

HEMCHAND YADAV VISHWAVIDYALAYA, DURG (C.G.)

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SCHEME OF EXAMINATION & SYLLABUS of M.Sc. (Botany) Semester Exam UNDER FACULTY OF LIFE SCIENCE Session 2021-23

**(Approved by Board of Studies)
Effective from July 2021**

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M.Sc. BOTANY

Semester	Paper	Title	External marks	Internal marks	Credit
First	I	Cytology	80	20	4
	II	Genetics	80	20	4
	III	Microbiology, Phycology and Mycology	80	20	4
	IV	Bryophyte, Pteridophyta and Gymnosperm	80	20	4
	LC - I	Lab Course-I (Based on paper I &III)	80	20	4
	LC - II	Lab Course-II (Based on paper II &IV)	80	20	4
Second	I	Taxonomy and diversity of plants	80	20	4
	II	Molecular Biology	80	20	4
	III	Plant physiology	80	20	4
	IV	Plant metabolism	80	20	4
	LC- I	Lab Course-I (Based on paper I &II)	80	20	4
	LC-II	Lab Course-II (Based on paper III &IV)	80	20	4
Third	I	Plant development and plant resources	80	20	4
	II	Plant Ecology– I (Ecosystem and vegetation ecology)	80	20	4
	III	Biotechnology I (Genetic engineering of plants & microbes)	80	20	4
	IV	Elective paper-1 Molecular plant pathology-I OR Elective paper-II Limnology-I OR Elective paper-III Ethno botany I	80	20	4
	LC-I	Lab Course-I (Based on paper I &II)	80	20	4
	LC-II	Lab Course-II (Based on paper III &IV)	80	20	4

Fourth	I	Plant reproduction and plant resources utilization	80	20	4
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	II	Plant Ecology II (Pollution and biodiversity conservation)	80	20	4
	III	Biotechnology II (Plant cell, tissue culture & organ culture)	80	20	4
	IV	Elective paper-I Molecular plant pathology-II OR Elective paper-II Limnology-II OR Elective paper-III Ethno botany II	80	20	4
	LC-I	Lab Course-I (Based on paper I &II)	80	20	4
	LC-II	Lab Course-II (Based on paper III &IV)	80	20	4

Choice Based Credit System: Semester II Course Forestry seed Technology.
Marks 100, Credit Points -03, Total Hours -50

Choice Based Credit System: Semester III Course Environmental Science.
Marks 100, Credit Points -03, Total Hours -50

- Each theory paper will have 5 questions of equal marks. First question will encompass all the five units without internal choice, whereas rest questions will be unit wise with internal choice.
- The respective teachers on each paper will ensure the internal evaluation by a class test and a seminar / poster presentation of 20 marks each and submit the foil and counter foil to the HOD by the end of the activity.



M.Sc. II SEMESTER, BOTANY
THEORY

PAPER	TITLE	MAX. MARKS	Internal Assessment /Seminar	Total marks
I	TAXONOMY AND DIVERSITY OF PLANTS	80	20	100
II	MOLECULAR BIOLOGY	80	20	100
III	PLANT PHYSIOLOGY	80	20	100
IV	PLANT METABOLISM	80	20	100

Choice Based Credit System: Semester II Course Forestry seed Technology.

Marks 100 , Credit Points -03, Total Hours -50

PRACTICAL

LAB COURSE-I	BASED ON PAPER I&II	80	20	100
LAB COURSE-II	BASED ON PAPER III&IV	80	20	100
TOTAL MARKS (Theory and Practical)				600

TOTAL MARKS OF SEMESTER I& II- 1200

NOTE: Botanical excursion (within or outside Chhattisgarh) is compulsory for the Students of M.Sc.



PRACTICAL SCHEME, LAB COURSE- I
M.Sc. II SEMESTER (BOTANY)

Time-5Hours

Maximum Marks 80

1.	Exercise based on Molecular biology	15 Marks
2.	Exercise based on plant description (2 plants)	35 Marks
3.	Spotting	20 Marks
4.	Viva-voce	10 Marks

5.	Sessional(Internal Assessment)	20 Marks

Total- 100 Marks

PRACTICAL SCHEME, LAB COURSE-II
M.Sc. II SEMESTER (BOTANY)

Time-5Hours

Maximum Marks80

1.	Exercise based on Paper-III	25 Marks
2.	Exercise based on Paper-IV	25 Marks
3.	Spotting	20 Marks
4.	Viva-voce	10 Marks

