JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(AUTONOMOUS)

Ooty road, Mysuru - 570025.

DEPARTMENT OF BOTANY

Schematic Syllabus under Choice Based Credit System (CBCS) & Continuous Assessment Grading Pattern (CAGP) as per UGC template

w.e.f.

2019-2020

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DEPARTMENT OF BOTANY
PROFORMA OF INSTRUCTIONS AND EXAMINATION FOR B.Sc. PROGRAMME IN BOTANY (CBCS)
DURATION OF THE COURSE: 3YEARS (6SEMESTER)
PROGRAMME: BSc BBM/CBZ, PROGRAMME CODE: BSc07/08 (2019-20)

Year	Sem	Core course	Title of the paper	Course Code	Lecture + Practical's hours per week	No. of credits			Total credits	Total hours		Maximum Marks in exam/Assessment				
						L	T	P		Th	Pr		IA(Theory)		Total	
													C-1	C-2		
I B.Sc	I	DSC-I :Theory	Biodiversity of Microbes and Archegoniate	DMA23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-I: Pract.	Biodiversity of Microbes and Archegoniate	DMA23107/08	04	0: 0: 2						35	7.5	7.5	50	3h
	II	DSC-II: Theory	Plant Ecology Morphology and Angiosperm Taxonomy	DMB23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-II: Pract.	Plant Ecology Morphology and Angiosperm Taxonomy	DMB23107/08	04	0: 0: 2						35	7.5	7.5	50	3h
II B.Sc	III	DSC-III:Theory	Plant Anatomy and Embryology of Angiosperm	DMC23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-III:Pract.	Plant Anatomy and Embryology of Angiosperm	DMC23107/07	04	0: 0: 2						35	7.5	7.5	50	3h
	IV	DSC-IV: Theory	Plant Physiology and Metabolism	DMD23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-IV:Pract.	Plant Physiology and Metabolism	DMD23107/08	04	0: 0: 2						35	7.5	7.5	50	3h
III B.Sc.	V	DSEA: Theory	No. of courses:1 DSE- A: Cell and Molecular Biology	DME23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSE:Practicals	Based on theory	DME23107/08		0: 0: 2										3h
		DSEB: Theory	DSE-B: Economic Botany and Biotechnology	DME23207/08												
		DSE:Practicals	Based on theory	DME23307/08												
		SEC	No. of courses:1 SEC-A : Ethnobotany	DME23407/08	02	2:0:0			02	30	-	35	7.5	7.5	50	2h
			SEC-B : Floriculture	DME23607/08												
	VI	DSEB: Theory	No. of courses:1 DSE-A: Genetics and Plant Breeding	DMF23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSE:Practicals	Based on theory	DMF23107/08		0: 0: 2										3h
		DSEB: Theory	DSE -B : Analytical Techniques and Plant Sciences	DMF23207/08												
		DSE:Practicals	Based on theory	DMF23307/08												

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (AUTONOMOUS)
OOTY ROAD, MYSURU-25

DEPARTMENT OF BOTANY

PROCEEDINGS OF THE MEETING OF BOARD OF STUDIES FOR THE PROGRAMMES B. Sc. IN BOTANY, BIOCHEMISTRY, MICROBIOLOGY (B.Sc. 07) AND CHEMISTRY, BOTANY, ZOOLOGY, (B.Sc. 08) HELD ON 14 JUNE 2019 AT 11.00 AM IN THE CHAMBER OF THE CHAIRMAN, DEPARTMENT OF BOTANY, JSS COLLEGE, OOTY ROAD, MYSURU-25

MEMBERS	SIGNATURE
Dr. S Prathibha Associate Professor, Dept. of Botany, JSS College, Ooty Road Mysuru Chairman	
Dr. Sowmya Associate Professor, Department of Botany Yuvaraja's college, Mysuru Member (VC Nominee)	
Dr. Syed Fasihuddin Associate professor of Botany Govt. Science College Bengaluru- 560001 Member (AC Nominee)	
Dr. V. N. Muralidhar Associate professor of Botany Govt. first grade College Sira- 572137 Tumkur District Member (AC Nominee)	

At the outset, the Chairman, BOS in Botany, welcomed the members to the meeting of BOS and briefed about the agenda to be discussed. The following agenda were placed by the Chairman which were discussed and resolved as follows:

Agenda 1: To frame/ revise, discuss and approve the Scheme/ Syllabus under Choice Based Credit System for the programmes: B.Sc. in Botany, Biochemistry, Microbiology and Chemistry, Botany, Zoology from the academic year 2019-20 onwards.

The Chairman appraised the members about the introduction of Choice Based Credit System to the above said programmes with the course matrix in 2017-18. Accordingly, a draft revised/ modified Scheme/ Syllabus was presented and placed before the Board for their opinion and approval.

Resolution: The BOS went through the Scheme/ Syllabus and discussed in length about various aspects of the same. After incorporation of the changes suggested by the members of BOS, the Syllabus was approved. Details of changes made with respect to the introduction of revised/ modified Scheme/ Syllabus in the existing courses is shown in Annexure-I.

Agenda 2: To prepare the Panel of Examiners for the examinations for the year 2019-20.

The Chairman presented the proposed Panel of Examiners to I to VI Semester examinations of 2019-20.

Resolution: After incorporating of certain changes suggested by the members, the Panel of Examiners was approved.

Agenda 3: Approval of Reference Books

The Chairman presented the proposed list of Reference Books to the Members.

Resolution: After incorporating of certain changes suggested by the members, the list of Reference Books was approved.

Agenda 4: Any other matter with the permission of the Chairman

The career oriented course Horticulture syllabi was thoroughly analysed and the contents were restructured according to the present day requirement. Question paper pattern, Maximum marks allotted and the hours per unit are also changed as per the BOS member's corroboration to bring uniformity

Finally the meeting was concluded with the Chairman thanking the Members for their active participation in the deliberations of the meeting.

Chairman

Annexure-I:

Revision/ modification made in the existing Syllabus for 2019-2020 batch onwards:

Existing	Proposed	Justification	Approved
I B.Sc. I Sem DSC-I			
Biodiversity of Microbes and Archegoniate (CMA23007/08):	**Biodiversity of Microbes and Archegoniate (DMA23007/08):**		
Unit 1: Microbial diversity:			
A. **Virus**- replication	Deleted	Repetition	**Approved**
D. Fungi- *Puccinia*	Yeast	Yeast is most important from economic point of view	**Approved**
Unit 2: Archegoniate:			
A. Pteridophytes -*Marsilea*	Deleted	Better to study in higher level	**Approved**
Practicals: Gram's Staining of Bacteria	Deleted	Repetition in Microbiology	**Approved**
Study of *Marsilea*		Better to study in higher level	
Study of *Puccinia*	Yeast	Yeast is most important from economic point of view	
I B.Sc. II Sem DSC-II			
Plant Ecology Morphology and Angiosperm Taxonomy	**Plant Ecology Morphology and Angiosperm Taxonomy**		

(CMB23007/08):	**(DMB23007/ 08):**		
Unit-3: Taxonomy: **C. Angiosperm families:** Apiaceae	Arecaceae	To Represent Monocot family	**Approved**
Practicals: Apiaceae	Solanaceae & Arecaceae	Routinely used vegetables belong Solanaceae family & to represent Monocot family	**Approved**
II B.Sc. III Sem-DSC III			
Plant Anatomy Embryology (CMC23007/08):	**Plant Anatomy and Embryology of Angiosperm (DMC23007/ 08):**		
Unit 3: Adaptive and protective systems	Brief Account of Epidermis, cuticle, Stomata & Trichome. Added	Blown up syllabi	**Approved**
Practicals:	Content Restructured	Appropriate	
Unit 4: Embryology	**Unit 4: Embryology of Angiosperms**		
Structure of pollen grains	Types of Tetrad, Male gametophyte & Embryosac development- Monosporic,Bisporic,Tetrasporic added	For detailed embryological studies.	
Mechanism & Adaptation of Pollination	deleted	Studied previously in lower levels	**Approved**
Practicals:	Content Restructured	Appropriate	
III B.Sc. V Sem-DSC IV			
Plant Physiology and Metabolism. (CMD23007/08):	**Plant Physiology and Metabolism**		

