

# 4. BOTANY

Scheme

Maximum Marks: 100

Paper I

3 hrs duration

Max Marks: 100

Paper II

3 hrs duration

Max. Marks 33

Paper III

3 hrs duration

Max. Marks 33

Practical (Max. Marks: 18)

4 hrs. duration

Max. Marks 34

Max. Marks 50

3 hours

4 hours

Duration of examination of each theory paper-

Duration of examination of practicals-

Note

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.
2. Paper I will have 18 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Paper II is divided into four units. There will be one question from each unit. These questions 2 to 5 will have internal choice.

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PAPER-I  
Molecular Biology and Biotechnology  
(2 hrs/week)

Unit-1

Genetic Material: Biological, chemical and physical nature of heredity material. Structure of DNA and RNAs (mRNA, tRNA and rRNA). Watson and Crick model of DNA. Nucleosome model.

DNA replication: Meselson - Stahl experiment of semiconservative replication of DNA; RNA Primers, Okazaki-fragments, polymerases; DNA-Protein interactions.

Preliminary account of DNA damage and repair.

Unit-2

Central dogma of life. Transcription in eukaryotes: role of promoter, gene pre mRNA synthesis, pre-mRNA processing: capping, splicing and polyadenylation.

Translation - genetic code (codon), Initiation, elongation and termination.

Regulation of gene expression in prokaryotes and eukaryotes: Negative and positive control; attenuation and anti-termination. Reverse transcriptase and its application.

Unit-3

Biotechnology: Functional definition. Basic aspects of Plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency; Callusing, Differentiation and morphogenesis. Micropropagation; Tissue culture and its applications. Basic concept of Protoplast culture. Anther culture, Embryo culture and their applications.

Unit-4

Recombinant DNA technology - Tools and techniques used in rDNA technology - Restriction enzymes, Vectors for gene transfer. Bacteriophage, plasmids, cosmids and Artificial chromosome, cDNA technology, gene amplification, Polymerase chain reaction. Application of PCR technique, DNA fingerprinting and its uses. Application of Biotechnology and Transgenic plants.

1. *Formulation and use of vectors and uses of various instruments in molecular biology.*

2. *Formulation and use of vectors and uses of various instruments in molecular biology.*

3. *Formulation and use of vectors and uses of various instruments in molecular biology.*

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2. Media preparation
3. Sterilization technique
4. Tissue culture-shoot tip, nodal segments
5. Isolation from plant parts
6. Gel electrophoresis technique

**Suggested Books**

1. Gupta, P.K. (2012) *Cell and Molecular Biology* Rastogi Publications, Meerut
2. Gamborg OI and Philips GL (1995) *Plant Cell, Tissue and Organ Culture*
3. Dnyansagar, VR. (1986). *Cytology and Genetics*, Tata McGraw-Hill Pub. Co. Ltd. New Delhi
4. Verma, PS. and Agarwal, VK. (2012). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand and Co. Ltd. New Delhi.
5. Alberts, B., Bray, DJ, Raff, M., Roberts, K. and Wasson, LD. (2001). *Molecular Biology of Cell*, Garland Publishing Co., Inc., New York
6. Micklos, DA, Freyer, GA and Cooley, DA (2003). *DNA Science a first course* (Second Ed.), Cold Spring Harbor Laboratory Press, NY., USA.
7. Razdan, MK. (1993) *An Introduction to Plant Tissue Culture*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
8. Mascarenhas, AF. (1988). *Handbook of Plant tissue culture*. Publication & Information Div., ICAR, New Delhi.
9. Purohit, SS. and Mathur, SK (1996) *Biotechnology fundamentals and applications*. Agro Botanical Publishers, Bikaner
10. Rana, SVS (2012) *Biotechniques theory & practice* (Third Ed.) Rastogi Publications, Meerut



Paper-II  
**PLANT PHYSIOLOGY AND BIOCHEMISTRY**  
 (2 hrs/week)

Unit-1

Water: Structure, physical & chemical properties, importance to plant life, concept of water potential, Absorption and transport of water; Ascent of sap, Transpiration, Guttation, stomatal movement, factors affecting transpiration, Guttation.  
 Mineral Nutrition: Essential micro and macro nutrients; their uptake, hydroponics-and nutrient requirement, deficiency and toxicity symptoms.  
 Transport of organic substances: Mechanisms of phloem transport, factors regulating the translocation of nutrients

Unit-2

Photosynthesis: Pigments, Photosynthetic apparatus, light reaction, photo system I & II, Z scheme, photophosphorylation, C<sub>3</sub> (Calvin cycle), C<sub>2</sub> cycle, and factors affecting the photosynthesis.  
 Respiration: Aerobic and anaerobic respiration; RQ (Respiratory Quotient), Krebs cycle, electron transport system, oxidative phosphorylation, and factors affecting the process. Fermentation

Unit-3

Carbohydrates: Introduction, importance, nomenclature, classification, molecular structure & function of mono, di and poly saccharides, their properties, glycosidic linkages and glycoprotein.  
 Amino acids: structure, electrochemical properties, peptide bonds, chemical bonds and nomenclature, structure and classification of proteins, physical and chemical properties  
 Enzymes: Structure, nomenclature & classification of enzyme, Characteristics of enzymes, mechanism of action, multi-enzyme system, regulation of enzyme activity.  
 Lipids: importance of fatty acids (saturated and unsaturated), Alpha and Beta oxidation.  
 Role of production and application of secondary metabolites