5.	Sessional(Internal Assessment)	20 Marks

Total- 100 Marks



M.Sc. Botany
SEMESTER II
PAPER - I

TAXONOMY AND DIVERSITY OF PLANTS

MAX.MARKS-80

UNIT-I

- Plant nomenclature: Historical background of nomenclature, Binomial Nomenclature, International code of Botanical nomenclature.
- Plant identification: Herbaria, Botanical gardens, Taxonomic literature, Taxonomic- keys.
- Taxonomic hierarchy - Major categories, minor categories, species concept.
- Taxonomic evidences - Morphology, Anatomy, Palynology, Embryology, Cytology, Phytochemistry, Genome analysis and Nucleic acid hybridization.

UNIT-II

- Pre Darwinian Classification Based on form relationship (Bentham and Hooker)
- Post Darwinian classification Engler and Prantl, Bessey's, Hutchinson, Takhtajan and Cronquist.
- Recent modifications : Dahlgren's system of classification.
- Fossil angiosperm.

UNIT-III

- Study of following families with particular reference to systematic position, phylogeny, evolutionary trends and economic importance.
- Polypetalae: Ranunculaceae, Magnoliaceae, Nymphaeaceae, Brassicaceae, Sterculiaceae, Meliaceae, Moringaceae, Fabaceae, Myricaceae, Cucurbitaceae, Apiaceae (Umbelliferae),
- Gamopetalae: Rubiaceae, Asteraceae, Sapotaceae, Oleaceae, Asclepiadaceae, Solanaceae, Bignoniaceae, Verbenaceae, Lamiaceae (Labiatae),

UNIT-IV

- Study of following families with particular reference to systematic position, phylogeny, Evolutionary trends and economic importance,
- **Monochlamydae**- Nyctaginaceae, Amaranthaceae, Polygonaceae, Euphorbiaceae, Moraceae, Casuarinaceae
- **Monocot families**- Orchidaceae, Iridaceae, Amaryllidaceae, Scitamineae (Musaceae) Zingiberaceae, Cannaceae, Liliaceae, Commelinaceae, Palmae (Araceae), Araceae, Cyperaceae, Poaceae (Graminae) study of local available familiar plants.



LIST OF PRACTICALS:-

1. Methods of non-destructive field collection and documentation.
2. Techniques of herbaria preparation.
3. Morphological characterization of selected families of dicots and monocots and identification up to families.
4. Preparation of artificial key based on appropriate character combination.
5. Identification of genus and species from Monocots and Dicots.
6. Identification of given plant up to species with the help of modern flora keys.
7. Every student should submit duly prepared atleast 40 herbarium sheets.

Suggested readings: -

1. Blatter E and W.S Millard. 1929. Some Beautiful Indian Trees J.Bom. Nat Hist Soc.33:624-635.
2. Bor N.L 1943. Manual of Indian Forest Botany.London.
3. Clifford H.T and W. Stephenson. 1975. An Introduction to NumericalTaxonomy. Academic Press,N.Y.
4. Cole A.J (Ed.) 1969. Numerical Taxonomy. AcademicPress,N.Y.
5. Cronquist, A. 1968. The Evolution and Classification of Flowering Plants. Thomas Nel and Sons, Ltd.London.
6. Davis P.H and V.H Heywood 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd London.
7. Heywood V.H 1967. Plant Taxonomy,London.
8. Lawrence, G.H.M 1951. Taxonomy of Vascular Plants.N.Y.
9. Lawrence G.H.M 1955. An Introduction to Plant TaxonomyN.Y.
10. Rendle A.B. 1925. The Classification of flowering plants. 2 Vols.London.
11. Santapau H. 1953. The Flora of Khandala on the Western Ghats ofIndia.
12. Singh V. and D.K Jain, 1981 Taxonomy of Angiosperms. Rastogi Publication,Meerut.
13. Swingle D.B. 1946. A Text book of Systematic Botany. Mc Graw Hill Book Co. NewYork.
14. Pande B.P 1997. Taxonomy of Angiosperms. S.Chand Publication.
15. Takhtajan A. 1969. Flowering Plants; Origin and Dispo



M.Sc. Botany
PAPER – II
MOLECULAR BIOLOGY

MAX. MARKS-80

UNIT-I

- RNA and DNA Structure. A, B, C and Z Forms of DNA, HnRNA, mRNA, tRNA, rRNA, exon, intron, split gene, junk DNA
- DNA replication , damage and repair

UNIT-II

- Transcription, translation in prokaryotes and eukaryotes
- Molecular Cytogenetics : Nuclear DNA content, C-value paradox, Cot curve and its Significance,
- Restriction mapping - concept and techniques,
- Multigene families and their evolution,

UNIT-III

- Gene structure and expression: fine structure of gene, Cis-trans test, fine structure analysis of eukaryotes, introns and their significance. RNA splicing, regulation of gene expression in prokaryotes and eukaryotes.
- Protein sorting: Targeting of proteins to organelles.