	(DMD23007/08):		
Unit 1: Plant-water relations: **Unit 2: Mineral nutrition** **Unit 3: Translocation in phloem** **Unit 4: Photosynthesis** **Unit 5: Respiration** **Unit 6: Enzymes** **Unit 7: Nitrogen metabolism** **Unit 8: Plant growth regulators** **Unit 9: Plant response to light and temperature**	**UNIT 1 Plant – Water Relations:** **1.Fundamental concepts,** **2.Short Distance Transport,** **3. Long distance Transport,** **4.Transpiration,** 5.**Mineral nutrition,** 6.**Translocation of solutes** **UNIT 2 – Enzymes:** **UNIT 3 – Bioenergetics:** **UNIT 4 -Nitrogen Metabolism:** **UNIT 5 - Plant Growth and Movements:**	Content Restructured	**Approved**
Practicals:	Content Restructured	Appropriate	**Approved**
III B.Sc. V Sem-DSE I			
DSE-1: Cell and Molecular Biology (CME23007/08):	**DSE-1: Cell and Molecular Biology (DME23007/08):**		
Unit 1-Techniques in Biology: Sample Preparation for light microscopy; Sample Preparation for electron microscopy; X-ray diffraction analysis.	**deleted**	Repetition in microbiology	**Approved**
Unit 2-Cell Membrane and Cell Wall : Carbohydrates in the membrane; Faces of the membranes;	**deleted**	Better to study in higher classes	**Approved**

Unit 7-Genetic material: DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative method	**Unit 7-Gene concept:** Semi-conservative method required	Appropriate	**Approved**
III B.Sc. V Sem SEC-I			
Floriculture	**Contents restructured**	Appropriate	**Approved**
III B.Sc. VI Sem DSE-II			
DSE-2: Genetics and Plant Breeding (CMF23007/08)	**DSE-2: Genetics and Plant Breeding (DMF23007/08)**		
Unit 1- Heredity: lethal genes Pleiotropism, co- dominance 9:7; 9:4:3; 13:3; 12:3:1	**deleted**	Repetition in Zoology	**Approved**
Practicals:	Complementary factors; supplementary factors, Duplicate factors, Epistatis	Proper terminologies have been used instead of ratios	**Approved**
	Genetic problems on Mendel's laws included	For better elucidation of theoretical concepts	**Approved**

Chairman

Programme Outcomes for BSc. in Chemistry, Botany, Zoology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify and explain their thinking and/or approach, both written and oral. Demonstrate the ability to present clear, logical and succinct arguments, including prose and mathematical language. Write and speak using professional norms, and demonstrate an ability to collaborate effectively.

PO2. Develop state-of-the-art laboratory skills and professional communication skills.

PO3. Apply the scientific method to design, execute, and analyze an experiment and also to explain their scientific procedures as well as their experimental observations.

PO4. Appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

PO5. Explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

PO6. Identify the taxonomic position of plants using principles and methods of nomenclature and classification in Botany.

PO7. Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Use interdisciplinary approaches with quantitative skills to work on biological problems.

PO9. Identify the major groups of organisms with an emphasis on animals and be able to classify them within a phylogenetic framework.

PO10. Compare and contrast the characteristics of animals that differentiate them from other forms of life.

PO11. Give specific examples of the physiological adaptations, development, reproduction and behaviour of different forms of life.

Programme specific Outcomes for BSc. in Chemistry, Botany and Zoology

After completing the graduation in the Bachelor of Science the students are able to:

PS01: Communicate effectively the fundamentals and applications of chemical and Biological sciences

PS02: Possess deeper understanding of Natural laws, accuracy and validity of both theoretical and practical knowledge

PS03: Explicate ecological interconnectedness of life, by tracing energy and nutrient flows through the environment

PS04: Analyse the avenues and remedies for burning environmental issues

PS05: Pursue, enhance and appreciate conservation practices for sustainable use of plants and development

PS06: Interact with the social activities with ethical approach due to collaborative field visits, botanical tours and academic trips.

Programme Outcome for Bachelor of Science in Botany, Biochemistry & Microbiology

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Identify the taxonomic position of plants using principles and methods of nomenclature and classification in Botany

PO2. Understand the impact of the plant diversity in societal and environmental context

PO3.Demonstrate the knowledge of, and need for sustainable development

PO4. Use interdisciplinary approaches with quantitative skills to work on biological problems

PO5. Demonstrate the ability to justify and explain their thinking and/or approach

PO6. Develop state-of-the-art laboratory and professional communication skills

PO7. Apply the scientific method to design, execute, and analyze an experiment

PO8. Explain scientific procedures and their experimental observations

PO9.Demonstrate an understanding of fundamental biochemical principles, structure and function

PO10. Work as a laboratory technician, biochemists or medical scientist

PO11. Explain the processes used by microorganisms for the growth

PO12. Explain the theoretical basis of the tools, technologies and methods of microbiology

Programme Specific Outcome
Bachelor of Science in Botany, Biochemistry & Microbiology

After completing the graduation in the Bachelor of Science the students are able to;

PSO1: Demonstrate applications of biochemical and biological sciences

PSO2: Inculcating proficiency in all experimental techniques and methods of analysis

PSO3: Acquire, articulate, retain and demonstrate laboratory safety skills

PSO4: Communicate scientific information effectively, relating to microbes and their role in ecosystem and health

PSO5: Gain proper procedures and regulations in handling and disposal of chemicals

PSO6: Understand biochemical and molecular processes that occur in and between the cells

LIST OF APPROVED PANEL OF EXAMINERS:

Sl. No	Name	Designation and DOB	Joining Date
	Internal Examiners		
1.	Dr.Prathibha S Jss College, Ooty Road, Mysore	Asso. Prof. 28/04/1964	28/08/1986
2.	Kiran B L Jss College, Ooty Road, Mysore	Asst. Prof. 30/12/1992	23/09/2015
3.	Divya gouda Jss College, Ooty Road, Mysore	Asst. Prof.	
	External Examiners		
4.	Shivanna M Bharathi College, Bharathi Nagarar	Asso. Prof. 30/06/1958	19/11/1985
5.	Ravikumar B S AVK College For Women, Hassan	Asso. Prof. 13/07/1962	16/07/1987
6.	Nagarathnamma Govt College For Women, Mandya	Asso. Prof. 01/06/1959	10/08/1992
7.	Mallikarjunamiah M N Govt. first grade boys college, Mandya.	Asso. Prof. 05/11/1963	14/08/1992
8.	Hemavathi C Maharani`s Science College For Women, Mysore	Asso. Prof. 05/04/1966	17/08/1992
9.	Vijay C R Maharani`s Science College For Women, Mysore	Asso. Prof. 01/10/1962	29/12/1992
10.	Shivalingaiah Maharani`s Science College for Women, Mysore	Asst. Prof. 01/06/1968	08/01/1996
11.	Purushotham S P Maharani`s Science College for Women, Mysore	Asst. Prof. 15/05/1967	02/08/1996
12.	Lingaraju D P AVK College for Women, Hassan	Asst. Prof. 26/02/1965	23/10/2002
13.	Basavaraju G L Govt College for Women, Mandya	Asst. Prof. 21/07/1976	30/01/2004
14.	Devika M Saradavilas College, Mysore	Asst. Prof. 14/03/1970	14/12/2005
15.	Suresh N S Maharani`s Science College for Women, Mysore	Asst. Prof. 25/02/1975	02/05/2006
16.	Jayalakshmi B Maharani`s Science College for Women, Mysore	Asst. Prof. 18/11/1974	14/07/2006
17.	Sowmya H K Govt Science College,Hassan	Asst. Prof. 18/06/1970	22/12/2007
18.	Thoyajaksha Govt Science College, Hassan	Asst. Prof. 20/07/1970	24/12/2007
19.	Sandhya Rani D Maharani`s Science College for Women, Mysore	Asst. Prof. 24/08/1972	24/12/2007
20.	Pushpalatha H G Maharani`s Science College for Women, Mysore	Asst. Prof. 23/12/1979	26/12/2007
21.	Ashok N Pyati Maharani`s Science College for Women, Mysore	Asst. Prof. 22/04/1970	28/12/2007
22.	Indushree PES College, Mandya	Asst. Prof.	
23.	Lalitha V Maharani`s Science College for Women, Mysore	Asst. Prof.	

24.	Gayathrri Devi N Jss College for women Chamarajanagar	Asst. Prof.	
25.	Revanamaba B Maharani`s Science College for Women, Mysore	Asst. Prof.	
26.	Dr.M.K. Mahesh Yuvarajas college, Mysore.	Asso. Prof.	
27.	Shravani, K.A Yuvarajas college, Mysore.	Asst. Prof.	
28.	Dr.krishna Yuvarajas college, Mysore.	Asst. Prof.	
29.	Dr.krishnamurthy Yuvarajas college, Mysore.	Asst. Prof.	
30.	Kalpashree Yuvarajas college, Mysore	Asst. Prof.	
31.	Dr. Sowmya, R Yuvarajas college, Mysore	Asst. Prof.	
32.	Deepa hebbar Maharani`s Science College for Women, Mysore	Asst. Prof.	

DMA23008/DMA23007

I B.Sc., I Semester DSC-I

Biodiversity of Microbes and Archegoniate

Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1 Understand the characteristics of viruses

CO2 Learn the classification and characteristics of bacteria

CO3 Identify the classification and characteristics of archegoniate

CO4 Identify the characteristics of algae

CO5 Understand the classification and characteristics of fungi.

