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UNIVERSITY OF DELHI

364

SCHEME OF EXAMINATION

AND

COURSES OF READING

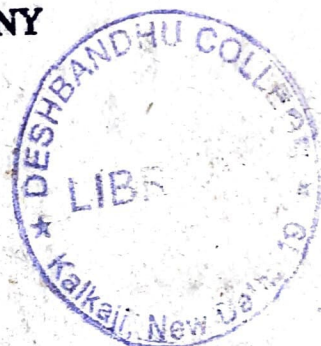
FOR

B.Sc. (HONS) EXAMINATION IN BOTANY

Part I Examination 1997

Part II Examination 1998

Part III Examination 1999



*Syllabi applicable for students seeking admission to the
B.Sc. (Hons) Botany Course in the academic year 1996-97*

Price : Rs. 5-00

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B.Sc. (Hons) BOTANY
SCHEME OF EXAMINATION

Part I Examination : 1997

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

Part II Examination : 1998

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

Part III Examination : 1999

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
Practicals on Papers 5—8	8	150
Theory Papers 1—8	...	600
Practicals on above	...	300
Total	...	900

DETAILED COURSES OF READING

Part I—Examination : 1997

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

PRACTICALS

Practicals based on the topics mentioned above.

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

Algae

1. Cyanophyceae—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, Peronospora, 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

4. Transmission and control of diseases caused by bacteria, viruses and fungi

Lichens

5. General account

PRACTICALS

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

Part II—Examination 1998

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 Pgonatum

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

Lycopodium, Selaginella, Equisetum, Pteris, Marsilea

3. **Gymnosperms**
Distribution, morphology, anatomy, life-history of the following :
Cycas, Pinus, Ephedra, Gnetum

Classification, and Phylogeny. Economic importance and experimental studies on gymnosperms

PRACTICALS

Practicals 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 Meiselson-Stahl. Taylor; and Cairns 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 Maternal 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

PRACTICALS

Practicals based on the topics mentioned above.

Part III—Examination : 1999

Paper V—Angiosperm Embryology and Anatomy

Embryology

1. *Brief History and scope*

2. *Anther and Pollen*

Development of anther and pollen; role of anther tapetum; 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

PRACTICALS

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—*Saccharum*, 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—*Papaver*, *Cannabis*
17. TOBACCO
18. INSECTICIDE—*Chrysanthemum cinerarifolium*
19. ESSENTIAL OILS—General account
20. OILS AND FATS—General account
21. FIBRE PLANTS—General account with special reference to cotton and jute

PRACTICALS

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

(a) Dicots : Moraceae, Chenopodiaceae, Caryophyllaceae, Ranunculaceae, Cruciferae, Capparaceae, Leguminosae Euphorbiaceae, Tiliaceae, 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 C₃ and C₄ plants; significance of C₄ 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

PRACTICALS

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

PRACTICALS

Practicals based on topics mentioned above.

