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UNIVERSITY OF DELHI

SCHEME OF EXAMINATION

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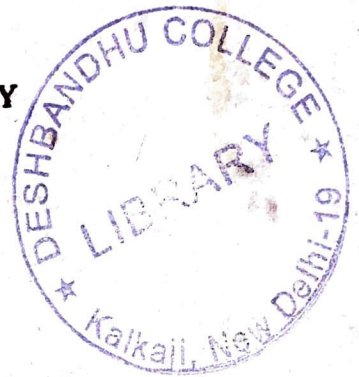
002

COURSES OF READING

FOR

B. Sc. (HONS.) EXAMINATION IN BOTANY

- Part I Examination 1989
- Part II Examination 1989
- Part III Examination 1990



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Syllabi applicable for students seeking admission to the
B. Sc. (Hons.) Botany Course in the academic year 1987-88

Price

Rs 1 - 0 0

B.Sc. (Hons) BOTANY
SCHEME OF EXAMINATION

Part I Examination : 1988

	<i>Duration</i>	
	<i>Hours</i>	<i>Marks</i>
Paper I—Cell Biology and Elementary Biochemistry.	3	75
Paper II—Thallophytes (Algae, Fungi, Pathology, Lichens)	3	75
Practical on Papers 1 and 2,	4	75

Part II Examination : 1989

Paper III—Bryophytes, Pteridophytes, Gymnosperms.	3	75
Paper IV—Genetics	3	75
Practical on Papers 3 and 4.	4	75

Part III Examination : 1990

Paper V—Angiosperm Anatomy, Embryology	3	75
Paper VI—Angiosperm Taxonomy, Economic Botany	3	75
Paper VII—Plant Physiology	3	75
Paper VIII—Ecology	3	75
Practical on Papers 5—8.	8	150
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Theory Papers 1-8	...	600
Practical on above.	...	300
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Total	...	900
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DETAILED COURSES OF READINGS

Part I—Examination **1988**

Paper I—Cell Biology and Elementary Biochemistry.

(1) The Cell—A Brief Introduction

Historical background; microscopy and cell theory; newer techniques of study—cell fractionation and electron microscopy; cell size and structures; structure of prokaryotic and eukaryotic cells; cell division—mitosis and meiosis.

(2) Cellular Chemistry

(i) Covalent bonds; non-covalent bonds and their importance in biology; ionic bonds; van der Waals forces and hydrophobic interactions; properties of water; (ii) the pH scale; buffers; (iii) the small molecules of life—sugars, amino acids, organic acids, and alcohols; (iv) macromolecules—polysaccharides; fats; proteins; and nucleic acids; general idea of the primary, secondary and tertiary structure; importance of conformational changes; (v) the making and breaking of chemical bonds—concept of free energy; ATP; coupled reactions and group transfers.

(3) Mitochondria

Structure, organization and function (elementary account of glycolysis and Krebs cycle and role of mitochondria in latter process).

(4) Chloroplasts

Structure, organization and function (basic information light and dark reactions)

(5) Nucleus, Ribosomes and Protein Synthesis

Chromosomes, nucleolus, nuclear membrane, and their significance. Role of ribosomes in protein synthesis.

(6) Cell Wall, Cell Membrane, and other Cell Constituents

Cell membrane—organization; movement of substances across the membranes; cell wall; endoplasmic reticulum; elementary idea

of the constituents like Golgi bodies; lysosomes, and microtubules.

(7) **Viruses**

Discovery, structure, types and multiplication.

(8) **Bacteria**

Discovery, structure, types, mode of reproduction and genetic recombination; economic importance.

(9) **Origin of Life**

PRACTICAL

Practicals based on the topics mentioned above.

Paper II—Thallophytes (Algae, Fungi, Pathology, Lichens)

Algae

Cynophyceae—general account.

Morphology and life history of the following with special reference to alternation of generations, sex, nature of sexuality and ecology.

Chlamydomonas, Volvox, Ulothrix, Coleochaete, Oedogonium, Spirogyra, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia.

Economic importance of algae—general account.

Fungi

2. Morphology and life history of the following with a general account of genetics, physiology, ecology, spore dormancy and germination, economic importance, and classification.

Myxomycetes. Phytophthora, Albugo, Pteronospora, Rhizopus, Saccharomyces, Erysiphe, Neurospora, Claviceps, Ascobolus, Ustilago, Puccinia, Agaricus, Alternaria, Penicillium, Colletotrichum and Fusarium.

Pathology

3. Late blight of potato, white rust of crucifers and other plants; powdery mildew of pea; smut of wheat, oat, and sugarcane; rusts of wheat, red rot of sugarcane; early blight of potato, wilt of arhar.

