

Botany

B.Sc. Botany-I

Total Mark: 100

Part-I

(Outlines of Tests)

Paper-A:	Diversity of Plants (Written)	:	35 Marks
Paper-B:	Plant Systematics Anatomy and Development (Written):		35 Marks
Paper-C:	Diversity of Plants (Practical-I)	:	15 Marks
Paper-D:	Plant Systematics Anatomy and Development (Practical-II)	:	15 Marks

(Syllabi and Courses of Reading)

Paper-A: Diversity of Plants

35 Marks

Definition, scope and classification of the kingdoms.

Basic concepts of evolution in plant diversity

1. Viruses:

(a) General structure, types and reproduction of viruses.

(b) Viral diseases and their economic importance

2. Kingdom Monera Prokaryotae (Bacteria and Cyanobacteria):

General structure, reproduction, classification and economic (such as cycle and industrial role)

3. Kingdom Protista/Protoetsta: (Algae):

(a) General structure, occurrence, reproduction and economic importance

(b) Classification of algae with specific examples

(i) Chlorophyta: Volvox

(ii) Charophyta: Chara

(iii) Vaucheriophyta: Vauchena

(iv) Bacillariophyta: Pinnularia

(v) Phacophyta: Laminaria

(vi) Rhodophyta.-Batrachospermum Polysiphonia

4. Kingdom Fungi:

(a) General structure, life cycle, classification with specific examples:

(i) Plasmodiophoromycota

Plasmodiophora

- (ii) Oomycota Pythium
 - (iii) Ascomycota Penicillium. Saccharomyces. Alternaria
 - (iv) Basidiomycota Ustilago, Puccinia and Agaricus
- (b) Role of fungi in agriculture, diseases of major economic crop Plants : rusts smuts, downy-and powdery mildews, damping off, root rots food and industry

Lichens:

General account, structure and life history of *Physcia*

5. Kingdom Plantae:

- (a) Bryophyta (Atracheophyta):

General account, reproduction, classification, affinities and ecological importance with special reference to the life cycle of *Anthoceros*, *Porella* and *Polytricum*.

- (b) Pteridophyta (Tracheophyta)

General account, structure, life cycle and biological importance with specific examples:

- (i) Psilopsida; *Psilotum*
- (ii) Lycopside: *Setaginella*
- (iii) Sphenopsida: *Equisetum*
- (iv) Pteropsida ; *Polypodium*, *Adiantum* and *Marsilea*

- (c) Gymnospermae (seed Plants)

General account with reference to structure and life history of *Cycas*, *Pinus* and *Ephedra* and their affinities.

- (d) Angiospermae
Introduction

Paper-B: Plant Systematics Anatomy and Development

35 Marks

Plant Systematic:

1. Introduction to Plant systematics its aims objectives and importance.
2. Classification : Importance, brief history, introduction, various systems of classification (Brief account of all the systems)
3. Brief introduction to nomenclature, importance of Latin names and binomial system with an introduction to international code of Botanical Nomenclature (ICBN).
4. Morphology and Phytography a detailed account of various morphological characters of root, stem, leaf, inflorescence, flower, placentation and fruit types.
5. Diagnostic characters, economic importance and distribution pattern of the following families;
 1. Ranunculaceae

2. Brassicaceae (Cruciferae)
3. Fabaceae (Leguminosae)
4. Rosaceae
5. Euphorbiaceae
6. Rataceae
7. Moraceae
8. Chenopodiaceae
9. Cucurbitaceae
10. Solanaceae
11. Lamiaceae (Labiatae)
12. Asteraceae (Compositae)
13. Liliaceae
14. Poceac (Gramineae)

Anatomy and Development:

1. Cell wall; structure and chemical composition.
2. Tissue and Tissu System: Concept; structure and function of various tissues.
3. Structure and development of root, stem and leaf including various type of meristem. Primary and secondary growth of dicot stem.
4. Early development of Plant body (embryology) *Capsella bursa-pastoris* or *Arubidopsis*.