Unit 1- Microbial diversity:

A. Virus **(4 Lectures)**

General structure, DNA virus (T_4-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance.

B. Bacteria **(5 Lectures)**

Definition, Classification (Based on Shape, Arrangement and flagellation) and Economic importance; ultra structure, Reproduction – vegetative (fission, Budding) asexual (Endospore) Sexual (Genetic recombination-Conjugation, Transformation and Transduction).

C. Algae **(14 Lectures)**

General characteristics; Classification, Reproduction and Economic importance of algae.
Type study- *Nostoc, Spirogyra, Sargassum.*

D. Fungi **(16 Lectures)**

1. General characteristics, classification , nutrition , reproduction and economic importance.
Type Study - *Rhizopus, saaccharomyces* (Yeast)*, Penicillium,*
2. Lichens: Distribution, classification and Economic importance, structure and reproduction.

Unit 2- Archegoniate:

A. Bryophytes **(7 Lectures)**

General characteristics, Classification and Economic importance . Type Study- *Marchantia* and *Polytrichum*

B. Pteridophytes **(7 Lectures)**

General characteristics and classification, Stelar evolution. Type Study - *Selaginella* and *Equisetum*.

C. Gymnosperms **(7 Lectures)**

General characteristics, classification and Economic importance. Type Study- *Cycas* and *Pinus.*

DMA2318/ DMA2317

I B.Sc., I Semester DSC-I
Biodiversity of Microbes and Archegoniate
Practical (Credits: 2)

Lectures: 60 Hours
(4 hours/week)

1. Study of TMV and of T_4- Phage through Microphotographs
2. Study of Bacteria.
3. Study of *Nostoc* (Specimen and permanent slides)
4. Study of *Spirogyra* (Specimen and permanent slides)
5. Study of *Sargassum* (Specimen and permanent slides)
6. Study of *Rhizopus*
7. Study of *Yeast*
8. Study of *Penicillium*
9. Study of Lichens
10. Study of *Marchantia*
11. Study of *Polytrichum*
12. Study of *Selaginella*
13. Study of *Equisetum*
14. Study of *Cycas*
15. Study of *Pinus*

Suggested Readings

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

I B.Sc., I Semester DSC-I
Scheme of theory question paper
Biodiversity of Microbes and Archegoniate

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit I :Microbial Diversity					
A&B.Virus and Bacteria	09	2X1=2	5X1=5	10X1=10	**17**
C. Algae	14	2X2=4	5X2=10	10X1=10	**24**
D. Fungi	16	2X1=2	5X3=15	10X1=10	**27**
Unit II: Archegoniate					
A. Bryophytes	07	2X1=2	-	10X1=10	**12**
B. Pteridophytes	07	2X1=2	-	10X1=10	**12**
C. Gymnosperms	07	2X2=4	-	10X1=10	**14**
Total	**60**	**8X2=16**	**4X6=30**	**6X6=60**	**106**

DMA23108/ DMA23107 **I B.Sc., I Semester DSC-I**

Biodiversity of Microbes and Archegoniate

Scheme of practical question paper

Time: 4 Hours **Max. Marks: 35(25+05+05)**

I. Identify the specimens 'A' and 'B' with reasons and labeled sketches **3x2=06 marks**

(**A**-Algae and **B**-Microphotographs of virus/Bacteria/fungi)

Identification – 1 mark
Reasons with labelled sketch – 2 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with reasons. Leave the preparation for evaluation. **4x01=04 marks**

(C-*Nostoc/Rhizopus/Saccharomyces* (yeast) / *Penicillium*)

Identification – 1 marks
Preparation/staining and mounting– 2 marks
Reasons with labelled sketch – 1 marks

III. Write critical notes on 'D', 'E' and 'F' **3x3=09 marks**

(D-Algae/Fungi, E-Lichens/Bryophytes, F- Pteridophytes /Gymnosperms)

Identification _ 1 mark
Reasons with lablled sketch – 2 marks

IV. Identify the Microslides 'G', 'H', and 'I' with reasons and labeled Sketches **02x03=06 marks**

(G-Algae/Fungi, H-Lichens/Bryophytes, I- Pteridophytes /Gymnosperms)

Identification – 1 mark
Reasons with lablled sketch – 1 marks

V. Practical record **05marks**

VI. Viva- Voce **05marks**

Note: Each student should submit the **duly valued and certified practical record** at the time of practical examination.

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DMA23108/ DMA23107 **I B.Sc., I Semester DSC-I**

Biodiversity of Microbes and Archegoniate

Practical Question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Identify the specimens 'A' and 'B' with reasons and labeled sketches 3x2=06 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with Reasons leave the preparation for evaluation. 4x1=04 marks

III. Write critical notes on 'D', 'E' and 'F' 3x3=09 marks

IV. Identify the Microslides 'G', 'H' and 'I' and with reasons and labeled Sketches 2x3=06 marks

V. Practical record 05 marks

VI. Viva- Voce 05marks

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I B.Sc., II Semester DSC-II

Plant Ecology, Morphology and Angiosperm Taxonomy

Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1 Specify the characteristics of ecosystem

CO2 Learn the classification and characteristics of Plant communities

CO3 Understand in details with examples plant morphology

CO4 Understand in depth Herbarium

Unit 1- Plant Ecology:

A. Introduction to Ecology and Ecological factors: **(6 Lectures)**

Introduction to ecology, Climatic factors- Light, temperature and water. Edaphic factors- soil formation, types and profile. Shelford law of tolerance.

B. Ecosystem **(6 Lectures)**

Structure and components of an ecosystem, study of pond and forest ecosystem, energy flow and trophic levels; Food chains, food webs, Ecological pyramids. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

C. Plant communities **(6 Lectures)**

Morphological Adaptations of hydrophytes and xerophytes. Plant Succession, Hydrosere and Xerosere.

Unit 2- Leaf and Floral Morphology: **(15 Lectures)**

A. Leaf- Structure, types and phyllotaxy.

B. Types of Inflorescence

C. Flower- structure of a typical flower (*Tribulus terrestris* / *Muntingia calabura*), Variation in floral morphology and floral organs in detail.

D. Types of Inflorescence

E. Types of fruits

Unit-3: Taxonomy:

A. Introduction to plant taxonomy **(8 Lectures)**

1. Taxonomic hierarchy
2. Types of classification (artificial, natural and phylogenetic)
3. Systems of classification- Bentham and Hooker, Engler and Prantl
4. Plant Nomenclature-Binomial system and ICBN principles.

B. Herbarium technique: **(5 Lectures)**

1. Herbarium- Techniques and importance
2. Botanical gardens

C. Angiosperm families: (14 Lectures)

Study of the following families according to Bentham and Hooker's system of classification.--Malvaceae, Leguminosae (Papilionaceae, Caesalpiniaceae and Mimosaceae), Apocynaceae Asteraceae and Arecaceae.

***

I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Practical (credits: 2) **Lectures: 60 Hours**
(4 hours/week)

1. Study of Ecological instruments used to measure microclimatic variables: Soil thermometer, Maximum and Minimum Thermometer, Anemometer, Psychrometer/Hygrometer, Rain gauge.
2. Study of morphological adaptations of the following

a. Hydrophytes Eg: ***Hydrilla. Pistia and Eichhornia***
b. Xerophytes Eg: ***Opuntia, Euphorbia Tirucalli,Nerium and Casuarina***

3. Study of biotic interactions of the following:

a.Stem parasite Eg: ***Cuscuta.***
b.Root parasite Eg: ***Striga***.
c.Epiphytes, Eg: ***Vanda***
d. Predatary plants (Insectivorous plants) Eg: ***Nepenthes***.

4. Study of root modifications
5. Study of stem modifications
6. Study of leaf-structure, types, phyllotaxy and modifications.
7. Parts of a typical flower **(*Tribulus terrestris* / *Muntingia calabura*)**
8. Floral organs in detail with their variations.
9. Types of inflorescence
10. Types of fruits
11. Study of families Malvaceae, Apocynaceae
12. Study of families Leguminosae (Papilionaceae, Caesalpiniaceae and Mimosaceae)
13. Study of families and Asteraceae
14. Study of Solanaceae and Arecaceae
15. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label

Suggested Readings:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi.

