaceae (b) Ranunculaceae (c) Menispermaceae (d) Sterculiaceae
10. Bipinnately compound leaves are found in
(a) *Azadirachta indica* (b) *Melia azedarach* (c) *Swietenia mahagoni* (d) *Swietenia macrophylla*
11. ‘Gum karaya’ is obtained from
(a) *Gardenia gummifera* (b) *Acacia arabica* (c) *Sterculia urens* (d) *Melhania incana*
12. The pollination in Sterculiaceae is
(a) Ornithophilous (b) Entamophilous (c) Chiropterophilous (d) Anemophilous

13. The botanical name of 'Vishnukiranthi' is _____.
- (a) *Convolvulus arvensis* (b) *Evolvulus nummularius*
 (c) *Evolvulus alsinoides* (d) *Ipomoea carnea*
14. The major source of the Ayurvedic medicine "Vasaka" is derived from _____.
 (a) *Justicia simplex* (b) *Justicia adhatoda* (c) *Justicia tranquebariensis* (d) *Justicia gendarussa*
15. The family, _____ is commonly known as "showy mistletoes".
 (a) Arecaceae (b) Aristolochiaceae (c) Loranthaceae (d) Chenopodiaceae

PART – B

(Answer any TWO questions)

(2x5 = 10 marks)

16. Outline Linnaeus system of classification of plants.
17. Briefly write about Botanical Survey of India.
18. What is chemotaxonomy? Explain in brief.
19. Write shortly on the floral characters of Anacardiaceae.
20. Discuss the phylogenetic relationship of Acanthaceae.

PART – C

(Answer ALL questions)

(5x10 = 50 marks)

- 21.(a) Write an essay on any known classification of Angiosperms based on natural system.
 (or)
 (b) Outline the classification of Angiosperm Phylogeny Group-III (APG-III).
22. (a) Discuss author citation and its importance in Taxonomy.
 (or)
 (b) Give an account on ICBN.
23. (a) Give a brief account on Embryology in relation to Taxonomy.
 (or)
 (b) What do you understand by the term 'Phylogeny of Angiosperms'? Add a brief note on evolution of Angiosperms.
24. (a) Write the general characteristics of the family classified under the Order, Parietales you have studied.
 (or)
 (b) Discuss the diagnostic characters, economic importance, systematics and phylogeny of Meliaceae.
25. (a) Compare the floral characteristics of Acanthaceae and Convolvulaceae.
 (or)
 (b) Write an essay on the salient features and economic importance of Sapotaceae.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-III

CORE COURSE VIII - PAPER CODE : 21PBY08

PLANT PHYSIOLOGY AND BIOPHYSICS

Objectives

1. To learn the underlying principles of the various physiological processes of plants
2. To study the various physicochemical and morphogenetic processes taking place during the various stages of plant growth
3. To understand the principles of thermodynamics

UNIT I

Water and plant relations permeability, chemical potential, water potential and osmotic potential in plants. Absorption of water and its mechanism apoplast-symplast transports, mechanism of ascent of sap.

Mineral nutrition: role of micro and macro elements. Mechanism of mineral absorption and phloem transportation. Hydroponics.

Environmental stress: types, Effect of water and salt stress on crop plants. Mechanism of drought and salinity stress resistance.

UNIT II

Photosynthesis: pigment system I & II - Emerson's enhancement effect. Photochemical reaction, Non - cyclic and cyclic transport. Photophosphorylation. Photorespiration. C₃ pathway. C₄ cycle. CAM pathway. Respiration - Aerobic and anaerobic - Glycolysis - Krebs cycle, Electron transport system.

UNIT III

Nitrogen Metabolism: Asymbiotic and symbiotic nitrogen fixation. Leghaemoglobin, nod and nif genes. Nitrate reduction. NR and NIR assimilation of ammonia - GDS. GS and GOGAT pathway. Transamination. Interrelationships between GDH, GS Photosynthesis and nitrogen metabolism.

UNIT IV

Physiological effects and mode of action of plant growth regulators -auxins, gibberellins, cytokinins, ethylene and abscissic acid, Phytochrome - role and mode of action. Photoperiodism and mechanism of flowering. Vernalization, Senescence, Dormancy.

UNIT V

Bioenergetics - laws of thermodynamics. Enthalpy, Entropy., Free energy. Mitochondrial bioenergetics, chloroplast bioenergetics, ATP bioenergetics NADP/ NADHP redox couple bioenergetics. Photobiology: light characteristics of solar radiation. Absorption Spectrum, Action spectrum of molecules. Fluorescence and Phosphorescence, Bioluminescence.

PRACTICALS

1. Determination of relative water content of leaf material.
2. Measurement of stomata index and frequency.
3. Measurement of membrane permeability as affected by chemicals.
4. Separation of Photosynthetic pigments by paper chromatography.
5. Estimation of photosynthetic pigments by Arnon's Method.
6. Measurement of rate of respiration in germinating seeds, flower buds using respiroscope.
7. Estimation of total nitrogen by Nesslerization method (or) Microkjeldhal Method.

DEMONSTRATION ONLY

1. Preparation of Knopp's solution (or) Arnon and Hoagland's solution
Hydroponics study
2. Warburg manometry - principle and application
3. Absorption spectrum of chlorophylls.
4. Hormone application (IAA, GA₃, Cytokinin) and seedling growth.