Paper-C: Diversity of Plants (Practical-I)

15 Marks

General culturing, maintenance. Preservation and staining of micro-organisms. Study of the morphology and reproductive structures of the types mentioned in theory paper. Identification of various types mentioned from prepared slides and fresh collection. Collection of diseased specimens of plants and their identification.

Recommended Books:

1. Bold. H.C.. Morphology of Plants. 2nd cd. Harper & Row, N Y.
2. Hafiz, A. (1986). Plant Diseases. Pakistan Agricultural Research Council. Islamabad, Pakistan.
3. Lee, R.E. (1999). Phycology. Cambridge University Press. U.K.
4. Mauseth, J.D. ((1998). An Introduction to Plant Biology : Multimedia Enhanced. Jones and Bartlett Pub U.K.
5. Moore. R.C.. W.D. and Vodopich, D.S. (1998). Botany. McGraw Hill Company. U.S.A.
6. Pandey. S.N. (1994). Text Book of Botany Vol. II. S. Chand & Co. New Dehli.

7. Raven, P.H., Evert, R. E. and Eichorn, S. E. (1999). Biology of Plants. W. H. Freeman and Company Worth Publishers.
8. Ray. P. M. Steeves, T. A. and Fultz. T. A. (1998). Botany. Saunders College Publishing. U.S.A.
9. Ross, F.C. (1991). Introduction to Microbiology. John Wiley, U.S.A.

Paper-D: Plant Systematics Anatomy and Development (Practical-II) 15 Marks

1. Study of cross section of monocot and dicot stem.
2. Study of the simple and compound tissue in macerated and sectioned material.
3. Study of cross section of bifacial leaf.
4. To study the Prepared slides of secondary growth in dicot stem.
5. Identification of families given in syllabus with the help of keys.
6. Technical description of common flowering plants belonging to families mentioned in theory syllabus.
7. Field trips shall be undertaken to study and collect local plants, Students shall submit 40 fully identified herbarium specimens.

Recommended Books:

1. Bold. H.C. (1997), Morphology of Plants. Harper & Row, N.Y.
2. Dickison, W.C. (2000). Integrative Plant Anatomy. Academic Press. UK.
3. Palm, A. (1990) Plant Anatomy. Pergamon Press, U.K.
4. Mauseth. J.I). (1993). An Introduction to Plant Biology: Multimedia Enhanced Jones and Bartlett Pub, U.K.
5. Moore, R.C., W.D. Clarke and Vodopich, D.S. (1998), Botany McGraw Hill Company. U.S.A.
6. Raven, P.H., Evert. R.E. and Eichhorn, S.E. (1999). Biology of Plants. W.H. Freeman and Company Worth Publishers.
7. Ray, P.M. Steeves, T.A. and Fultz, T.A. (1998). Botany. Saunders College Publishing, USA.
8. Stuessy, T.F. (1990). Plant Taxonomy. Columbia University Press, USA.

B.Sc. Botany-II

Total Mark: 100

Part-II

(Outlines of Tests)

Paper-A:	Cell Biology, Genetics and Evolution (Written)	:	35 Marks
Paper-B:	Physiology and Ecology (Written)	:	35 Marks
Paper-C:	Cell Biology, Genetics and Evolution (Practical-I)	:	15 Marks
Paper-D:	Physiology and Ecology (Practical-II)	:	15 Marks

(Syllabi and Courses of Reading)

Paper-A: Cell Biology, Genetics and Evolution 35 Marks

Cell Biology:

2. Structures and Functions of Bio-Molecules
 - Carbohydrates
 - Lipids
 - Proteins
 - Nucleic Acids
3. Cell: The Physico-chemical nature of Plasma membrane and cytoplasm.
4. The ultra structure of plant cell with a brief description and functions of the following organelles
 - (a) Endoplasmic reticulum
 - (b) Plastids
 - (c) Mitochondria
 - (d) Ribosomes
 - (e) Dictyosomes
 - (f) Vacuole
 - (g) Microbodies (Glyoxysomes + Peroxisomes)
5. Nucleus: Nuclear membrane, nucleolus, ultrastructure and morphology of chromosomes, karyotype analysis
4. Reproduction in somatic and embryogenic. cell, mitosis & meiosis, cell cycle

- 2 Chromosomal aberrations.
 - (b) Change in the number of chromosomes. Aneuploidy and euploidy
 - (c) Changes in the structure of chromosomes, deficiency, duplication, inversion and translocation.

