

**BOTANY**  
**BSc Part II (Pass Course Syllabus)**

Scheme		Max Marks: 150
Min. Pass Marks : 36		
Paper I	3 hrs. duration	Max. Marks 50
Paper II	3 hrs. duration	Max. Marks 50
Paper III	3 hrs. duration	Max. Marks 50
Practical Min.Marks: 18	4 hrs, duration	Max. Marks 50
		Max. Marks 50
Duration of examination of each theory paper-		3 hours
Duration of examination of practicals-		4 hours

**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. Q.No. 1 (objective / short answer type) will have 20 questions covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

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PAPER-I

Molecular Biology and Biotechnology  
(2 hrs or 3 periods/week)

Unit-1

Watson and Crick model of DNA, Chromatin structure and gene expression. Preliminary account of DNA synthesis and repair. DNA Replication, Types of RNA, Genetic code.

Unit-2

Central dogma, Reverse transcriptase and its application, Transcription in eukaryotes, RNA processing, capping, splicing and polyadenylation, Translation, initiation, elongation and termination. Negative and positive control, attenuation and antitermination, structure of promoter gene.

Unit-3

Biotechnology: Functional definition, Concept of cellular totipotency. Basic aspects of Plant tissue culture, basal medium, media preparation and aseptic culture technique. Differentiation and morphogenesis. Micropropagation and synthetic seeds. Protoplast culture and somatic hybridization. Anther culture and androgenic haploid. Embryo culture and application.

Unit-4

Recombinant DNA technology: techniques used in rDNA technology. Restriction enzymes. Vectors for gene transfer, Plasmids and cosmids, cDNA technology, gene amplification. Application of Biotechnology and Transgenic plants. Polymerase chain reaction, Application of PCR technique, DNA fingerprinting and its use.

Suggested Books:

1. Cell and Molecular Biology. PK Gupta.

2. Molecular Biology of the Gene. JD Watson et al.
3. Plant Cell tissue and organ culture. OL Gamborg and GC Phillips.

#### Practical Exercises:

1. Aseptic culture technique
2. Media preparation
3. Explant culture-shoot tip nodal segment
4. Callus culture
5. Protoplast isolation
6. Elementary knowledge of principles and uses of various instruments in molecular biology and biotechnology-Laminar air flow, Centrifuge, Autoclave, Incubator, Spectrophotometer, pH meter, Gel electrophoresis unit.
7. DNA isolation from plant parts.
8. PCR: DNA amplification.

#### Paper-II

### PLANT PHYSIOLOGY AND BIOCHEMISTRY

(2 hrs or Three periods/week)

#### Unit-1

Water: Structure, physico-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 translocations of nutrients.

#### Unit-2

Photosynthesis: Pigments, Photosynthetic apparatus, light reaction, photo system I & II, Z scheme, photophosphorylation, C<sub>3</sub> (Calvin

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cycle), C<sub>4</sub> cycle, and factors affecting the photosynthesis.

Respiration: - Aerobic and anaerobic respiration; RQ (Respiratory Quotient), Krebs's 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 polysaccharides, their properties, glycosidic linkages and glycoprotein.

Proteins: 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.

Brief introduction and application of secondary metabolites.

### Unit-4

Phases of growth and development: Seed dormancy and germination, plant movement, Biological clock-their regulatory factors.

Photoperiodism & vernalisation; physiology and mechanism of action, concept of florigen and phytochrome.

Plant hormones: auxins, gibberellins, cytokinins, ethylene and ABA; discovery & physiological effects.

#### Experimental 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.

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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.Q. by Ganong's respirometer
18. Measurement of growth using auxanometer.

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### Paper III

### Pteridophytes, Gymnosperms & Palaeobotany

(2 hrs./week)

(Teaching hours-15 hours for each unit)

#### Unit-1

General characters of pteridophytes, classification by Smith & Sporne. Important characteristics of Psilopsida, Lycopiida, Sphenopsida and Pteropsida. Stear system in Pteridophytes. Eusporangiate and Leptosporangiate development of sporangia. Alternation of Generations. Distribution, structure and life history of *Lycopodium*, *Equisetum*.

#### Unit-2

Distribution, structure and life history of *Selaginella*, *Marselia*. Heterospory

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and seed habit.

Characteristics of seed plants. Differences between Gymnosperms and Angiosperms, General characters classification of (Andrew's, Sporne & Bierhorst) and Economic importance of Gymnosperms

### Unit-3

Systematic position, distribution, Morphology of Vegetative and reproductive parts, anatomy, reproduction and life cycle of following genera,—*Cycas*, *Pinus* and *Ephedra*.

### Unit-4

Fossilization types of fossils, techniques of study of fossils. Geological time scale.

Applied aspects of palaeobotany-use in coal and petroleum exploration.

Primitive land plants : *Rhynia*.

Fossil Pteridophytes, *Lepidodendron*, *Calamites*.

Fossil Gymnosperms – *Williamsonia*.

### Suggested Laboratory Exercises:

1. Study of external morphology, anatomy of vegetative and reproductive parts of *Lycopodium*, *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 and various Fossil members by students.

5. Field visits / Lab visits

### Suggested Readings

Bold, H.C., Alexopolous, C.J. and Delevoryas, T.: Morphology of Plant and Fungi (4th ed.), Harper and Foul Co., New York, 1980.

Gifford, E.M. and Foster A.S. : Morphology and Evolution of Vascular Plants W.H. Freeman and Company, New York, 1988. Raven, P.H.

Evert, R.F. and Eichhom, S.C. : Biology of Plants, (5th Ed.)

Freeman and Co. Worth Publication, Nev York. U.S.A. 1999. Sharma

O.P. : Pteridophytes, Today and Tomorrow Publication. 2000.

  
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Sarabhai R.C. and Saxena. R.C.: A text book of Botany, Rastogi Publication, Meerut, 1990.

Sporne. K.R. : The Morphology of Gymnosperms B.1. Pub. Pvt., Mumbai, Kolkata, Delhi, 2002.

Vashista. P.C. : Pteridophytes, S. Chand & Co. New Delhi. 2002.

Wilson. N.S. and Rothman. G.W. : Palaeobotany and Evolution of Plants. (2nd ed.) Cambridge University Press, U.K.. 1993

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BOTANY PRACTICAL EXAMINATION B.Sc PART-III

SKELETON PAPER

M.M. 50

TIME: 4 Hours

S.No.	Practical	Regular	ExNC
1	Plant Taxonomy		
	(a) Describe vegetative and reproductive parts of flower in semi-technical language.	7	6
	(b) Give floral diagram and floral formula and identify the family giving reasons.	3	3
2	Comment on the embryological exercise	5	5
3(a)	Anatomical exercise on secondary growth	5	5
3(b)	Ecological exercise based on quadrat method	5	5
4	Histochemical test/ Comment on the economic part of the specimen	5	5
5	Comment upon spots (1-5 for Regular & 1-8 for ExNC) Viva-Voce	10	16
6	Viva- Voce	5	5
7	Practical records + Visits Lab/ Models/ Project Reports	5	-
	<b>TOTAL</b>	<b>50</b>	<b>50</b>

Note: For NC spots may be 1-8.

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