TEXT BOOKS

1. Annie and Arumugam, 2000, Biochemistry and Biophysics. Saras Publication, Nagercoil, Tamilnadu
2. Malik C.P. and Srivastava, A.K. 1995. Textbook of plant physiology Kalyani Publishers, New Delhi.
3. Noggle G.R. and Fritx G.J. 1976. Introductory Plant Physiology. Prentice Hall India, New Delhi.
4. Sinha R.K. 2004. Modern Plant Physiology, Narosa Publication, New Delhi.
5. Thiravia raj. S. 2001. Biophysics Saras Publication, Nagarcoil, Tamilnadu

REFERENCE BOOKS

1. Beevers L. 1976. Nitrogen metabolism in plants, Wiliam Clowes & Limited, London
2. Bray CM. 1983. Nitrogen metabolism in plants Longman, England.
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7. Salisbury F.B. and Ross. C.W. 1992. Plant physiology, Wordsworth Publication, California.
8. Steward F.C (ED) 1956. Plant Physiology (Vol I- VID) Addition clowers & sons, Limited, London
9. Taiz L. and Zeiger. E. 1998. Plant physiology sinaner Associates. Publishers, USA

WEB RESOURCES

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

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the water relations, absorption of water & minerals; stress mechanism	Understand
CO2	learn the photosynthesis and respiration; compare the C3, C4 and CAM cycles	Analyse
CO3	understand the mechanisms of nitrogen fixation	Create
CO4	learn the applications of growth regulators and their role in plant physiological activities	Apply
CO5	understand the concepts of thermodynamics and photobiology	Understand

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

M.Sc., BOTANY
MODEL QUESTION PAPER - THEORY
(For the candidates admitted from 2021-2022 onwards under CBCS pattern)
SEMESTER-III - PAPER-VIII- PAPER CODE : 21PBY08

PLANT PHYSIOLOGY AND BIOPHYSICS

Time : 3 hrs

Part A
(Answer ALL questions)

Total marks: 75
(15X1 =15 marks)

1. The plants die due to wilting when
(a) Available light is reduced to half (b) xylem is blocked (c) a few roots are broken
(d) phloem is blocked
2. The direction and the rate of water movement from cell to cell is based on
(a) Diffusion pressure deficit (b) incipient Plasmolysis (c) turgor pressure
(d) wall pressure
3. Which one of the following is used for measuring the rate of respiration
(a) Auxanometer (b) Respirometer (c) Mohl's experiment (d) Ganong's
photometer
4. The correct sequence of cell organelles during photorespiration is
(a) Chloroplast - peroxisome - mitochondria
(b) Chloroplast - Vacuole - peroxisome
(c) Chloroplast - Golgi bodies - mitochondria
(d) Chloroplast - Rough endoplasmic reticulum - Dictyosomes
5. In ----- NADP is converted into NADPH₂
(a) Photolysis (b) Cyclic Photophosphorylation (c) Noncyclic
Photophosphorylation (d) Oxidative phosphorylation
6. Oxidative Phosphorylation refers to
(a) Anaerobic respiration (b) Citric acid cycle production of ATP (c) alcoholic
fermentation (d) Production of ATP by chemiosmosis
7. Coconut milk factor is
(a) an auxin (b) a gibberellin (c) Abscissic acid (d) a cytokinin
8. An enzyme that can stimulate the germination of barley seeds is
(a) α -amylase (b) lipase (c) protease (d) invertase
9. Differentiation of shoot is controlled by
(a) High auxin : cytokinin ratio (b) High cytokinin : auxin ratio (c) High
gibberellin : auxin ratio (d) High gibberellins : cytokinin ratio
10. Conversion of ammonia to nitrite and then to nitrates is called
(a) Ammonification (b) Denitrification (c) Assimilation (d) Nitrification
11. Important enzymes involved in nitrogen fixation are
(a) Nitrogenase and hydrogenase (b) Nitrogenase and hexokinase (c) Nitrogenase
and peptidase (d) Nitrogenase and hydrolyase
12. All the following are free living N₂ fixers except
(a) *Azotobacter* (b) *Rhizobium* (c) *Clostridium* (d) *Rhodospirillum*
13. Chemical dissociation is
(a) Exothermic (b) reversible (c) endothermic (d) reversible and endothermic

14. Which of the following is the largest unit of energy
(a) electron volt (b) joule (c) calorie (d) erg
15. Entropy is a
(a) path function, intensive property (b) path function, extensive property
(c) point function, intensive property (d) point function, extensive property

Part B

(Answer any TWO questions) (2X5 = 10 marks)

(Draw diagrams wherever necessary)

16. Explain the importance of “Trace elements” in plants:-
17. Enumerate the various steps of CAM pathway:-
18. Describe the nif genes briefly:-
19. Give a brief account on vernalization:-
20. Explain Entropy:-

Part C

(Answer ALL questions) (5X10=50 marks)

(Draw diagrams wherever necessary)

- 21(a) Ascent of sap - Discuss:-
(or)
(b) Describe the mechanism of drought resistance prevailing in crop plants:-
- 22(a) Explain the Hatch Slack pathway:-
(or)
(b) Enumerate the various steps of Krebs cycle:-
- 23(a) Describe the various steps in ammonium assimilation:-
(or)
(b) Write an essay on symbiotic N₂ fixation:-
- 24(a) Explain Photoperiodism:- add a note on the mechanism of flowering:-
(or)
(b) Write an account on the physiological aspects of PGR
i) Auxin ii) Gibberellin
- 25(a) Give a detailed account on ATP bioenergetics: -
(or)
(b) Explain i) Fluorescence ii) Phosphorescence in detail: -

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-III

CORE COURSE IX - PAPER CODE: 21PBY09

PLANT BIOTECHNOLOGY

Objectives

1. To understand the various plant tissue culture techniques and their applications
2. To have an in depth knowledge of the specialized areas of plant biotechnology

UNIT I

Tools, techniques and procedures of Tissue culture- Principles of plant tissue culture terminology, totipotency. Establishment of plant tissue culture lab: equipment, culture vessels, surface sterilization of explants, pretreatment of explants, subculture and repeated transfer of explants. Composition of various tissue culture media and their preparation. Factors affecting tissue culture success- media, explants, light, temperature, humidity, gas, genotype and season. Micropropagation: Stages of Micropropagation, Nodal Culture, Meristem Culture, factors affecting shoot multiplication, application and limitations. Production of virus free plants.

UNIT II

Establishing callus culture: Dynamics of callus growth, organogenesis, embryogenesis - somatic embryogenesis, factors influencing somatic embryogenesis. Cell suspension culture - Production of secondary metabolites. Somaclonal variation, isolation and characterization of variants, molecular basis and induced mutations. Applications and limitations of Somaclonal variation.