Genetics:

5. Introduction scope and brief history of genetics. Mendelian inheritance; Laws of segregation and independent assortment, back cross, test cross, dominance and incomplete dominance.
6. Sex linked inheritance, sex linkage in *Drosophila* and man (colour blindness. XO. X Y. WZ mechanism, sex limited and sex linked characters, sex determination.
7. Linkage and crossing over: Definition, linkage groups, construction of linkage maps, detection of linkage.
8. Molecular genetics ; DNA replication- Nature of gene, genetic code, transcription, translation, protein synthesis, regulation of gene expression (e.g. lac operon).
9. Transmission of genetic material in Bacteria: Conjugation and gene recombination in *E. coli* transduction and transformation.
10. Principles of genetic engineering biotechnology; Basic genetic engineering techniques.
11. Application of genetics in plant improvement: Induction of genetic variability (gene mutation, recombination), physical and chemical mutagens, selection, hybridization and plant breeding techniques, establishment of varieties release of new varieties.
12. Introduction of genetic conservation
13. Evolution

Paper-B: Physiology and Ecology

35 Marks

Physiology:

- (c) Types and properties of solutions. Electrolytes and non-electrolytes. SI units for expressing concentration of solutions, acids, bases and salts, pH. Definition of buffers and their role in biological systems. Colloidal systems, their nature, properties, and biological significance.
- (d) Water relations (water potential, osmotic potential, pressure potential, matric potential) Absorption and translocation of water. Transpiration, factors affecting transpiration. Stomatal structure and functions.
- (e) Mineral nutrition: Soil as a source of minerals. Passive and active transport of nutrients. Essential mineral elements, their role and deficiency symptoms with emphasis on N, K, P & Ca.
- (f) Enzymes: Definition, nature, classification and properties.
- (g) Photosynthesis: The process; absorption and action spectra. Mechanism: light reactions (electron transport and photophosphorylation) and dark reactions (Calvin cycle). Factors

affecting this process; concept of limiting factors. Products of photosynthesis.

6. Respiration: Definition and mechanism, Glycolysis. Krebs cycle. Electron transport system and oxidative phosphorylation. Anaerobic respiration. Respiratory substrates and respiratory quotients.
7. Nitrogen Metabolism: Biological nitrogen fixation.
8. Growth: Definition; role of auxins, gibberellins, cytokinins abscisic acid and ethylene in controlling growth, introduction to plant tissue culture.
9. Photoperiodism: Definition. historical background, short day, long day and day neutral plants. Role of phytochromes and hormones in photoperiodism.
10. Dormancy: Definition and causes of seed dormancy: methods of breaking seed dormancy.
11. Vernalization : Annual and biennial forms. Hormonal concept and phasic development theory.
12. Plant Movements: tropic movements - phototropism, gravitropism and their mechanisms. Nastic movements.

Ecology:

- (c) Concepts of Ecology
 - (d) Brief history of Ecology (General., Pakistan)
 - (e) Ecophysiology
 - (ii) Light and temperature responses
 - Quantity of light
 - Variation in light (temperature)
 - Ecophysiological responses
 - (iii) Edaphology
 - Brief introduction of soil forming process
 - Texture, structure, and water
 - Chemical Properties
 - Biological components: Soil Organisms. Organic matters
 - (iv) Water
 - Precipitation: kinds, and affectivity.
 - Distribution of vegetation in relation to moisture.
 - (v) Wind-Ecological importance of wind
- b Population Ecology
- A brief introduction, history and background. Seed dispersed. Seed bank, demography, reproductive strategy.