UNIT-IV

- Mutation: Spontaneous and induced mutation, physical and chemical mutagens molecular basis of gene, transposable elements in prokaryotes and eukaryotes mutation induced by transposones, site directed mutagenesis Inherited human diseases and defects in DNA repair, translocation, intersect Robertsonian translocation, B-Atranslocation.

PRACTICALS:

1. Study of structure different types of DNA and RNA
2. Formation and significance of chromosomal bridge, micronuclei, legard, acentric and dicentric due to Chromosomal aberrations
3. Physical and chemical mutagens and its role
4. Symptoms and inheritance pattern of genetic human diseases- sickle cell anaemia , thallasemia, alkaptunuria, phenylketonuria etc.



Suggested Readings:

1. Albert B. Bray, D Lewis, J Raff, M. Robert, K. and Walter 1989, Molecular Biology of the Cell (Second Edition) Garland Publishing Inc, NewYork.
2. Atherly, A.G., Girton, J.R. and McDonald, J.F 1999. The Science of Genetics Saunders College Publishing, Frot Worth,USA.
3. Burnham, C.R 1962. Discussions in Cytogenetics. Burgess Publishing Co. Minnesota.
4. Busch, H. and Rothblum. L 1982. Volume X. The Cell Nucleus rDNA partA. AcademicPress.
5. Hartk D.L and Jones, E.W 1998 Genetics: Principles and Analysis (Fourth Edition). Jones and Bartlett Publishers, Massachusetts,USA.
6. Khush, G.S 1973. Cytogenetics of Aneuploids. Academic Press, NewYork, London.
7. Karp, G. 1999. Cell and Molecular Biology : Concept and Experiments. John Wiley and Sons, Inc., USA.
8. Lewin, B. 2000. Gene VII. Oxford University Press, New York,USA.
9. Lewis, R. 1997. Human Genetics : Concepts and Application (SecondEdition). WCB McGraw Hill,USA.
10. Malacinski, G.M and Freifelder, D. 1998 : Essentials of Molecular Biology (Third Edition). Jones and B. Artlet Publisher, Inc., London.
11. Russel, P.J. 1998. Genetics (Fifth Edition). The Benjamin/Cummings Publishing Company IND.,USA.
12. Snustad, D.P and Simmons, M.J 2000. Principles of Genetics (Second Edition). John Wiley and Sons Inc.,USA.
13. Gardner and Simmons Snustad 2005 (Eighth Edition). Principles ofGenetics, John Wiley and Sons,Singapore.
14. Sariu C 2004 (Sixth Edition) Genetics. TATA McGraw-Hill Publishing Company Ltd., NewDelhi.
15. Ahluwalia K.B 2005 (First Edition). Genetics. New Age InternationalPrivate Ltd. Publishers, New Delhi.(Page12)
16. Burus and Bottino 1989. (Sixth Edition). The Science of Genetics. Macmillan Publishing Company, New York(USA).
17. Pawar C.B 2003 (First Edition). Genetics Vol. I and II. Himalaya Publishing House,Mumbai.
18. Strickberger 2005. (Third Edition). Genetics. Prentice Hall of India Pvt. Ltd., NewDelhi.
19. Verma and Agarwal, Genetics, S. Chand Co, NewDelhi..
20. Singh B.D 2004. Genetics. Kalyani Publication,Ludhiana.
21. Gupta P.K Genetics and Cytogenetics, Rastogi Publications.



M.Sc. Botany
PAPER - III
PLANT PHYSIOLOGY

MAX. MARKS - 80

UNIT-I

- **Membrane transport and translocation of water and solutes:** Plant-water relation, physical and chemical properties of water, imbibition, osmosis, diffusion, DPD, OP, TP, WP, plasmolysis (incipient, evident and limited), deplasmolysis, mechanism of water transport through Xylem, root microbe interaction in facilitating nutrient uptake. Comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport, membrane transport system.