UNIT III

Production of haploids (anther, pollen and ovule culture), detection of haploids (morphology and genetic markers), uses of haploids in plant breeding and other uses. Protoplast isolation and culture; protoplast fusion - techniques and mechanism; selection of fused protoplasts, uses of somatic hybrids and cybrids.

UNIT IV

Principles of conservation, Introduction to *in-vitro* conservation - techniques, equipment, Slow Growth Preservation, Preserving by use of osmoticum, Preservation at low temperature. Synthetic seed, types and methods of making synthetic seeds and applications. Cryopreservation - Encapsulation - Dehydration, Encapsulation - Vitrification, Factors affecting cryopreservation. Germplasm storage, seed banks, Achievements and current trends.

UNIT V

Molecular farming in plants: Agrobacterium mediated expression; Bio-safety issues in Plant Molecular Farming. Phytoremediation: Cleaning Up with Plants; Biopesticides, Bioinsecticides and disadvantages of chemical pesticides.

TEXT BOOKS

1. RamavatKG 2004 Plant Biotechnology S Chand & Co New Delhi.
2. Kalyan Kumar De 1991 Plant tissue Culture Timer Baran Jha
3. Nirmal Kumar 2000 An introduction to plant tissue and cell culture Emkay Pub

REFERENCE BOOKS

1. Gupta PK 2000 Elements of Biotechnology Rastogi and Co
2. Dubey RC 2000 A text book of Biotechnology S Chand and Co
3. Chawla H S 2004 Introduction to Plant Biotechnology Second Edition Oxford and IBH New Delhi
4. Biswajit Ghosh 2005 Plant Tissue culture Universities Press

WEB RESOURCES

<https://www.easybiologyclass.com/plant-biotechnology>

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	propagate plants of desired characters	Create
CO2	apply tissue culture techniques in industries	Apply
CO3	produce somatic hybrids and cybrids	Create
CO4	understand <i>in vitro</i> conservation and synthetic seed production	Apply
CO5	understand the concept of phytoremediation and patenting	Understand

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

M.Sc., BOTANY
MODEL QUESTION PAPER - THEORY
(For the candidates admitted from 2021-2022 onwards under CBCS pattern)
SEMESTER-III - PAPER-IX- PAPER CODE : 21PBY09

PLANT BIOTECHNOLOGY

Time : 3 hrs

Part A
(Answer All questions)

Total marks: 75
(15X1 =15 marks)

1. Who is known as the Father of tissue culture?
(a) Bonner (b) Laibach (c) Haberlandt (d) Gautheret
2. The following are the plant material used for tissue culture EXCEPT:
(a) Tissues (b) Cells (c) Protoplasts (d) Trichome
3. Activated charcoal is used in nutrition media to _____
(a) Absorb toxic substances (b) Absorb moisture (c) Absorb elements
(d) Absorb microbes
4. In which of the following conditions do the somaclonal variations appear?
(a) Plants raised in tissue culture (b) Plants exposed to gamma rays (c) Plants growing in polluted soil or water (d) Plants transferred by a recombinant DNA technology.
5. Elicitors are molecules that
(a) induce cell division (b) stimulate production secondary metabolites (c) stimulate hairy root formation that accumulate secondary metabolites (d) none of these
6. In-plant tissue culture, the callus tissues are generated into a complete plantlet by altering the concentration_____.
(a) Sugars (b) Hormones (c) Amino Acids (d) Vitamins and minerals
7. Which of the following chemicals are most widely used for protoplast fusion?
(a) Mannitol (b) Polyethylene glycol (c) Sorbitol (d) Mannol
8. Haploid plants can be obtained from_____.
(a) Anther culture (b) Bud culture (c) Leaf culture (d) Root culture
9. Cybrids are produced by
(a) The nucleus of one species but cytoplasm from both the parent species
(b) The fusion of two same nuclei from the same species
(c) The fusion of two different nuclei from different species
(d) None of the above
10. Preserving germplasm in frozen state is
(a) Cryopreservation (b) Cold storage (c) In situ preservation (d) Verbalization
11. Synthetic seeds are produced by the encapsulation of somatic embryos with_____.

(a) Sodium acetate (b) Sodium nitrate (c) Sodium chloride (d) Sodium alginate

12. What is Dimethyl sulfoxide used for?

(a) A gelling agent (b) Cryoprotectant (c) Chelating agent (d) An Alkylating agent

13. Right of the author or creator is known as

(a) Intellectual property right (b) Creator right (c) Author right (d) Copyright

14. The bioremediation process involving the usage of plants to degrade pollutants is

(a) Composting (b) Biopile (c) Phytoremediation (d) Land farming

15. If you file provisional specification for patenting, the complete specification is required to be filed within

(a) 10 months (b) 12 months (c) 18th months (d) 24 months

Part B

(2X5 = 10 marks)

**(Answer any TWO questions)
(Draw diagrams wherever necessary)**

16. Describe in brief about the factors affecting the plant tissue culture:-

17. Write a brief account on Somatic embryos:-

18. Write a brief account on the importance of haploids in plant breeding:-

19. Describe Synthetic seeds and its production:-

20. List out the Bioethical issues in patenting:-

Part C

(5X10 = 50 Marks)

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

21(a) Enumerate the steps of Micropropagation:-

(Or)

(b) Explain in detail about the sterilization methods in Plant tissue culture:-

22(a) Production of Secondary metabolites through Cell Suspension Culture – Discuss:-

(or)

(b).Explain Somaclonal variation:- Add a detailed account on its applications:-

23(a) Describe Somatic hybridization and its importance in detail:-

(or)

(b) Enumerate the various steps involved in the Haploid production:-

24(a) Describe the role of Cryopreservation in storage in detail:-

(or)

(b)Write an essay on the principles of conservation:-

25(a) Describe the phytoremediation and add an account on its importance:-

(or)

(b) Explain Plant Molecular Farming with an example:-

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-22 onwards under CBCS pattern)

M.Sc., Botany

PAPER CODE : 21PBYCS

BIOINFORMATICS

Course Objectives:

1. To understand the role of Bioinformatics.
2. To acquire Knowledge about different components of MS-Excel.
3. To know about the Basic Database concepts & SQL.
4. To understand the biological databases.
5. To know about genomics and proteomics.