DMB23008/ DMB23007

I B.Sc., II Semester DSC-II

Plant Ecology, Morphology and Angiosperm Taxonomy

Scheme of theory question paper

Time: 3.00 Hours **Max. Marks: 70**

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: A. Plant Ecology	06	-	-	10x1=10	**10**
B. Ecosystem	06	-	5x2=10	-	**10**
C. Plant communities	06	2x1=2	-	10x1=10	**12**
Unit II: Leaf and Floral Morphology, Fruits	15	2x3=6	5x2=10	10x1=10	**26**
Unit III: Taxonomy A. Introduction to plant taxonomy	08	2x2=4	-	10x1=10	**14**
B. Herbarium technique	05	2x1=2	5x1=5	-	**07**
C.Angiosperm families	14	2x1=2	5x1=5	10x2=20	**27**
Total	**60**	**8x2=16**	**5x6=30**	**10x6=60**	**106**

DMB23108/ DMB23107

I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Scheme of practical question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled Sketches. **3x3=9 marks**

(A-Ecological instruments, B-Hydrophytes/xerophytes/parasites/epiphytes, C-Underground root & stem modifications/Leaf phyllotaxy /leaf types/)

Identification – 1 mark
Labeled sketch with reasons – 2 marks

II. Assign the plant 'D' to its respective family giving reasons. **4x1=4 marks**

(D- Malvaceae/Apocynaceae/Asteraceae/Arecaceae
Family name – 1 mark
Salient features – 3 marks

III. Describe the plant 'E' in technical terms. **4x1=4 marks**

(Papilionaceae /Caesalpiniaceae)
Family name – 1 mark
Technical terms – 3 marks

IV. Draw the floral diagram and write the floral formula of the give plant 'F' **4x1=4 marks**

(Malvaceae, Solanaceae, Apocynaceae)
Floral formula -1mark
Floral diagram -3marks

V. Identify the specimen 'G' and 'H' **2x2=4marks**

(J-Inflorescence, H- Fruits)
Identification – 1 mark
Reasons – 1mark

VI. Practical **05marks**

VII. Viva- Voce **05marks**

Note: each student should submit the **duly valued and certified practical record** at the time of practical examination.

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I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Practical Question Paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled Sketches **3x3=9 marks**

II. Assign the plants 'D' to its respective family giving reasons. **4x1=4marks**

III. Describe the plant 'E' in technical terms. **4x1=4 marks**

IV. Draw the floral diagram and write the floral formula of the give plant 'F' **4x1=4marks**

V. Identify the specimen 'G' and 'H' **2x2=4marks**

VII. Practical record **05marks**

VIII. Viva-Voce **05marks**

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DMC23008/DMC23007 II B.Sc., III Semester DSC-III

Plant Anatomy and Embryology of Angiosperms
Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

Course outcome:
After completion of the course the student is able to:

CO1 Understand the details of histology
CO2 Understand the details of anatomy
CO3 Understand the characteristics of secondary growth
CO4 Learn the details of embryology

Unit 1: Histology and Anatomy (18 Lectures)

Meristem- structure, classification, based on origin, position and function. Study of Simple and complex tissues.
Internal Structure of dicot and monocot root,stem and leaf.

Unit 2: Secondary Growth (4 Lectures)

Process of secondary growth in dicot stem.

Unit 3: Adaptive and protective systems (7 Lectures)

Anatomical adaptations in xerophytes (Nerium & Causarina) and Hydrophytes (Hydrilla & Eichhornia). Epidermis, cuticle, Stomata & Trichome. (Brief Account)

Unit 4: Embryology of Angiosperms (8 Lectures)

T.S of mature anther, Microsporogenesis, types of tetrads and Male gametophyte, Megasporogenesis- types of ovules, L.S of Anatropous ovule, Embryosac development- Monosporic (Polygonum), Bisporic (Allium), Tetrasporic (Frittilaria) structure of Mature Embryo sac.

Unit 5: Pollination and fertilization (11 Lectures)

Definition, types, contrivances for self and cross pollinations
Process of Double Fertilization, Post Fertilization changes

Unit 6: Embryo and endosperm (6 Lectures)

Structure and development of Dicot (Capsella) and Monocot embryo (Maize). Endosperm- nucellar, cellular, helobial and ruminate.

Unit 7: Experimental Embryology (6 Lectures)

Brief account of apomixis (recurrent and non-recurrent), apospory, polyembryony, parthenocarpy.

DMC23108/DMC23107 II B.Sc., III Semester DSC-III

Plant Anatomy and Embryology of Angiosperms

Practical (Credits: 2)

Lectures: 60 Hours
(4 hours/week)

1. Study of Meristems through permanent slides and photographs- apical, intercalary and lateral meristems.
2. Study of simple Tissues (parenchyma, collenchyma and sclerenchyma) through Permanent slides and photographs.
3. Study of complex Tissue (xylem and phloem) through Permanent slides and photographs.
4. Study of Anatomical characteristics of Root: Monocot- *Zea mays* and Dicot- *Helianthus*.
5. Study of Anatomical characteristics of Stem: Monocot- *Zea mays*; Dicot-*Helianthus*.
6. Study of Anatomical characteristics of Monocot and Dicot Leaf.
7. Adaptive anatomy: Xerophyte (*Nerium* & *Causaurina*); Hydrophyte (*Hydrilla* & *Eichhornia)*.
8. Structure of anther (young and mature) and mounting of Pollen grains.
9. Calculation of percentage of germinated pollen in a given medium (Hanging drop method).
10. Types of ovules: Anatropous, Orthotropous, Circinotropous, Amphitropous/ Campylotropous.
11. Female gametophyte: Polygonum (monosporic) type of Embryo sac Development.
12. Pollination types and seed dispersal mechanisms. (Photographs and specimens).
13. Dissection/ mounting of embryo/endosperm from seeds.

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Suggested Readings

1. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.

2. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.

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DMC23008/DMC23007 **II B.Sc., III Semester DSC-III**

Plant Anatomy and Embryology of Angiosperms

Scheme of theory question paper

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Histology and Anatomy	18	2X1=2	5X2=10	10X2=20	**32**
Unit 2: Secondary Growth	04	2X1=2	5X1=5	-	**07**
Unit 3: Adaptive and protective systems	07	2X1=2	5X2=10	-	**12**
Unit 4: Embryology	08	2X1=2	-	10X1=10	**12**
Unit 5: Pollination andfertilization	11	2X1=2	-	10X2=20	**22**
Unit 6: Embryo and endosperm	06	2X1=2	-	10X1=10	**12**
Unit 7: Experimental Embryology	06	2X2=4	5X1=5	-	**09**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

DMC23108/DMC23107 II B.Sc., III Semester DSC-III

Plant Anatomy and Embryology of Angiosperms

Scheme of practical question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches 2x3=6 marks

(A-Meristem- Apical, intercalary and lateral, B-Simple tissues, C-Complex tissues)

Identification – 1 mark
Labeled sketch with reasons – 1marks

II. Prepare a stained temporary slide of 'D. Sketch, label and identify with reasons Leave the preparation for evaluation 5x1=5 marks

(D-Dicot stem/ Monocot stem Anatomy)

Identification – 1 mark
Mounting and Preparation -2 marks
Labeled sketch with reasons – 2 marks

III. Identify the microslides/ photographs 'E' 'F' & 'G' sketch, label with reasons 3x3=09 marks

(E-root/ leaf, F-Xerophytes/ Hydrophytes, G-T.S of anther/ types of ovule

Identification – 1 mark
Labeled sketch with reasons – 2marks

IV. 'H'- Dissect Embryo/Endosperm, sketch label with reasons/ Mounting of Pollen grains / calculate the percentage of germinated pollen

5x1=5 marks

Identification – 1 mark
Labeled sketch with reasons – 4marks

V. Practical record 05 marks

VI. Viva-Voce 05 marks

Note: Each student should submit the **duly valued and certified practical record** at the time of practical examination.

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DMC23108/DMC23107 II B.Sc., III Semester DSC-III

Plant Anatomy and Embryology of Angiosperms

Practical question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches 2x3=6 marks

II. Prepare a stained temporary slide of 'D. Sketch, label and identify with reasons.

Leave the preparation for evaluation 05marks

III. Identify the microslides/ photographs 'E' 'F'& 'G', sketch, label with reasons

3x3=9 marks

IV. 'H'- Dissect Embryo/Endosperm, sketch label with reasons/ Mounting of Pollen grains / calculate the percentage of germinated pollen.

V. Practical record 5 marks

VI. Viva-Voce 5 marks

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DMD23008/DMD23007 II B.Sc., IV Semester DSC-IV

Plant Physiology and Metabolism

Theory (Credits: 4)

Lectures: 60 Hours

(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1 Learn in depth translocation in phloem
CO2 Specify the classification and characteristics of enzyme
CO3 Understand the details of photosynthesis
CO4 Identify the characteristics of plant response to light and temperature

UNIT 1 - Plant – Water Relations: (20 Lectures)

1. **Fundamental concepts:** Importance of water to plants, Diffusion, Imbibition, Osmosis, Endosmosis and Exosmosis, Plasmolysis, Osmotic Pressure, Water potential and its components.
2. **Short Distance Transport:** Absorption of water – Active and passive absorption, Absorption of minerals – Donnan's equilibrium (Passive absorption), Carrier-ion concept (Active absorption)
3. **Long distance Transport:** Ascent of sap; Root pressure theory (Vital theory), TCT Theory (Physical theory), Soil plant atomospheric continum (SPAC)
4. **Transpiration:** Types, Mechanism of stomatal movement; Starch-sugar interconversion theory, Potassium ion pump theory, Significance of transpiration, Antitranspirants, Guttation.
5. **Mineral nutrition:** Macro and Micro nutrients; Role of Nitrogen, Phosphorous, Potassium, Sulphur, Manganese and Zinc, Hydroponics.
6. **Translocation of solutes:** Path of translocation, Munch's mass flow hypothesis with merits and demerits.