1. Transmission and control of diseases caused by bacteria and fungi.

Lichens

5. General account.

PRACTICAL

Practicals based on the types mentioned above, and phytoplankton estimation.

Part II—Examination, 1989

Paper III—Bryophytes, Pteridophytes, Gymnosperms

1. Bryophytes

Morphology, anatomy, life history, classification, phylogeny, and experimental studies with special reference to the following:

Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum, Funaria Pogonatum.

2. Pteridophytes

Structure and evolutionary significance of *Rhynia* and *Psilotum*. Morphology, anatomy, life-history, classification, phylogeny, steelar evolution, apogamy, apospory, seed habit, and experimental studies with special reference to the following :

Lycobodium, Salaginella, Equisetum, Pteria, Marsilea.

3. Gymnosperms

Distribution, morphology, anatomy, life-history of the following :

Cycas, Pinus, Ekedra, Gnetum.

4. Classification, and Phylogeny: economic importance and experimental studies on gymnosperms.

PRACTICAL

Practical based on the topics mentioned above.

Paper IV—Genetics

1. Mendelian Principles

Mendel's experiments and the laws of inheritance.

2. Deviations from Mendelian Laws

Incomplete dominance; gene interactions (epistasis; duplicate, complementary and supplementary factors).

3. The Chromosome Theory of Inheritance

Linkage and crossing over; gene mapping; genetic recombination in prokaryotes and eukaryotes.

4. Chemical Basis of Heredity

Transformation in bacteria; evidence for DNA (and RNA) as genetic material; Miescher's discovery; base equivalence; in DNA; the Watson and Crick model of DNA structure.

5. Replication and Transcription of DNA

Semi-conservative replication—experimental findings of Meselson-Stahl; Taylor; and Cairn replication at the molecular level.

6. Translation

Gene-protein relationship (Beadle and Tatum's experiments); colinearity of genes and proteins; deciphering the genetic code.

7. Structural Organization of the Genetic Material

Genome organization in viruses, bacteria, and the organelles of eukaryotes; chromosomes of eukaryotes; cell cycle.

8. Sex Determination

Chromosomal and genic basis.

9. Variations in the Number and Structure of Chromosomes

Haploids, euploids, aneuploids; deletion, duplication, inversion, translocation; chromosomal abnormalities in man.

10. Mutation and Repair of DNA

Type of mutations; spontaneous and induced mutations; physical and chemical mutagens; molecular basis of mutation; damage and repair of DNA.

11. Quantitative Inheritance and Hybrid Vigour

Polygenic inheritance in plants and animals; mechanism of quantitative inheritance; mechanism of hybrid vigour; hybrid vigour and crop improvement.

12. Cytoplasmic Inheritance and Material Influence

Organic inheritance; plasmids and episomes; maternal influence.

13. Gene Regulation

The operon concept—inducible and repressible systems.

14. Evolution

The genetic mechanisms; elementary idea of population genetics.

15. Applied Aspects of Genetics

Genetic counselling; genetics and cancer; artificial synthesis of genes and genetic engineering; general principles and techniques of plant breeding; uses of mutations; genetics in the improvement of wheat, sugarcane, and cotton.

PRACTICAL

Practicals based on the topics mentioned above.

Part III—Examination 1990

Paper V—Angiosperm Embryology and Anatomy

Embryology

1. *Brief History and scope*

2. *Anther and Pollen*

Development of anther and pollen; role of anther tepalum; pollen viability, storage and germination; haploids from Pollen grains.

3. *Ovule and Embryo Sac*

Development of ovule; brief outline of megasporogenesis and megagametogenesis; organization and ultrastructure of embryo sac; ovule culture.

4. *Pollen-Stigma Interaction and Fertilization*

Role of pollen-wall proteins and stigma—surface proteins; pollen tube growth in pistil; basic concepts of incompatibility and methods of overcoming incompatibility.

5. *Embryo and Endosperm*

Development, organization and differentiation; role of suspensor; embryo-endosperm relation; polyembryony; culture of embryo and endosperm.

Seed and fruit development.

6. *Apomixis*

Embryogenesis in tissue culture including pollen embryos.

7. *General*

Embryology in relation to other disciplines; embryological systems as experimental materials; applications of embryology in agri-horticulture.

Anatomy

A short history of plant anatomy; study of tissues, their structure, function and distribution; anatomy of root, stem, leaf; normal and anomalous secondary growth; ecological anatomy; vascular and cork cambium; recent trends in the study of plant anatomy.

PRACTICAL

Practicals based on the topics mentioned above.

Paper VI—Angiosperm Taxonomy and Economic Botany.

Angiosperm Taxonomy

1. *Taxonomy*

Aims and approaches; historical development.