Unit - I:

Bioinformatics - Scope and applications of Bioinformatics. Internet - basics, Biological Databases - Classification, Mining the database.

Unit - II:

Ms-Excel : Working with Formula: Using Functions, Built-in Functions - Advanced Operations: Data Filtering, Sorting, Validation, Using Ranges. Charts: Types of charts - creating and editing simple charts - Pivot charts.

Unit - III:

DBMS: - Databases - DDL & DML - Tasks done by DBMS - Need for DBMS- SQL: Database Tables- SQL commands- SQL Select statement-where clause-operators in the where clause- AND, OR, and NOT operators - SQL functions - Order by- Null values - Group BY- Having - SQL insert, update and delete statements.

Unit - IV:

Genomics - Prokaryotic Genome: structure and organization. Methods of Genome sequencing - Sanger's Dideoxy method and Shotgun sequencing. Sequence similarity and homology. Human genome project-outline

Unit - V:

Computational gene prediction and Genome annotation. Proteome- General Account; Tools of proteome analysis - MALDI-TOF and 2-D Gel Electrophoresis

REFERENCES

1. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
2. Baldi, P. and Brunak, S. 2001 Bioinformatics: The machine learning approach, The MIT Press.
3. Baxevanis, A. and Ouellette, F.B.F (Editors) 1998 Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. John Wiley and Sons, New York.

4. Campbell, A.M. & Heyer, L.J. 2002 Discovering Genomics, Proteomics and Bioinformatics. Benjamin/Cummings.
5. Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
6. Fogel, G.B. and Corne, D.W., Evolutionary Computation in Bioinformatics.
7. Lesk, A.M. 2005, 2nd edition, Introduction to Bioinformatics. Oxford University Press.
8. Liebler, D. 2002 Introduction to Proteomics: Tools for New Biology. Human Press Totowa.
9. Mount, D.W., Bioinformatics: 2001, Sequence and Genome Analysis. CSHL Press. 8. Durbin R., Eddy S., Krogh A. and Mithchison G. 2007 Biological Sequence Analysis, Cambridge University Press.
10. Primrose and Twyman 2003 Principles of Genome Analysis & Genomics. Blackwell.
11. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
12. Wilkins, M.R., Williams, K.L., Appel, R.D., Hochstrasser, D.F. (Editors) 1997 Proteome Research: New Frontiers in Functional Genomics. Springer Verlag Berlin Heidelberg.

WEB REFERENCES:

<https://www.biologydiscussion.com/biodiversity/bioinformatics/notes-on-bioinformatics-genetics/38224>

<https://nptel.ac.in/courses/102/106/102106065/>

https://www.tutorialspoint.com/excel/excel_pdf_version.htm

<https://www.gacbe.ac.in/pdf/ematerial/18BCS5EL-U5.pdf>

<https://www.geeksforgeeks.org/dbms/?ref=lbp>

<https://www.w3schools.in/dbms/>

https://www.tutorialspoint.com/dbms/dbms_pdf_version.htm

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the basics of internet and biological databases	Understand
CO2	Sort and validate the data using Excel	Create
CO3	Understand Database management system	Apply
CO4	appreciate the genome organization and genome sequencing	Apply
CO5	analyze genome annotation methods, transcriptome and proteome	Create

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-IV

CORE COURSE X - PAPER CODE: 21PBY10

BIOCHEMISTRY AND BIOSTATISTICS

Objectives

1. To understand the structure and properties of the biomolecules
2. To know the reactions performed by the biological macromolecules
3. To understand the application of statistical methods in biology

UNIT I

Basic concepts of atoms and molecules - chemical bonds - covalent bonds, hydrogen bond, electrostatic interactions, hydrophobic interactions, Vander waal's forces. Five types of chemical transformations in cells (oxidation - reduction, rearrangement, group transfer, cleavage, and condensation), Optical isomerism, isoelectric point, Buffer systems, Redox potential.

UNIT II

Carbohydrates: Occurrence, structure and properties of monosaccharides, oligosaccharides and polysaccharides. Biological significance of carbohydrates. Proteins: classification, structure - primary, secondary, tertiary and quaternary -properties and purification of proteins.

UNIT III

Amino acids: structure - D&L forms, classification, essential and non-essential amino acids, properties. Enzymes: chemistry of enzymes - classification - mechanism of action - factors affecting enzyme activity. Michaelis - Menten model of enzyme kinetics. Co-enzymes, isoenzymes, allosteric enzymes, ribozymes and abzymes.

UNIT IV

Lipids: components of lipids - classification of fatty acids. Simple lipids, compound lipids and derived lipids (steroids) - properties of lipids. Biosynthesis and function of terpenoids, alkaloids and flavanoids. Vitamins: structure, types, source and their role.

UNIT V

Methods of sampling, classification and tabulation of data, histograms - frequency polygon, frequency curve. Measures of central tendency - mean, median and mode. Measures of dispersion - standard deviation and standard error, student's t-test, chi-square test and analysis of variance.

PRACTICALS

1. Preparation of solutions - percent - ppm, molal, molar and normality concentrations.
2. Preparation of buffers (phosphate & citrate):
3. Estimation of reducing sugars (Nelson -somogyi method)
4. Estimation of total free amino acids (Moore & Stein, 1948.)
5. Estimation of proline (Bates et al., 1973)
6. Estimation of protein (Lowry's method)
7. Estimation of phenol (Mahadevan 1996)
8. Analysis of sample (leaf/ fruit / seed) covering mean, median and mode, histograms, frequency curve - standard deviation and standard error.