UNIT 2 – Enzymes: (4 Lectures)

Properties, Classification and Mode of action (Lock & Key theory, Induced fit theory)

UNIT 3 – Bioenergetics: (18 Lectures)

1. Photosynthesis : Introduction, Photosynthetic apparatus, Mechanism – Light and Dark reactions (C_3 pathway/Calvin Cycle), C_4 pathway, Significance of Photosynthesis.

2.Respiration : Introduction,,Types, Ultrastructure of Mitochondrion, Mechanism of Aerobic respiration – Glycolysis, Krebs' cycle and Terminal Oxidation of reduced coenzymes , Anaerobic respiration – alcoholic & lactic acid fermentation, Significance .

UNIT 4 -Nitrogen Metabolism: (6 Lectures)

Nitrogen fixation (Symbiotic and Non Symbiotic), Nitrate reduction, Aminoacids & their synthesis

(Transamination & Reductive amination)

UNIT 5 - Plant Growth and Movements: (12 Lectures)

1. Growth: Definition, Phases of growth and Growth curve
2. Growth regulators Chemical nature, application of Auxins, Gibberellins, Cytokinins, Abcissic acid (ABA) & Ethylene.
3. Photoperiodism and Vernalisation : A brief account.
4. Plant movements : Tropisms & their types (Phototropism, Thigmotropism, Hydrotropism & Geotropism)

DMD23108/DMD23107 **II B.Sc., IV Semester DSC-IV**

Plant Physiology and Metabolism

Practicals (2 credits) **Lectures: 60 Hours**

(4 hours/week)

I. Minor Experiments:

1. a) Root pressure experiment

   b) Ganong's Potometer experiment

2. c) Ganong's light screen experiment

   d) Mohl's half leaf experiment

3. f) Kuhne's experiment to demonstrate fermentation.

   g) Phototropism

4. h) Geotropism

   i) Arc Auxanometer experiment

5. j) Bolting.

   k) Effect of auxins on rooting.

II. Major Experiments:

1. Determination of Osmotic Potential by Plasmolytic method using *Rhoeo discolor (Epidermal peel)*
2. Experiment to demonstrate the Relationship between Absorption and Transpiration.
3. Experiment to demonstrate the Suction force due to transpiration.
4. Separation of photosynthetic pigments using paper Chromatography.
5. Evolution of Oxygen during photosynthesis
6. Calculation of stomatal index and stomatal frequency.

III. Biochemical tests:

Qualitative biochemical tests for Carbohydrates, fats and protein**.**

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Suggested Readings

1. Taiz, L., Zeiger, E., (2010). Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.

2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.

3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.

II B.Sc., IV Semester DSC-IV
Plant Physiology and Metabolism
Scheme of theory question paper

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Plant-water relations	20	2X3=6	5X2=10	10X2=20	**36**
Unit 2: Enzymes	4	2X1=2	5X1=5	-	**7**
Unit 3: Bioenergetics	18	2X2=4	5X1=5	10X2=20	**29**
Unit 4: Nitrogen metabolism	6		5X1=5	10X1=10	**15**
Unit 5: Plant Growth and Movements:	12	2X2=4	5X1=5	10X1=10	**19**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

DMD23108/DMD23107 II B.Sc., IV Semester DSC-IV

Plant Physiology and Metabolism

Scheme of practical question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Perform the major experiment 'A' write the principle, Requirements, Procedure and record the result with inference and leave the setup for evaluation 9x1 = 9 marks

(Determination of osmotic potential of plant cell sap by plasmolytic method. Study of plasmolysis and deplasmolysis on Rhoeo leaf

OR

Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophytes

OR

Experiment to demonstrate the Relationship between Absorption and Transpiration.

OR

Separation of photosynthetic pigments by paper chromatography

OR

Evolution of Oxygen during photosynthesis

OR

Experiment to demonstrate the Suction force due to transpiration

Principle	-2 marks	Procedure	-3 marks
Requirements	-1 mark	Result and inference	-1 marks
Setting	-2 marks		

II. Comment on 'B' &'C' (Minor experiments) 4x2 =8 marks

(Root pressure experiment/ Ganong's Potometer experiment / Ganong's light screen experiment/ Mohl's half leaf experiment/ Kuhne's experiment / Phototropism/ Arc Auxanometer experiment/ Bolting/ Effect of auxins on rooting)

Identification	-1 marks
Critical notes	-2 marks
Labeled sketch	-1 marks

III. Perform the biochemical test of the given sample 'D' & 'E'

Procedure -3marks Result-1 marks **4x2=8 marks**

IV. Practical record 05 marks

V. Viva-Voce 05 marks

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DMD23108/DMD23107 II B.Sc., IV Semester DSC-IV

Plant Physiology and Metabolism

Practical Question Paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Perform the major experiment 'A' write the principle, Requirements, Procedure and record the result with inference and leave the setup for evaluation 9x1 =9 marks

II. Comment on 'B' & 'C' (Minor experiments) 4x2=8 marks

II. Perform the biochemical test of the given sample 'D' & 'E' 4x2=8 marks

IV. Practical record 05 marks

V. Viva-Voce 05 marks

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DME23008/DME23007 III B.Sc., V Semester DSE-V

Cell and Molecular Biology

Theory (4 credits) Lectures: 60 Hours

(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1 Understand in depth microscopy
CO2 Learn the details of cell
CO3 Specify the details of DNA
CO4 Learn the details of gene regulation

Unit 1- Microscopy: (5 Lectures)

Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM).

Unit 2- Cell: (4 Lectures)

Cell Theory; Ultra structure of Prokaryotic and eukaryotic cells;

Unit 3- Cell Wall and Cell Membrane: (4 Lectures)

Cell wall- Structure; Cell Membrane- Fluid mosaic model and functions

Unit 4- Cell Organelles: (13 Lectures)

Ultrastructure and functions of Nucleus, Mitochondrion, Chloroplast, Endoplasmic reticulum, Golgi bodies, Lysosomes, Ribosomes, Peroxisomes and Glyoxisomes

Morphology of chromosomes in general, Ultrastructure of Chromosome (Nucleosome concept), Karyotype and Ideogram

Unit 5-Cell Division: (6 Lectures)

Cell cycle, Mitosis and Meiosis and their significance

Unit 6- Nucleic acids: (12 Lectures)

A. **DNA**: Chemistry, Structure and Replication in Eukaryotes (semi- conservative method) DNA as a genetic material Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment.

B.RNA: Chemistry, Structure, Types (mRNA, tRNA, rRNA) and structure. Frankel Conrat's experiment

Unit 7-Gene concept: (12 Lectures)

A. Cistron, Recon, Muton- Prokaryotic and Eukaryotic gene structure, Split gene concept.

B. Genetic code- features, Wobble concept. Protein synthesis: Transcription, Splicing and Translation. Central dogma of molecular Biology.

Unit 8-Regulation of gene expression: (4 Lectures)

Lac operon and Tryp operon concepts.

DME23108/DME23107 **III B.Sc., V Semester DSE-V**

Cell and Molecular Biology

Practical (2 credits) **Lectures: 60 Hours**

(4 hours/week)

1. Preparation of fixatives and stains: FAA, Carnoy's fixative, safranine, acetocarmine and aceto-orcein.
2. Study of viruses, prokaryotic cell (bacteria) and eukaryotic cell with the help of light and electron micrographs.
3. Study of cell organelles through photographs.
4. Study of structure of plant cell through temporary mounts- Onion peeling and tomato pulp
5. Study of Mitosis (temporary mounts and permanent slides).
6. Study of Meiosis (temporary mounts and permanent slides).
7. Study the structure of nuclear pore complex by photograph (from Gerald Karp)
8. Structure of DNA and RNA (mRNA, rRNA, tRNA).
9. Study DNA packaging through photographs- solenoid model.
10. Lac operon and Tryp operon concepts.

Suggested Readings

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.