2. *Nomenclature*

Principles of International Code of Botanical Nomenclature.

3. *Classification*

Principles; usage of categories—species, genus and family. Systems of classification proposed by Bentham and Hooker, Engler and Prantl, Hutchinson, and Takhtajan.

4. *Phylogeny*

Origin and evolution of angiosperms; phylogenetic concepts; evolutionary trends

5. *Modern trends in taxonomy.*

Economic Botany

6. CULTIVATED PLANTS—Origin and importance.
7. CEREALS—Wheat, rice, maize.
8. LEGUMES—Soyabean, groundnut, gram.
9. FRUITS—Mango, citrus, banana, papaya
10. SUGARS AND STARCHES—*Saccharam*, *Manihot*, potato.
11. SPICES—*Piper nigrum*, *Capsicum*, *Curcuma longa*, *Zingiber* clove, saffron fennel, coriander.
12. BEVERAGES—Tea, coffee, cocoa.
13. TIMBER PLANTS—General structure of hard and soft woods as illustrated by teak, semal, pine, and deodar. Uses of woods.
14. RUBBER—*Hevea*.
15. DRUGS—*Cinchona*, *Aconitum*, *Atropa belladonna*, *Digitalis*, *Rauwolfia*.
16. DRUGS OF ADDICTION—*Papayer*, *Cannabis*.
17. TOBACCO
18. INSECTICIDE—*Chrysanthemum cinerariifolium*.
19. ESSENTIAL OILS—General account.
20. OILS AND FATS—General account.
21. FIBRE PLANTS—General account with special reference to cotton and jute.

PRACTICAL

Study of the following taxa with special reference to local flora :

- (a) *Dicots*: Moraceae, Chenopodiaceae, Caryophyllaceae, Ranunculaceae, Cruciferae, Capparaceae, Leguminosae Euphorbiaceae, Tilliaceae, Myrtaceae, Umbelliferae, Apocynaceae, Asclepiadaceae, Labiatae, Solanaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Compositae.
- (b) *Monocots*: Potamogetonaceae, Gramineae, Commelinaceae, Liliaceae, Cannaceae.

Practicals on Economic Botany based on topics mentioned in the syllabus.

Paper VII—Plant Physiology

1. Physiology of the Plant Cells

Colloidal system, solutions, and membranes in relation to plant cell; permeability, osmosis, and imbibition; chemical potential, water potential, osmotic potential and matric potential; hydrogen ion concentration.

2. Plant-Water Relations

Mechanism of water absorption, conduction, and transpiration; stomatal opening and its relation to transpiration; significance of transpiration and water stress.

3. Mineral Nutrition

Methods of studying mineral nutrition; macro and microelements—their availability and uptake; mechanism of active absorption involving carriers; role of mineral elements in plant metabolism.

4. Enzymes

Major types of enzymes and co-enzymes; mechanism of action, and regulation.

5. Photosynthesis

History; pigments in prokaryotes and eukaryotes; role of light and dark reactions; the organization of the photosystems; carbon dioxide reduction cycle in C_3 and C_4 plants; significance of C_4 pathway and elementary idea of photorespiration.

6. Respiration

Significance and mechanism of aerobic and anaerobic respiration; electron transport and oxidative phosphorylation.

7. Transport of Organic Substances

Evidences and mechanism of phloem transport.

8. Fat Metabolism

Synthesis and degradation of fats; significance and mobilization of fat reserves for growth.

9. Nitrogen Metabolism

Proteins and nucleic acids; uptake and assimilation of nitrate. Nitrogen fixation, synthesis of amino acids and proteins. Role of nucleic acids.

10. Growth and Development

Physiology of vegetative and reproductive growth; role of temperature and light in plant development with special reference to phytochrome system and vernalization; senescence; growth regulators; seed germination and dormancy; phototropism, geotropism; nature, significance of biological clocks; principles and problems of differentiation and morphogenesis; Elementary knowledge of tissue culture.

PRACTICAL

Practicals based on the topics mentioned above.

Paper VIII—Ecology

1. Biosphere

An introduction.

2. Environmental Variables

Soil—chemical and physical properties; hydrologic cycle temperature, light, atmosphere; biotic environment; micro-climate adaptations.

3. Plant Communities

Structure, classification and succession; species and population dynamics; principles of plant geography.

4. Ecosystem

Concept, structure, productivity, trophic levels, food chains ecological pyramids bio-geochemical cycles.

5. **Vegetation of India** with special reference to that of Delhi.

6. **Applied Ecology**

Principles of resource management in agriculture; forestry and wild life; conservation, pollution, radiation ecology; plant introduction, and plant indicators.

PRACTICAL

Practicals based on topics mentioned above.