DEMONSTRATION EXPERIMENTS:

1. Estimation of oil in oil seeds. .
2. Assay of peroxidase

TEXT BOOKS

1. John JothiPrakash, E., and Joseph A.J.Raja, 2002. An Introduction to Biochemistry. JPR publications, Vallioor, Tamilnadu
2. Ross C.W. 1981. The biochemistry of plants, Academic press, New York
3. Srinivastava, H.S. 1990. Elements of Biochemistry, Rastogi publications, Meerut.

REFERENCE BOOKS

Biochemistry

1. Apps 1982 biochemistry EBLs Edn
2. Armstrong F.B. 1980. Biochemistry. Oxford university press, London
3. Bohinsky, R.C 1987. Modern concepts in Biochemistry, allyn and bacon, USA
4. Bonner F.J 1966. Plant biochemistry, academic press, New York.
5. Dey, P.M. and Harbone J.B. 2000. Plant biochemistry Harcourt Asia PTE Ltd, Singapore

6. Goodwin and mercer 1986. Introduction to plant Biochemistry Pergamon press.
7. Harbone J.B. 1973. Photochemical Methods. Toppan company Ltd, Japan
8. Lehniger, A.L. Nelson, D.I. And Cox, M.M.1993. Biochemistry CBS Publishers & Distributors, Delhi - 110032.
9. Stryer.L. 1975. Biochemistry, Toppan company Ltd., Toppan, Japan.

Biostatistics

1. Campbell, R.C 1967. Statistics for biologists, Cambridge University press London
2. Lewis A.E. 1971. Biostatistics, East west press, New Delhi.
3. L. N. Balaam 1972. Fundamentals of Biometry, George Allen & Unwin Ltd, London

WEB RESOURCES

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

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the concept of atoms, molecules and chemical bonds	Analyse
CO2	learn about carbohydrates, proteins and protein purification methods	Understand
CO3	appreciate the classification of amino acids and enzyme kinetics	Evaluate
CO4	understand the components of lipids, biosynthesis of secondary metabolites and the role of vitamins	Understand
CO5	utilize the statistical tools for evaluating biological experiments	Apply

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

M.Sc., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER – IV
CORE COURSE -X– 21PBY10
BIOCHEMISTRY AND BIostatISTICS

Time: 3 hrs

Maximum: 75 marks

PART A
(Answer ALL questions)

(15x1=15 Marks)

1. Which of the molecules does not have a permanent dipole moment?
(a) SO₃ (b) SO₂ (c) H₂S (d) CS₂
2. Which among the following is not a property of Ionic bond?
(a) Losing of electrons (b) Gain of electrons (c) Sharing of electrons (d) Transfer of electrons
3. Which among the following is not an example of hydrogen bond?
(a) H₂O (b) Liquid HCl (c) NH₃ (d) CHCl₃
4. Polysaccharides are
(a) Polymers (b) Acids (c) Proteins (d) Oils
5. The aldose sugar is
(a) Ribulose (b) Glycerose (c) Erythrulose (d) Dihydroxyacetone
6. The protein present in hair is
(a) Keratin (b) Elastin (c) Myosin (d) Tropocollagen
7. Sulphur containing amino acid is
(a) Valine (b) Leucine (c) Methionine (d) Asparagine
8. Ninhydrin with evolution of CO₂ forms a blue complex with
(a) Peptide bond (b) α-Amino acids (c) Serotonin (d) Histamine
9. Michaelis – Menten equation is used to explain the effect of substrate concentration on
(a) Carbohydrate (b) Enzyme (c) Lipid (d) Protein
10. Molecular formula of cholesterol is
(a) C₂₇H₄₅OH (b) C₂₉H₄₇OH (c) C₂₉H₄₇OH (d) C₂₃H₄₁OH
11. Triglycerides are
(a) Heavier than water (b) Major constituents of membranes (c) Non-polar
(d) Hydrophilic
12. Iodine number denotes
(a) Degree of unsaturation (b) Saponification number (c) Acid number
(d) Acetyl number
13. Component bar charts are used when data is divided into
(a) Parts (b) Groups (c) Circles (d) None of the above

14. The correlation coefficient computed for two parameters measured in 429 patients is $r=0.829$. This means that:
- The two parameters are directly correlated, and the link is weak - r is positive and close to 0
 - The two parameters are inversely correlated, and the link is strong - r is negative and close to 1
 - The two parameters are directly correlated, and the link is strong - r is positive and close to 1
 - There are too few cases (under 30) and we do not trust this coefficient's value
15. What is the median of the following set of scores? 19, 5, 12, 10, 14
- 10
 - 14
 - 119
 - 12

PART B
Answer any TWO questions

(2X5=10 Marks)

- Explain oxidation - reduction with suitable example
- Mention the properties of monosaccharides.
- Write a brief account on factors affecting enzyme activities:-
- What are the properties of lipids?
- Write the methods of sampling

PART C
Answer ALL questions

(5 X 10 = 50 marks)

- Explain chemical bonds in detail:-
(or)
(b) Give an account of buffers and their role in biological systems.
- Write an essay on polysaccharides:-
(or)
(b) Discuss the structure of proteins with suitable examples.
- Give a concise account of the properties of amino acids
(or)
(b) Explain the Michaelis - Menten Model of enzyme kinetics
- Give an account of compound lipids
(or)
(b) What are alkaloids ? Describe their structure and function
- Explain mean, median, and mode using suitable examples.
(or)
(b) Define standard deviation. Explain the steps involved in calculating Standard deviation by direct method.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-IV

CORE COURSE XI - PAPER CODE : 21PBY11

BIOINSTRUMENTATION

Objectives

1. To understand the various techniques and its application in biological system
2. To study the data collection in biology
3. To understand the tabulation and presentation

UNIT I

Microscopy: Principles of Light and Electron Microscopy; Phase contrast and Fluorescent microscopy; TEM and SEM.

UNIT II

pH meter -Hydrogen ion concentration, basic principles and measurement of pH; BOD analyzer - basic principles, methods and uses.

UNIT III

Chromatography - basic principles and types - paper, column, TLC, HPLC; Electrophoresis – Agarose , PAGE - electrophoretic mobility and factors - isoelectric focusing –applications.