2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA. 4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

III B.Sc., V Semester DSE-V
Cell and Molecular Biology
Scheme of theory question paper

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours Alloted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Microscopy	5	-	-	10X1=10	**10**
Unit 2: Cell	4	2X1=2	5X1=5	-	**07**
Unit 3: Cell Membrane and Cell Wall	4	2X1=2	5X1=5	-	**07**
Unit 4: Cell Organelles	13	2X1=2	-	10X2=20	**22**
Unit 5: Cell Division	06	2X1=2	-	10X1=10	**12**
Unit 6: Nucleic acid	12	2X1=2	5X2=10	10X1=10	**22**
Unit 7: Gene concept	12	2X2=4	5X1=5	10X1=10	**19**
Unit 8: Regulation of gene expression	04	2X1=2	5X1=5	-	**07**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

DME23108/DME23107 III B.Sc., V Semester DSE-I

Cell and Molecular Biology

Scheme of practical question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Prepare a temporary squash of given material 'A'. Sketch, label and identify with reasons. Leave the preparation for evaluation. 07 marks

(Onion root tip/ flower bud)

Preparation - 4marks

Identification - 1mark

Sketch and label - 1mark

Reasons - 1mark

II. Identify the cytological slide/Photograph 'B' with labeled diagram and reasons. 04 marks

(Mitosis/ Meiosis)

Identification - 1mark

Sketch and label - 1mark

Reasons - 2marks

III. Comment on 'C' and 'D' (charts/photographs) 3 X 2= 06marks

C- Cell organelle **(**Identification - 1mark, labeled Sketch and Reason - 2marks)

D- Fixative/ stain **(**Identification - 1mark,labeled Sketch and Reason - 2marks,)

IV. Prepare a temporary mount of a plant cell 'E' 04 marks

(Onion peeling/ tomato pulp)

Preparation - 2 marks

Sketch and label - 2 marks

V. Write critical notes on 'F and 'G' 2 X 2 = 04 marks

F-DNA/ DNA packaging/RNA types

G- Nuclear pore complex/ Lac operon/Tryp operon

Identification - 1 mark

Reasons - 1 marks

VI. Practical record 05marks

VII. Viva-voce 05marks

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DME23108/DME23107 III B.Sc., V Semester DSE-I

Cell and Molecular Biology

Practical question paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Prepare a temporary squash of given material 'A'. Sketch, label and identify with reasons. Leave the preparation for evaluation. 07 marks

II. Identify the cytological slide/photograph 'B' with labeled diagram and reasons. 04 marks

III. Comment on 'C' and 'D' (charts/photographs) 3 X 2= 06 marks

IV. Prepare a temporary mount of a plant cell 'E' 04 marks

V. Write critical notes on F and G 2 X 2 = 04 marks

VI. Practical record 05 marks

VII. Viva-voce 05marks

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DME23208/DME23207 **III B.Sc., V Semester DSE-II**

Economic Botany and Biotechnology

Theory (4 credits) **Lectures: 60 Hours**

(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1 Understand in details with application, if applicable, economic botany
CO2 Specify the details of plant tissue culture
CO3 Understand in details with examples recombinant DNA technology

Unit 1: Cereals and Millets **(4 Lectures)**

Rice, Wheat, Maize, Ragi (Botanical name, family, part used, morphology and uses)

Unit 2: Legumes **(6 Lectures)**

General account with special reference to Pigeon pea, Green gram, Black gram, Bengal gram (Botanical name, family, part used, morphology and uses)

Unit 3: Spices and condiments **(8 Lectures)**

General account with special reference to clove, black pepper, cinnamom, cardamom, garlic, onion, chilli and coriander (Botanical name, family, part used, morphology and uses)

Unit 4: Beverages **(4 Lectures)**

Tea and coffee (Botanical name, family, part used, morphology and uses)

Unit 5: Oils and Fats **(4 Lectures)**

General description with special reference to groundnut, sunflower, mustard (Botanical name, family, part used, morphology and uses)

Unit 6: Fibre Yielding Plants **(4 Lectures)**

General description with special reference to Cotton, Jute, kapok and sunn hemp (Botanical name, family, part used, morphology and uses)

Unit 7: Introduction to biotechnology **(2 lecture)**

Unit 8: Plant tissue culture **(10 Lectures)**

Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture with their applications

Unit 9: Recombinant DNA Techniques **(18 Lectures)**

Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection.

DME23308/DME23307

III B.Sc., V Semester DSE-II
Economic Botany and Biotechnology
Practical (2 credits)

Lectures: 60 Hours
(4 hours/week)

1. Study of Cereals and Millets
2. Study of Legumes
3. Study of Spices and condiments
4. Study of Beverages
5. Study of Oils and Fats
6. Study of Fibre Yielding Plants
7. Familiarization with basic equipments in tissue culture.
8. Study through photographs: Anther culture, somatic embryogenesis,
9. Study through photographs: endosperm and embryo culture; micropropagation.
10. Study of molecular techniques: PCR, Blotting techniques and PAGE.

Suggested Readings

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.

2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.

3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

III B.Sc., V Semester DSE-II

Economic Botany and Biotechnology

Scheme of Theory Question Paper

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Cereals and Millets	4		5X1=5	-	**07**
Unit 2Legumes	6	2X1=2	-	10X1=10	**12**
Unit 3: Spices and condiments	8	-	5X1=5	10X1=10	**15**
Unit 4: Beverages	4	-	5X1=5	-	**05**
Unit 5: Oils and Fats	4	2X1=2	5X1=5	-	**07**
Unit 6: Fibre Yielding Plants	4	2X1=2	-	10X1=10	**12**
Unit 7: Introduction to biotechnolog	2	2X1=2	-	-	**02**
Unit 8: Plant tissue culture	10	2X1=2	5X1=5	10X1=10	**17**
Unit 9: Recombinant DNA Techniques	18	2X2=4	5X1=5	10X2=20	**29**
Total		**8X2=16**	**5X6=30**	**10X6=60**	**106**

DME23608/ DME23607 **III B.Sc., V Semester SEC-I**

Floriculture

Theory (2 credits) **Lectures: 30 Hours**
(2 hours/week)

Course outcome:
After completion of the course the student is able to:

- **CO1** Specify the classification and characteristics of gardening
- **CO2** Understand in depth nursery management
- **CO3** Identify in details with examples ornamental plants

Unit 1- Establishment and management of Nurseries: **(7 Lectures)**

Definition, importance of nurseries, classification of nurseries, and management of nurseries

1. **Basic requirements for Nurseries**: Agro-climatic conditions, Topography, Selection of site Selection of soil, Seed bed preparation, Water supply and irrigation.

   Parts of nursery- a) Building structures, b) Propagating structures- raising of seedlings

2. **Management of nursery:** Irrigation, Nutrition, Weed control, Plant protection, Uprooting, packing and transplantation

Unit 2-Gardening and Landscaping **(8 Lectures)**

A. Features of a garden:

1. Introduction, living elements, hedges, edges, trees, flower beds, lawn, Shrubbery, climbers and creepers, paths, Steps, arches, pergola, rockery, Water garden, sunken garden, carpet beds, topiary, trophy, ,non living elements.

2. Gardening: Introduction, Formal style, Informal style, planning a garden, creating a garden, establishment of the garden.

3. Some Famous gardens of India

B. Landscaping:

1. Home garden, Public garden. Educational institution, commercial complexes and companies.

2. Importance, Scope of floriculture and landscape gardening.

Unit 3-Garden Plants: **(5 Lectures)**

Introduction, Annuals, Biennials, Perennials, Shrubs, Trees, Climbers(Divine Vines) Succulents, Cacti,Ferns, Gymnosperms, Palms, Orchids, Bulbous Ornamentals.

Unit 4- Commercial Floriculture: **(8 Lectures)**

Introduction, Importance of Floriculture from social, Economic, Health and Aesthetic point of view. Marketing and floristry in Indian scenario. Future and scope of Floriculture in India-Employment opportunities. Packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Rose, Chrysanthemum, Gerbera, Gladiolous, Marigold, Orchids).

Unit 5- Diseases and pests of ornamental plants: **(2 Lectures)**

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References

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India Allied Publishers

DME23608/ DME23607 **III B.Sc., V Semester SEC-I**

Floriculture

Scheme of Theory Question Paper

Blue print: **Max. Marks: 50**

Units	Hours allotted	No. of questions from each category			Total Marks 50
		2 marks (5/8)=10	5marks (4/6)=20	10marks (2/4)=20	
Unit 1: Establishment and management of Nurseries.	7	2X2=4	5X1=5	10X1=10	**19**
Unit 2: Gardening and Landscaping:	8	2X2=4	5X2=10	10X1=10	**24**
Unit 3: Garden Plants:	5	2X2=4	5X2=10	-	**14**
Unit 4: Commercial Floriculture	8	2X1=2	-	10X2=20	**22**
Unit 5: Diseases and Pests of Ornamental Plants.	2	2X1=2	5X1=5	-	**07**
Total	**30**	**8X2=16**	**5X6=30**	**10X4=40**	**86**

DME23408 /DME23407 **III B.Sc., V Semester SEC-II**

Ethnobotany

Theory (Credits 2)

Lectures: 30 Hours
(2 hours/week)

Course outcome

After completion of the course the student is able to:

CO1. Understand the details of Ethnobotany

CO2. Learn the characteristics of traditional medicinal plants

Unit 1- Ethnobotany: **(6 Lectures)**

Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science

The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses.