Unit-4

Phases of growth and development: Seed dormancy and germination, plant movement, Biogenic amine, plant regulatory factor  
 Photoperiodism: A very short day plant, mechanism of action, concept of florigen and photoperiod  
 Plant hormones: auxin, gibberellins, cytokinin, ethylene and ABA, discovery & physiological effects

Suggested Readings

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2. Parashar, A. N. and Bhatia, K. N.: Plant physiology. Trueman Book Company, 1985.
3. Sinha, A. K. Fundamentals of plant physiology. S. Chand & Company Ltd.
4. Sinha, S. K. and Verma, M. A textbook of plant physiology, biochemistry and biotechnology. S. Chand Ltd., 2000.
5. Verma, V. Textbook of plant physiology. ANE Books India, 2007.
6. Malik, V. P. and Srivastava, A. K. Textbook of plant physiology. Kalyani publication, 1982.

### Practical Exercises:

1. To determine the osmotic potential of vacuolar sap by plasmolytic method.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature of permeability of plasma membrane.
4. To separate chloroplast pigments by solvent method
5. To separate chloroplast pigments using paper chromatography.
6. To separate amino acids in a mixture by paper chromatography.
7. To prepare the standard curve of protein.
8. To demonstrate the tests for proteins in the unknown samples.
9. To demonstrate the enzyme activity - Catalase, peroxidase and amylase.
10. To demonstrate the tests for different types of carbohydrates and lipids.
11. Bioassay of growth hormone (auxin, cytokinin, gibberellin)
12. Demonstration of phenomenon of osmosis by use of potato osmometer
13. To demonstrate root pressure
14. To demonstrate rate of transpiration by use of potometers.
15. Photosynthesis by inverted funnel method, Moll's experiment
16. To demonstrate anaerobic and aerobic respiration
17. R.D. by Ganong's respirometer
18. Measurement of growth using auxanometer

Paper III  
Pteridophytes, Gymnosperms & Palaeobotany  
(2 hrs. week)

Unit-1

Evolutionary characters of Pteridophytes. Classification (G.M. Smith). Distribution and alternation of generations. Stear system in Pteridophytes. Eusporangiate and leptosporangiate development of Sporangia. Asexual gametophytes. Ecological importance of Pteridophytes.

Unit-2

Morphology, anatomy and reproduction of *Psilotum*, *Selaginella*, *Equisetum* and *Marsilea*.

Characteristics of Gymnosperms, distribution and classification (K.R. Sporne).

Unit-3

Morphology, anatomy, reproduction and life cycle of *Cycas*, *Pinus* and *Ephedra*. Economic importance of Gymnosperms.

Unit-4

Principles of fossilization, types of fossils, techniques of study of fossils, Geological time scale. Fossil land plant *Roynia*, Fossil Pteridophytes, reconstructed plants-Lepidodendron and *Coelamites*, Fossil Gymnosperms *Wollemia*.

Suggested Laboratory Exercises:

1. Study of external morphology, anatomy of vegetative and reproductive parts of *Psilotum*, *Selaginella*, *Equisetum* and *Marsilea*
2. Study of external morphology, anatomy of vegetative and reproductive parts of *Cycas*, *Pinus* and *Ephedra*
3. Study of fossils and slides of fossils
4. Preparation of charts of Geological time scale

Suggested Readings

Boyd, H.C. "Accopulous Cells and Development" 1987 "Microbiology of Plant and Fungi" (5th Edition) McGraw-Hill, New York

Chapman, P.M. "Pteridophytes and Gymnosperms" 1981 "Vascular Plants, With

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Unit-1

Sharma, G.P. Pteridophytes. 2000, Today and Tomorrow Publications.

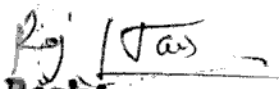
Sarabhai, R.C. and Saxena, R.C. 1990. A Text book of Botany. Rastogi Publications, Meerut.

Sporne, K.R. 2002. The Morphology of Gymnosperms. B.I. Pub. Pvt. Ltd., Mumbai, Kolkata, Delhi.

Vasishtha, J.C. 2002. Pteridophytes. S. Chand & Co. New Delhi.

Wilson, N.S. and Rothewall, G.W. 1993. Palaeobotany and Evolution of Plants. (2<sup>nd</sup> Ed.). Cambridge University Press, U.K.

Singh, V., Pandey, P.C. & Jain, D.K. 2013. A Text book of Botany (IV Ed). Rastogi Publications, Meerut.

  
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BOTANY PRACTICAL EXAMINATION B. Sc PART-II

SKELETON PAPER

M.M. 50

TIME: 4 Hours

S. No.	Practical	Regular	EX NC
1(a)	Comment on the Tissue culture or Biotechnology technique	5	5
1(b)	Exercise based on molecular biology	5	5
2	Perform the given physiological experiment and write the principle, procedure, results based on observations and precautions involved.	7	-
3	Perform the bio-chemical test of the given sample and discuss the observation giving reasons.	3	3
4	Make a suitable preparation of material "A" (Pteridophyte) (vegetative/reproductive part). Draw a labelled sketch. Identify giving reasons.	5	5
5	Make a suitable preparation of material "B" (Gymnosperm) (vegetative/reproductive part). Draw a labelled sketch. Identify giving reasons.	5	5
6	Comment upon spots (1-5)	10	15
7	Viva-Voce	5	5
8	Practical record	5	-
<b>TOTAL</b>		<b>50</b>	<b>50</b>

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