UNIT-II

- **Signal Transduction :** Overview, receptors and G proteins, Phospholipids signaling, role of C-AMP, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, specific signaling mechanism- two component sensor regulatory system in bacteria.

UNIT-III

- **Stress physiology :mineral nutrition in plants (excess and deficiency),** Plant responses to biotic and abiotic stress, mechanism of biotic and abiotic stress tolerance, HR Fundamental and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.


UNIT-IV

- Sensory photobiology, History of discovery of phytochromes and cryptochromes and their photo chemical and biochemical properties, Photophysiology of chloroplast under light responses, cellular localization, and molecular mechanism of action of enzyme.
- The flowering process:- Photoperiodism and its significance, endogeneous clock and its regulation, floral induction and development, Genetic, molecular analysis, role of vernalization.



LIST OF PRACTICALS (Based on Paper III and IV)

1. Determination of osmotic pressure of cell sap by plasmolytic method.
2. Determination of Diffusion pressure deficit in potato tuber.
3. Determination of imbibition pressure of seeds of different catagories (protein, lipid, carbohydrate containing seeds).
4. To compare the rate of imbibitions of fatty and starchy seeds.
5. Determination of osmotic pressure of cell sap by plasmolytic method.
6. Determination of effect of temperature on the permeability of plasma membrane of beet root.
7. Determination of effect of different organic solvents (alcohol, formaline, benzene) on the permeability of plasma membrane of beet root.
8. Determination of effect of different concentration of organic solvents (alcohol, formaline, benzene) on the permeability of plasma membrane of beet root.
9. Determination of effect of different Phytohormones on the germination of seeds.
10. Determination of effect of different concentration of auxins on the germination of seeds.
11. Determination of the rate of respiration by Ganong's Respirometer.
12. Determination of the rate of respiration by Pipette manometer.
13. Determination of R.Q. of carbohydrates by Ganong's Respirometer.
14. Determination of R.Q. of lipids by Ganong's Respirometer.
15. Determination of R.Q. of proteins by Ganong's Respirometer.
16. Separation of chlorophyll pigments by paper chromatography.
17. Separation of chlorophyll pigments by circular paper chromatography.
18. Qualitative analysis of Organic acids by paper chromatography.
19. Qualitative analysis of amino acids by paper chromatography.
20. Qualitative analysis of sugars by paper chromatography.
21. Separation of A.A by thin layer chromatography method.
22. Separation of chlorophyll by thin layer chromatography.
23. Determination of the effect of CO₂ concentration on the rate of photosynthesis by inverted funnel method.
24. Determination of the effect of CO₂ concentration on the rate of photosynthesis by Wilmot's bubbler.
25. Determination of the effect of intensity of light on the rate of photosynthesis by Wilmot's bubbler.
26. Determination of the effect of intensity of light on the rate of photosynthesis by inverted funnel method.
27. Determination of the effect of quality of light on the rate of photosynthesis by inverted funnel method.
28. Determination of the effect of quality of light on the rate of photosynthesis by Wilmot's bubbler.



MINOR EXPERIMENTS

- 1 Preparation of molar and molal solutions.
- 2 Preparation of percentage solution.
- 3 Preparation of normal solution of solute.
- 4 Preparation of normal solution of acid and base.
- 5 Demonstration of Brownian movement in the latex of Calotropis.
- 6 Demonstration of Tyndall effect.
- 7 Demonstration of plasmolysis and deplasmolysis in plant cell.
- 8 Demonstration of exosmosis and endosmosis in grapes and resins.
- 9 Demonstration of the rate of respiration of flower buds by pipette manometer.
- 10 Demonstration of evolution of O_2 during photosynthesis by inverted funnel method.
- 11 Demonstration of the rate of photosynthesis by inverted funnel method.
- 12 Demonstration of the rate of photosynthesis by Wilmot's bubbler.
- 13 Determination of the effect of temperature on the rate of photosynthesis by inverted funnel method.
- 14 Demonstration of the rise of temperature during seed germination.
- 15 Demonstration of evolution of CO_2 during respiration.
- 16 Demonstration of fermentation by Kuhns tube.
- 17 Demonstration of Determination of R.Q. of organic acids by Ganong's Respirometer.
- 18 Effect of phytohormones on the growth of seedling.