Unit 2- Methodology of Ethnobotanical studies: **(6 Lectures)**

a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places.

Unit 3- Role of Ethnobotany in modern Medicine: **(10 Lectures)**

Medico-ethnobotanical sources in India;Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum*

c) *Vitex negundo* d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata*

g) *Cassia auriculata* h) *Indigofera tinctoria*

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

Role of ethnic groups in conservation of plant genetic resources Endangered taxa and forest management (participatory forest management).

Unit 4- Ethnobotany and legal aspects: **(8 Lectures)**

Ethnobotany as a tool to protect interests of ethnic groups.Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.

References

1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.

2) S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi – 1981

3) Lone et al,. Palaeoethnobotany

4) S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.

5) S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.

6) Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester

7) Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah.8) Rajiv K. Sinha – Ethnobotany The Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur-19969)

DME23408 /DME23407 **III B.Sc., V Semester SEC-II**

Ethnobotany

Scheme of Theory Question Paper

Blue print: **Max. Marks: 50**

Units	Hours allotted	No. of questions from each category			Total Marks 50
		2 marks (5/8)=10	5marks (4/6)=20	10marks (2/4)=20	
Unit 1: Ethnobotany	6	2X2=4	5X1=5	10X1=10	**19**
Unit 2: methodology of Ethanobotanical studies	6	2X3=6	5X2=10	-	**16**
Unit 3: role of ethonobotany in modern medicine	10	2X2=4	5X1=5	10X2=20	**29**
Unit 4: Ethnobotany and legal aspects	8	2X1=2	5X2=10	10X1=10	**22**
Total	**30**	**8X2=16**	**5X6=30**	**10X4=40**	**86**

DMF23008/ DMF23007 **III B.Sc., VI Semester DSE-III**

Genetics and Plant Breeding

Theory (4 credits) **Lectures: 60 Hours**
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1 Specify the details of heredity

CO3 Write down the classification and characteristics of mutations

CO4 Learn the details of plant breeding

CO2 Identify in details with examples linkage

Unit 1- Heredity: **(24 Lectures)**

1. Brief life history of Mendel
2. Terminologies
3. Laws of Inheritance
4. Modified Mendelian Ratios: incomplete dominance; complementary factors; supplementary factors, Duplicate factors, Epistatis.
6. Pedigree Analysis
7. Cytoplasmic Inheritance: leaf variegation in *Mirabilis jalapa*, Male sterility.
8. Chromosome theory of Inheritance.
9. Quantitative inheritance-Concept, mechanism, examples. Monogenic vs polygenic Inheritance.

Unit 2- Sex-determination and Sex-linked Inheritance: **(6 Lectures)**

Sex – determination in *Melandrium album* by XX-XY method, Bridges Genic balance theory**,** Sex-linked Inheritance

Unit 3- Linkage and Crossing over: **(8 Lectures)**

Linkage: complete & incomplete linkage, coupling & repulsion, recombination frequency, linkage in Maize, two point test cross, linkage maps, Coincidence and interference. Crossing over: concept and significance.

Unit 4-Mutations and Chromosomal Aberrations: **(6 Lectures)**

Types of mutations, effects of physical & chemical mutagens. Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy; Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations.

Unit 5- Plant breeding and Methods of crop improvement: (12 lectures)

Introduction, objectives and Methods: Plant introduction, selection, Hybridization- Emasculation and bagging. Mutation breeding, polyploidy breeding, genetic or molecular plant breeding. Methods of propagation– Procedure, advantages and limitations

Unit 6- Inbreeding depression and heterosis: (4 lectures)

Inbreeding depression and Heterosis; Applications. Germplasm maintenance, Pollen banks and Quarantine measures.

DMF23108/ DMF23107 **III B.Sc., VI Semester DSE-III**

Genetics and Plant Breeding

Practical (2 credits)

Lectures: 60 Hours
(4 hours/week)

1. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.

2. Chromosome mapping using point test cross data.

3. Pedigree analysis for dominant and recessive autosomal and sex linked traits.

4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).

5. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes through photographs.

6. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.

7. Hybridization techniques - Emasculation, Bagging (For demonstration only).

8. Induction of polyploidy conditions in plants (For demonstration only).

Suggested Readings

1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. WileyIndia.

2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.

3. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings

4. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

5. Pierce BA (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning 6. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.

7. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.

8. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.

III B.Sc., VI Semester DSE-III

Genetics and Plant Breeding

Scheme of Practical Question Paper

Time: 4 Hours **Max. Marks: 35 (25+05+05)**

I. Perform the experiment 'A'. **6 marks**

(Emasculation and bagging)

Preparation -2 marks

Sketch and label - 2marks

Reasons - 2marks

II. Conduct experiment 'B'. **4 marks**

(Induction of polyploidy)

Principle -1 marks
Requirements -1 marks
Procedure -1 marks
Result and inference -1 marks

III. Problems on Chromosome mapping using point test cross data'C'. **4 marks**

IV. Comment on the given specimen 'D' **3 marks**

(Pedigree analysis)

Identification - 1mark

Reasons - 2marks

V. Problems on gene interaction 'E' **4 marks**

VI. Identify the given photographs 'F' & 'G' **2x2=4 marks**

(F- Aneuploidy & G- Translocation)

Identification - 1mark

Reasons - 1marks

VI. Practical record **5 marks**

VII. Viva-Voce **5 marks**

III B.Sc., VI Semester DSE-III
Genetics and Plant Breeding
Scheme of Theory Question Paper

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)40	
Unit 1:Heredity	24	2X3=6	5X1=5	10X3=30	**41**
Unit 2: Sex-determination and Sex-linked Inheritance	4	2X1=2	5X1=5	-	**7**
Unit 3: Linkage and Crossing over	8	2X1=2	-	10X1=10	**12**
Unit 4: Mutations and Chromosoma Aberrations	4	2X1=2	5X1=5	-	**7**
Unit 5: Plant Breeding	4	2X1=2	5X1=5	-	**07**
Unit 6: Methods of crop improvement	8	-	5X1=5	10X1=10	**15**
Unit 7: Inbreeding depression and heterosis	4	2X1=2	5X1=5	-	**02**
Unit 8: Crop improvement and breeding	4	-	-	10X1=10	**10**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

DMF23208/ DMF23207 III B.Sc., VI Semester DSE-IV

Analytical Techniques in Plant Science

Theory (4 credits) Lectures: 60 Hours

(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO2 Learn the details of Spectrophotometry

CO3 Write down the details of chromatography

CO1 Specify the details of cell fractioning

CO4 Identify in details with application, if applicable, biostatistics

Unit 1: Imaging and related techniques (15 Lectures)

Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit 2: Cell fractionation (8 Lectures)

Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl2 gradient, analytical centrifugation, ultracentrifugation, marker enzymes.

Unit 3: Radioisotopes (4 Lectures)

Use in biological research, auto-radiography, pulse chase experiment.

Unit 4: **Spectrophotometry (4 Lectures)**

Principle and its application in biological research.

Unit 5: Chromatography (8 Lectures)

Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Unit 6: Characterization of proteins and nucleic acids (6 Lectures)

Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

Unit 7:Biostatistics (15 Lectures)

Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.

DMF23308/ DMF23307 **III B.Sc., VI Semester DSE-IV**

Analytical Techniques in Plant Science

Practicals (2 credits) **Lectures: 60 Hours (4 hours/week)**

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.
7. To estimate protein concentration through Lowry's methods.
8. To separate proteins using PAGE.
9. To separate DNA (marker) using AGE.
10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
11. Preparation of permanent slides (double staining).

Suggested Readings

1. Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGrawHill Publishing Co. Ltd. New Delhi. 3rd edition.
2. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.
3. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.
4. Zar, J.H. (2012). Biostatistical Analysis. Pearson Publication. U.S.A. 4th edition

III B.Sc., VI Semester DSE-IV
Genetics and Plant Breeding
Scheme of Theory Question Paper

Time: 3.00 Hours **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)40	
Unit 1: Imaging and related techniques	15	2X2=4	5X2=10	10X1=10	**24**
Unit 2: Cell fractionation	8	2X1=2	5X1=5	10X1=10	**17**
Unit 3: Radioisotopes	4	2X2=4	-	-	**4**
Unit 4: Spectrophotometry	4	2X1=2	-	10X1=10	**12**
Unit 5: Chromatography	8	-	5X1=5	10X1=10	**15**
Unit 6: Characterization of proteins and nucleic acids	6	2X1=2	5X1=5	-	**7**
Unit 7: Biostatistics	15	2X1=2	5X1=5	10X2=20	**27**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

Botany Pattern of theory question paper (CBCS)
DSC I-DSC IV
(I semester to IV)

Time: 3 Hours **Max. Marks: 70**

Instructions to the candidates:
Draw neat labelled diagrams where ever necessary.