UNIT IV

Centrifuge - principles -types - operations - uses. Colorimetry - spectrophotometry — flame photometry—atomic absorption spectrophotometer — construction - principles and uses.

UNIT V

Isotope methodology - radio activity and half life - G.M. counter and Scintillation counter – autoradiography; Isolation of phytochemicals – soxlet apparatus; phytocomponent analysis – GC-MS

PRACTICALS

1. Measurement of pH of fruit juice and soil example
2. Verification of Beer's law using CuSO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ solutions.

DEMONSTRATION EXPERIMENTS

3. Determination of dissolved O_2 . Analysis of minerals K, Ca, Na from soil / water / plant samples using flame photometer.
4. Separation of DNA by Agarose Gel Electrophoresis.

5. Quantitative separation of any three standard amino acids by paper chromatography method
6. Separation of photosynthetic pigments by TLC.

REFERENCE BOOKS

1. Anbalagan, K. 1999. An Introduction to Electrophoresis. Life Sciences Book house, Madurai.
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WEB RESOURCES

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

COURSE OUTCOME

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

Sl.No.	COURSE OUTCOME	BLOOM'S VERB
CO1	understand the principles of microscopy from simple to advanced type	Apply
CO2	understand the basics and operational principles of pH meter and oxygen analyzer	Apply
CO3	differentiate various chromatographic techniques	Analyse
CO4	appreciate the applications of centrifuge in research	Apply
CO5	learn the principles of G.M. counter and Scintillation counter	Understand

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S – Strong; M – Medium; L - Low

M.Sc., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER – IV
CORE COURSE -XI– 21PBY11
BIOINSTRUMENTATION

Time: 3 hrs

Maximum: 75 marks

PART A
(Answer ALL Questions)

(15x1=15 Marks)

1. Range of pH scale is
(a) 7 to 10 (b) 0 to 10 (c) 0 to 14 (d) 7 to 14
2. When more and more water is diluted with acids its H⁺ ion concentration will
(a) increase (b) decrease (c) remains the same (d) depends on the type of acids
3. A buffer solution comprises which of the following
(a) A weak acid in solution
(b) A strong acid in solution
(c) A weak base in solution
(d) A weak acid and its conjugate base in solution
4. Chromatography is a physical method that is used to separate_____
(a) Simple mixtures (b) Complex mixtures (c) Viscous mixtures (d) Metals
5. A combination of paper chromatography and electrophoresis involves_____
(a) Partition chromatography (b) Electrical mobility of the ionic species
(c) Both (a) and (b) (d) None of these
6. Which technique separates charged particles using electric field?
(a) Hydrolysis (b) Electrophoresis (c) Protein synthesis (d) Protein denaturing
7. Which of the following is not a type of centrifugation?
(a) Hydro cyclone (b) Tubular centrifuge (c) Microfiltration (d) Disk stack separator
8. Which of the following is the principle of Flame emission photometers?
(a) Radiation is absorbed by non-excited atoms in vapour state and are excited to higher states
(b) Medium absorbs radiation and transmitted radiation is measured
(c) Colour and wavelength of the flame is measured
(d) Only wavelength of the flame is measured
9. In Atomic Absorption Spectroscopy, which of the following is the generally used radiation source?
(a) Tungsten lamp
(b) Xenon mercury arc lamp
(c) Hydrogen or deuterium discharge lamp
(d) Hollow cathode lamp
10. The atoms of an element which have the same number of protons and different number of neutrons are called_____
(a) isotopes (b) isobars (c) isotones (d) isomers
11. An atom of _____ contains no neutrons.
(a) hydrogen (b) deuterium (c) tritium (d) none of these

12. Which type of molecule is used for labelling the cellular entities in the autoradiography technique?
(a) Glycoproteins (b) Radioisotopes (c) Stereoisomers (d) Enantiomers
13. All types of radiations can be measured using
(a) HPLC (b) TLC (c) GM Counter (d) electrophoresis
14. The process in which the water vapour becomes liquid
(a) Condensation (b) evaporation (c) crystallisation (d) Freezing
15. The instrument which is used to measure the volatile components
(a) HPLC (b) GC-MS (c) Centrifuge (d) PAGE

PART B

(2x5=10 Marks)

(Answer any TWO questions)

16. Write the principles of fluorescent microscope
17. What is Buffer? add a note on its importance.
18. Write briefly on the TLC.
19. Critically analyze the basics of colorimeter.
20. Explain the construction of G.M. Counters and principle involved in measurement.

PART C

(5x10=50 Marks)

(Answer ALL questions)

- 21 (a). Explain the principles of microscopy :- Add a note on the phase contrast microscope
(or)
(b). Compare and contrast TEM and SEM
- 22 (a). Write an essay on BOD analyser.
(or)
(b). What is pH? How is it measured?
- 23 (a). Write in detail the principle and application of
(i) TLC.
(ii) Column chromatography.
(or)
(b). Give a detailed account on gel electrophoresis.
- 24 (a). Write an essay on atomic absorption spectrophotometer.
(or)
(b). Describe in detail on the principles, types and uses of centrifuge.
- 25 (a). Using liquid scintillation counter how will you measure radioactivity?
(or)
(b). Write an essay on Autoradiography.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-IV

CORE COURSE XII - PAPER CODE : 21PBY12

BIOFERTILIZERS

Objectives

- The aim of the course is to make the student to learn importance of biofertilizers, green manures and in agriculture
- To know about the field application and production technologies of biofertilizers, green manures and composts.

UNIT I

Biofertilizers - General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. Symbiotic N₂ fixers: *Rhizobium* - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants - Process of nodule formation - Enzyme nitrogenase and its component.

UNIT II

Non-symbiotic nitrogen fixers - Free living – *Azotobacter* and *Azospirillum* - isolation, characteristics, mass inoculums, production and field application. Phosphate solubilizers - Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application.

UNIT III

Mycorrhizal biofertilizers - Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants - Mass inoculum production of VAM, field applications. Blue Green Algae (BG(A) – Significance, mass inoculum production, field application. *Azolla* – Mass multiplication, application and benefits.