Suggested Reading :-

1. Moore T.C. 1989. Biochemistry and Physiology of Plant Hormones Springer–Verlag, New York,USA.
2. Nobel P.S 1999. Physiochemical and Environmental Plant Physiology(Second Edition) Academic Press, San Diego,USA.
3. Salisbury F.B and Ross C.W 1992. Plant physiology (Fourth Edition)Wadsworth Publishing Company,California,USA.
4. Singhal G.S., Renger G., Sopory, S.K. Irrgang K.D and Govindjee1999. Concept in Photobiology; Photosynthesis and Photomorphogenesis.Narosa Publishing House, New Delhi.
5. Taiz L. and Zeiger E. 1998. Plant Physiology (Second Edition). Sinauer Associates, Inc. Publishes, Massachusetts,USA.
6. Thomas B. and Vince-Prue D. 1997. Photoperiodism in Plants (Second Edition) Academic Press, San Diego,USA.
7. Verma S.K. and Verma Mohit 2007. A.T.B of Plant Physiology, Biochemistry and Biotechnology, S.Chand Publications.
8. Lehninger A.C 1987. Principles of Biochemistry, CBS Publishers and Distributors (Indian Reprint)



M.Sc. Botany
PAPER - IV
PLANT METABOLISM

MAX.MARKS-80

UNIT-I

- **Photosynthesis :** General concepts and historical background, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, photo oxidation of water, mechanism of electron and proton transport, Carbon assimilation ,the Calvin cycle, photorespiration and its significance, the C₄ cycle, the CAM pathway, biosynthesis of starch and sucrose, physiological and ecological considerations.

UNIT-II

- **Respiration and lipid metabolism :** Overview of plant respiration, aerobic and anaerobic, glycolysis, Fermentation, Krebs' cycle (TCA cycle), electron transport and ATP synthesis, Pentose phosphate pathway, alternative oxidative system, structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids ,structural lipids and storage lipids and their catabolism, Glyoxylate cycle.

UNIT-III

- **Nitrogen and Sulphur metabolism: Overview,** biological nitrogen fixation, nodule formation and nod factors, nif gene, nitrogenase, leghaemoglobin, mechanism of nitrate uptake and reduction, ammonium assimilation, sulphur uptake, transport and assimilation.nitrogen cycle, sulphur cycle.

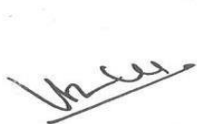
UNIT-IV

- **Plant growth regulators and elicitors :** Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylenes, abscisic acid, brassinosteroid, polyamines ,jasmonic acid and salicylic acid, hormone receptors.
- **Movements** in plants-types and its measurement.
- **Fundamentals of enzymology :** Structure and nature of enzymes, inhibitions, General aspects of allosteric mechanism, regulatory & active sites, isozymes, kinetics of enzymatic catalysis, Michaelis-Menton equation and its significance.



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Determination of the effect of CO₂ concentration on the rate of photosynthesis by Wilmot's bubbler.

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16. Demonstration of fermentation by Kuhns tube.
17. Demonstration of Determination of R.Q. of organic acids by Ganong's Respirometer.
18. Effect of phytohormones on the growth of seedling.



BIOCHEMISTRY PRACTICALS

- i. Qualitative estimation of amylase enzyme activity in the germinating seeds of wheat.
- ii. Qualitative estimation of amylase enzyme activity in potato tuber.
- iii. Qualitative estimation of catalase enzyme activity in the germinating seeds of wheat.
- iv. Qualitative estimation of catalase enzyme activity in potato tuber.
- v. Effect of enzyme concentration on the rate of catalase enzyme activity in potato tuber.
- vi. Effect of enzyme concentration on the rate of catalase enzyme activity in the germinating seeds of wheat.
- vii. Effect of enzyme concentration on the rate of amylase enzyme activity in potato tuber.
- viii. Effect of enzyme concentration on the rate of amylase enzyme activity in the germinating seeds of wheat.
- ix. Effect of substrate concentration on the rate of catalase enzyme activity in the germinating seeds of wheat.
- x. Effect of substrate concentration on the rate of catalase enzyme activity in potato tuber.
- xi. Effect of substrate concentration on the rate of amylase enzyme activity in the germinating seeds of wheat.

Suggested readings

1. Moore T.C. 1989. Biochemistry and Physiology of Plant Hormones Springer–Verlag, New York, USA.
2. Nobel P.S 1999. Physiochemical and Environmental Plant Physiology (Second Edition) Academic Press, San Diego, USA.
Salisbury F.B and Ross C.W 1992. Plant physiology (Fourth Edition) Wadsworth Publishing Company, California, USA.
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