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# UNIVERSITY OF DELHI

09

**SCHEME OF EXAMINATION  
AND  
COURSES OF READING  
FOR**



**B.Sc. (HONS) EXAMINATION IN BOTANY**

**Part I Examination 1994**

**Part II Examination 1995**

**Part III Examination 1996**

*Syamsun*  
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*Syllabi applicable for students seeking admission to the  
B.Sc. (Hons) Botany Course in the academic year 1993-04*

Rs 2-00  
Price

**B.Sc. (Hons) BOTANY**  
**SCHEME OF EXAMINATION**

✓ **Part I Examination : 1994**

	<i>Duration Hours</i>	<i>Marks</i>
Paper I— Celi 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 : 1995**

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

**Part III Examination : 1996**

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
<b>Total</b>	...	<b>900</b>

## DETAILED COURSES OF READING

### Part I—Examination : 1994

#### *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, Cedogonium, 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 : 1995**

*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, 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 Meselson-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 : 1996***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 geodar, 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, 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

## 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-climatic 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.