UNIT IV

Green manuring – Green manures and green leaf manures; Types – Leguminous and non-leguminous plants used as green manures; Importance and application of *Gliricidia*, *Crotalaria juncea* (sun-hemp), *Sesbania* spp., *Tephrosea purpurea* (Kolunji), *Azadirachta indica* (neem), *Millettia pinnata* (Pongam); Role of green manuring in crop production – Benefits of green manuring.

UNIT V

Organic waste recycling - Composting – Farm Yard Manure (FYM), organic composts, neem cake; Methods of composting - benefits and applications of composts; Nutrient and microbial enrichment - Advantages and disadvantages of organic composts. Vermicomposting – Role of earthworms in soil fertility – Earthworm species used (*Eisenia fetida*, *Eudrilus eugeniae* and *Perionyx excavatus*) – Vermicomposting methods – Organic wastes suitable for vermicomposting – agricultural, industrial and domestic wastes – weeds; Nutrient status and application of vermicompost.

TEXT BOOKS

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2. Mahendra K. Rai, 2005. Hand Book of Microbial Biofertilizers, The Haworth Press, Inc. New York.
3. Motsara, I.M.R., Bhattacharyya, P. and Srivastava, B., 1995. Biofertilizer Technology, Marketing and Usage - A Source Book-cum-Glossary. FDCO, New Delhi.
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2. Bergerson, F. J., 1980. Methods for Evaluating Biological Nitrogen Fixation. John Wiley and Sons.
3. Burges, H. D., 2012. Formulation of Microbial Biopesticides: Beneficial Microorganisms, Nematodes and Seed Treatments. Springer.
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5. Glare, T. R. and Moran-Diez, M. E. (Eds.), 2017. Microbial-Based Biopesticides: Methods and Protocols: 1477 (Methods in Molecular Biology). Humana Press Publ. Co., New Jersey.
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WEB RESOURCES

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- *Rhizobium*: Species, Nitrogen Fixation, Biofertilizer and Culture. <https://www.microscopemaster.com/rhizobium.html>
- Biofertilizer Blue-Green Algae (Cyanobacteri(a)). https://biocyclopedia.com/index/biotechnology/plant_biotechnology/biofertilizers/biot_ech_blue_green_algae.php
- Singh, A., Karmegam, N., Singh, G.S., et al., 2020. Earthworms and vermicompost: an eco-friendly approach for repaying nature's debt. *Environmental Geochemistry and Health*, 42: 1617–1642. <https://link.springer.com/article/10.1007/s10653-019-00510-4>

COURSE OUTCOME

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

S. NO.	COURSE OUTCOME	BLOOM'S VERB
CO1	appreciate the advantages of biofertilizers over the chemical fertilizers	Analyse
CO2	understand the role of non- symbiotic micro organisms in soil enrichment	Apply
CO3	produce the VAM and BGA mass inoculums	Create
CO4	appreciate the role of green manures in crop production	Apply
CO5	perform composting and vermicomposting	Create

MAPPING WITH PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

M.Sc., BOTANY
MODEL QUESTION PAPER – THEORY
(For Candidates admitted from 2021-22 onwards Under CBCS Pattern)
SEMESTER – IV
CORE COURSE -XII– 21PBY12
BIOFERTILIZERS

Time: 3 hrs

Maximum: 75 marks

PART A

(15x1=15 Marks)

(Answer ALL questions)

1. Which of the following is not a biofertilizer?
(a) Mycorrhiza (b) *Rhizobium* (c) *Agrobacterium* (d) *Nostoc*
2. Which control strategy is likely to have the greatest impact on non-target organisms?
(a) Chemical control (b) Cultural control (c) Biological control (d) Physical/mechanical control
3. Which of the following is commonly used as a nitrogen fixer in paddy fields?
(a) *Frankia* (b) *Oscillatoria* (c) *Azospirillum* (d) *Rhizobium*
4. Which of the following is a nitrogen fixer in the root nodules of *Alnus*?
(a) *Clostridium* (b) *Bradyrhizobium* (c) *Azorhizobium* (d) *Frankia*
5. Which of the following fern is a biofertilizer?
(a) *Salvinia* (b) *Azolla* (c) *Pteridium* (d) *Marsilea*
6. Which of the following is an endomycorrhiza?
(a) *Rhizobium* (b) *Agaricus* (c) *Glomus* (d) *Nostoc*
7. 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
8. A biofertilizer involving a Pteridophyte host is
(a) *Azotobacter* (b) *Clostridium* (c) *Anabaena* (d) *Rhizobium*
9. Which of the following is used as a biofertilizer for soybean crop?
(a) *Nostoc* (b) *Azospirillum* (c) *Rhizobium* (d) *Azotobacter*
10. Which one of the following is NOT a leguminous green manure plant?
(a) *Sesbania* (b) *Azadirachta* (c) *Gliricidia* (d) Pongam
11. *Gliricidia* is a
(a) Shrub (b) Tree (c) Herb (d) Non-legume plant
12. Green leafy manure is
(a) *Gliricidia* (b) *Crotalaria juncea* (c) *Tephrosea* (d) None of these

13. Which of the following is not organic compost?
 (a) FYM (b) Gypsum (c) Aerobic compost (d) Vermicompost
14. Earthworms belonging to the ----- category are suitable for vermicomposting.
 (a) Endogeic (b) Carnivorous (c) Epigeic (d) None.
15. The earthworm species commonly called as 'African Night Crawler' is
 (a) *Eisenia fetida* (b) *Perionyx excavatus* (c) *Drawida* sp. (d) *Eudrilus eugeniae*

PART – B **(2X5 = 10 Marks)**
(Answer any TWO questions)

16. What are the advantages of using biofertilizers?
17. Briefly write on the role of phosphobacteria in crop production.
18. Write shortly on mass production of Blue Green Algae (BG(A).
19. What are green manure plants? Add a note on advantages of using green manures.
20. Give a brief account on farm yard manure and their applications in agriculture.