I. Explain / define any FIVE of the following. 2x5=10

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

II. Write short notes on any FOUR of the following. 5x4=20

9.
10.
11.
12.
13.
14.

III. Give comprehensive and detailed account of any FOUR of the following. 10x4=40

15.
16.
17.
18.
19.
20.

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Botany Pattern of theory question paper (CBCS)
DSE
(V semester to VI)

Time: 3 Hours **Max. Marks: 70**

Instructions to the candidates:
Draw neat labelled diagrams where ever necessary.

II. Explain / define any FIVE of the following. 2x5=10

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

II. Write short notes on any FOUR of the following. 5x4=20

9.
10.
11.
12.
13.
14.

III. Give comprehensive and detailed account of any FOUR of the following. 10x4=40

15.
16.
17.
18.
19.
20.

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Botany Pattern of theory question paper (CBCS)
SEC
(V semester)

Time: 2 Hours **Max. Marks: 50**

Instructions to the candidates:
Draw neat labelled diagrams where ever necessary.

III. Explain / define any FIVE of the following. 2x5=10

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

II. Write short notes on any FOUR of the following. 5x4=20

9.
10.
11.
12.
13.
14.

III. Give comprehensive and detailed account of any TWO of the following. 10x2=20

15.
16.
17.
18.

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Suggested Readings:

Author	Title of the Book	Publisher
VIRUSES AND BACTERIA		
R.C.Dubey and D.K. Maheshwari	A textbook of Microbiology	S. Chand & company, Ramnagar N.Delhi-110005.
P.D. Sharma	Microbiology	Rastogi Publications; Shivaji road Meerat; 250002; India
P. D. Sharma	Microbiology and Plant pathology	Rastogi Publications; Shivaji road Meerat; 250002; India
H. C. Dube	Text book of fungi, Bacteria & Virus	Vani Educational books , Vikas house 20/4, Industrial area, Sahidabad, 201010, Ghaziabad, UP.
Power & Daginawala		Himalaya Publishing house, Bombay
Power & Daginawala	General Microbiology. Vol. I	Himalaya Publishing house, Bombay
Pelzar Michael.J	General Microbiology. Vol. II	
Prescott, Lansing and Others	Text Book of Microbiology Microbiology	Orient and Longman, New Delhi.
Ananthanarayana .R . Jayaram Panicker	Text Book of Microbiology	Tata Mc graw Hill
a) salle. A. J.	Functional Principles of Bacteriology	Himalaya Publishing house, Bombay
Vinita Kale and Kishore Bhusari	Applied Microbiology.	ELBS Publisher , New Delhi
Frazier William. C.	Food Microbiology	Prentice Hall of India N.Delhi
Cruckishank	Text book of Medical Microbiology	Vardaman Publishers , Bangalore. Vol. III & Vol. IV.
Rangaswamy.G.	Diseases of crop plants in India.	Tata McGraw Hill Publishing company.
Sundar Rajan	College Microbiology	
William. C. Frazier and Dennis C. West hoff. 3rd Edn	Food Microbiology	R. Chand & company, Publishers, N.Delhi.
ALGAE		Pradeep Pub., Jalandhar.
K.N. Bhatia	A Treatise on Algae	Mc graw Hill , New york.
Chopra. G.L	A Text book of Algae	Thomas, Nelson and Sons Rastogi Publications
G. M. Smith	Cryptogamic Botany Vol. I	
Prescott, G.W	The Algae to Review	Cambridge University Press
Kumar, M.A and Kashyap.	Recent advances in physiology	

A.K.		Mac Milan, Publishing New
Fritsch. F. E.	Structure and Reproduction of	York.
	Algae Vol. I & Vol. II	Rastogi Publications; Shivaji
ChapmanV.J&Chapman	The Algae 2nd Edn.	road Meerat; 250002; India
D.J.	A text book of Botany	S. Chand & company, Ltd.
Singh, Pande , Jain.		Ramnagar N.Delhi-110005.
	Simplified course in Botany	Black well Publishers.
B. P. Pandey		
	Algal Biology	Mc Grawhill, New york.
Darley. M. W.		Wiley Eastern Ltd. New Delhi.
FUNGI	Cryptogamic Botany Vol. I	
Smith. G. M.	Introduction to Mycology	Pradeep publications, Jalandar
Allexopolos. C. J. and		Mac Milan & Co Calcutta
Mims. C. W.	Text book of Fungi	Prentice Hall of India New Delhi.
Chopra G. L. and Verma. V	Fungi & Plant diseases	Rastogi Publications
Mundkur, B. B.	Diseases of India 3rd Edition	S. Chand and Company, New
Rangaswamy, G.	The fungi	Delhi.
Sharma. P. D.	Fungi	
Vashista, R.R		S. Chand and Company, New Delhi.
BRYOPHYTA	Bryophyta	S. Chand and Company, New Delhi.
Pandey. B.P.		
	Bryophyta	Central book depot, Allahabad.
Vashista. B. P.		Mc Grawhill, New York
	Bryophyta	Pradeep Publications, Jalandar.
Parihar. N.S.	Cryptogamic Botany vol. I	
G. M. Smith	Class Book and Pteridophytes	
G. L. Chopra		
	Bryophytes and Pteridophytes	
Chauhan D.K.S		MC Graw Hill, New York.
ANATOMY	Introduction to Plant Anatomy	Wiley Eastern, New Delhi.
Eames A.J. and Mac		S. Chand and Company.
Daniels, L. H	Anatomy of seed plants	Rastogi publications, Meerat.
Katherien Esau	Introduction to Plant Anatomy	
Pandey. B. P	Anatomy of seed plants	Rastogi publications, Meerat.
Singh. V., Pandey, P.C and		
Jain, D.K.	Plant anatomy	
Tayal M. S.	College Botany Vol. I	
Ganguli Das L Datta	Cytology and Anatomy	
Venkateshvaralu		
EMBRYOLOGY OF ANGIOSPERMS &		Vikas publishing HOUSE, New Delhi.
TAXANOMY	The Embryology of Angiosperms	Rastogi publications, Shivaji
Bhojwani. S. S. &		Road, Meerat, 250002.
Bhatnagar, S. P.	The Embryology of Angiosperms	MC Graw Hill publishing

Singh, Pandey, Jain		Company, New Delhi.
	The Embryology of Angiosperms	Ind. Sci. Acad. Bull. No.41, New Delhi.
Maheshwari , P		
	Comparative Embryology of	MC Graw Hill, New York.
Johri, B.M.	Angiosperms	Narosa publishing House New Delhi.
	Morphology of Angiosperms	
Eames A. J.	Plant cell and Tissue culture.	
Reinert . J and Yeoman M.M	Plant Anatomy	
	Taxonomy of Vascular plants	
Vashishta	A Text book of systematic	
George H.M. Lawarance.	Botany	Harper C Row, New York.
R.N. sutaria	Botany for Degree Students.	
A. C. Dutta		Mc Graw Hill, New York.
PTERIDOPHYTA	Morphology of plants and Fungi	
Bold , H.C., Alexopoulos, C.J		Central book depot. Allahabad.
& Delevoryas, T.	Morphology of vascular plants (lower groups).	
Eames, Arthur, J.	The Biology and Morphology of Pteridophytes.	Vikas publishing House, New Delhi.
Parihar, N.S. 1977		Vani educational books, New Delhi.
	Text book of Botany, Vol. II	
	An introduction to Pteridophyta.	Hutchinson university library,
Pandey, S.N.& Others	The Morphology of Pteridophytes	London.
Rashid,A.1986		S. Chand and Co., New Delhi.
Sporne,K.R.1970	Pteridophyta	
		Asia publishing house, New
Vashista,P.C. 1987	An Introduction to	Delhi.
GYMNOSPERMS	Gymnosperms.	K. Nath and Co.
Datta, S.C.	Gymnosperms.	Prasaranga, University of
Pandey, B.P.	Anavrutha beeja sasyagalu	Mysore, Mysore.
Ramaswamy, S.N. 1984	(Gymnosperms)	Ratna Prakashana Mandir, Agra
	Text book of Botany Vol. II.	Hutchinson university library,
Saxena and Sarabhai 1993	The Morphology of	London.
Sporne, K.R.1969	Gymnosperms.	Shashidhar Malaviya Prakashan.
		S.Chand & Co. New Delhi.
Trivedi, B.S.& Singh, D.K	An Introduction to	Wiley, New York.
Vashista, B.R.	Gymnosperms.	Narosa, New Delhi.
Andrews, H.N. 1961	Gymnosperms.	
Biswas, C. & Johri, B.M.	Studies in palaeobotany.	
1997	The Gymnosperms.	Wiley-Estern, New Delhi.
PLANT PHYSIOLOGY		
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