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

- 21(a) Give an account on microbial biofertilizers.
 (or)
 (b) Write an essay on the isolation and mass multiplication of *Rhizobium*.
- 22(a) What are free living nitrogen fixers? Explain the production and application of any one free living nitrogen fixing organism that you have studied.
 (or)
 (b) Explain the method of isolation, mass cultivation, field application of *Azospirillum*.
- 23(a) Describe the types and significance of mycorrhizal fungi in crop production.
 (or)
 (b) Discuss the large scale production of *Azolla* and its application in agriculture.
- 24(a) Bring out the role of leguminous green manure plants in crop production.
 (or)
 (b) Give an account on the production, benefits and application of *Crotalaria juncea* as green manure.
- 25(a) Write an essay on composting methods and benefits of composting.
 (or)
 (b) What is vermicomposting? Briefly write on the method of vermicompost production.

GOVERNMENT ARTS COLLEGE, (AUTONOMOUS) SALEM- 636 007
(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

SEMESTER-IV
RESEARCH ACUMEN COURSE III - COURSE CODE : 21RAC03

RESEARCH AND PUBLICATION ETHICS

Course Objective:

- To provide the students with the fundamental knowledge of basics of philosophy of science and ethics, research integrity, publication ethics.
- To expose the students to Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor).
- To create awareness about plagiarism, and plagiarism tools for a valid and ethical research report.

Course Outcome:

Students will be able to:

- Understand the scientific philosophy and publication ethics.
- Know plagiarism and misconduct.
- Learn about publication of research findings and publication sources.
- Aware about various scientific databases and altmetrics.

UNIT I: Philosophy and ethics

Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgements and relations.

UNIT II: Research conduct

Ethics with respect to science and research - Intellectual honest and research integrity - Scientific misconducts: falsification, fabrication, and plagiarism. Redundant publications: duplicate and overlapping publications.

UNIT III: Publication ethics and misconduct

Publication ethics: Definition, introduction and importance - UGC-CARE - Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types - Violation of publication ethics, authorship and contributorship - Identification of publication misconduct, complaints and appeals.

UNIT IV: Open access publishing and search tools

Open access publications and initiatives - SHERPA/RoMEO online resources to check publisher copyright and self-archiving policies. Journal finder/ journal suggestion tools -

Tools/software for plagiarism detection - Turnitin, Urkund and other open source software tools.

UNIT V: Databases and research metrics

Databases - Indexing databases; Citation databases - Research Metrics - Impact Factor of journal as per journal citation report (JCR), SNIP, SJR, IPP, Cite Score. Metrics: h-index, g-index, i10-index, altmetrics.

REFERENCE BOOKS

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6. Lipson, C. (2018). *Cite Right, Third Edition – A Quick Guide to Citation Styles— MLA, APA, Chicago, the Sciences, Professions, and More (Chicago Guides to Writing, Editing, and Publishing)*. University of Chicago Press.
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12. Yadav, S. K. (2020). *Research and Publications Ethics*. Ane Books Pvt. Ltd., Chennai.

WEB RESOURCES

- The top list of academic research databases.
<https://paperpile.com/g/academicresearch-databases/> Publication ethics.
<http://www.lnit.org/index.php?m=content&c=index&a=lists&catid=41>
- Ethics in Research & Publication. https://www.elsevier.com/__data/assets/pdf_file/0008/653885/Ethics-inresearch-and-publication-brochure.pdf
- COPE and Publication Ethics. http://publicationethics.org/files/Overview_publication_ethics.pdf
- Understanding Academic Integrity, Research, and Classroom Ethics.
<https://pitt.libguides.com/academicintegrity>

M.Sc., BOTANY DEGREE EXAMINATION

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

PRACTICAL -III - PAPER CODE:21PBYP3

(Taxonomy of Angiosperms, Plant Physiology & Biophysics, Plant Biotechnology)

Time : 4 hrs.

Maximum : 60 Marks

Practical : 50 Marks

Record : 5 Marks

Viva - Voce : 5 Marks

1. Find the Binomials of A and B using Gamble's Flora. (2x5=10 Marks)
2. Refer specimens C, D and E to their respective families giving reasons at each level of hierarchy. (3x4=12 Marks)
3. Set up the experiment F assigned to you. Record observations and interpret the results leave the set up for valuation (12 marks)
4. Name the family genus and Species of G and H. (2x3=6 Marks)
5. Write critical notes on I and J. (2x3=6 Marks)
6. Write notes of interest on K and L. (2x2=4 Marks)

Key

A, B = Flowering plants from families prescribed from the syllabus

C,D,E = Plants from families prescribed from the syllabus

F = Physiology experiment

G,H = Taxonomy plants

I,J, = Spotters - in plant physiology Charts / Figures / Graphs / Tables / instruments/ Chemicals / Models / Photographs.

K = Spotter – in Plant Biotechnology

L = Spotters from Biophysics

M.Sc., BOTANY DEGREE EXAMINATION

(For the candidates admitted from 2021-2022 onwards under CBCS pattern)

PRACTICAL - IV -PAPER CODE: 21PBYP4

(Biochemistry, Biostatistics Bioinstrumentation and Biofertilizer)

Time : 4 hrs.

Maximum : 60 Marks

Practical : 50 Marks

Record : 5 Marks

Viva - Voce : 5 Marks

1. Conduct the experiment, A assigned to you by lot. Record your observations and interpret the results. Leave the set up for valuation (12 Marks)
2. From the given material B. Find out the mean and calculate the Standard Deviation. Present data in the form of a graph. (10 Marks)
3. Verify Beer's law using the given solution C. (10 Marks)
4. Find out the pH of the given sample D. (10 Marks)
5. Write notes on E, F, G and H (4x2=8 Marks)

Key

- A = Biochemistry Experiment assigned by lot
B = Leaf / Fruit 50 in numbers
C = $K_2Cr_2O_7$ / $CuSO_4$ solution.
D = Water sample / Fruit juice
E = Spotter - Biofertilizer
F = Spotter - Biostatistics
G and H = Spotter - Bioinstrumentation