- (d) Community Ecology
- i Concept of plant community-attributes
 - ii Sampling methods
- Succession-history, concept, development and modern theories of succession Brief concept of productivity.
- Local vegetation
3. Ecosystem
- Definition and background
- Ecological energetic
- Biogeochemical cycle (Hydrologic and nitrogen cycle).
4. Applied Ecology:
- Aridity, biodiversity, conservation, water logging and salinity, pollution, erosion, desertification, management.

Paper-C: Cell Biology, Genetics and Evolution (Practical-I)

15 Marks

Cell Biology:

6. Study of cell structure using compound microscope and elucidation of ultra-structure from electron microphotographs
7. Measurement of cell size.
8. Study of mitosis and meiosis by smear squash method and from prepared slides.
9. Study of chromosome morphology and variation in chromosome number.
10. Extraction and estimation of carbohydrate, protein. RNA. DNA from plant sources.

Genetics :

15. Genetical problems related to transmission and distribution of genetic material.
16. Identification of DNA in plant material. Carmine, orcein staining.
17. Study of salivary gland chromosomes of *Drosophila*.

Recommended Books:

5. Hoelzel. A.R. 2001. Conservation Genetics. Kluwer Academic Publishers.
6. Dyonsager, V.R. (1986). Cytology and Genetics. Tata and McGraw Hill Publication Co. Ltd.. New Dehli,
7. Lodish. H. 2001. Molecular Cell Biology. W.H. Freeman and Co.
8. Sinha, U. and Sinha, S. (1988). Cytogenesis Plant Breeding and Evolution. Vini Educational Books, New Dehli.
9. Strickberger, M.V. (1988), Genetics, MacMillan Press Ltd, London.

7. Carroll, S.B., Grenier J.K. and Welnerbee, S.d. 2001. From DNA to Diversity- Molecular Genetics and the Evolution of Animal Design. Blackwell Science.
8. Lewin. R. 1997. Principles of Human Evolution. Blackwell Science.

Paper-D: Physiology and Ecology

(Practical-II)

15 Marks

Physiology:

10. Preparation of solutions of specific normality of acids/bases, salts, sugars, molal and molar solutions and their standardization.
11. Determination of uptake of water by swelling seeds when placed in sodium chloride of different concentrations.
12. Measurement of leaf water potential by the dye method.
13. Determination of the temperature at which beet root cells lose their permeability.
14. Determination of the effects of environmental factors on the rate of transpiration of a leafy shoot by means of a photometer/by cobalt chloride paper method.
15. Tests for sugars (Reducing and non-reducing). Glucose, maltose, fructose.
16. Chemical tests for the following cell constituents:
 - Starch
 - Cellulose
 - Lignin
 - Proteins
17. Extraction of chlorophyll from the leaves and separation of component pigments on a paper chromatogram. Study of absorption spectra using spectrophotometer.
18. Comparison of the effects of green, red and blue-coloured light on the amount of oxygen evolved by a photosynthesizing plant.
19. Estimation of oxygen utilized by a respiring plant by Winkler's method.
20. Extraction of amylase from germinating wheat seeds and study of its effect on starch breakdown.
21. Measurement of carbon dioxide evolution during respiration of germinating seeds by the titration method.
8. Measurement of growth by leaf area increase method.
9. Study of different stages of seed germination.

Recommended Books:

9. Ihsan Ullah; (1995). Plant Physiology, Biochemical Processes in Plants, UGC Press.
10. William & Devlin. 1986 Exercises in Plant Physiology, AWS Publishers, Boston.

3. Taiz, L and Zeiger, E. 1998. Plant Physiology. 2nd Ed. Sinauers Publ, Co .Inc.Calif.
4. Salisbury F.B. and Ross C. B. 1999. Plant Physiology. 5th Edition. Wadsworth Publishing Co. Belmont CA.
5. W.B. Hopkins. 1999, Introduction to Plant Physiology. 2nd Ed. John Wiley & Sons New York.

Ecology:

1. Measurement of light and temperature.
2. Effect of light and temperature on seed germination
3. Determination of soil texture by hydrometer method.
4. Determination of maximum water holding capacity.
5. Determination of carbonates, electrical conductivity and pH in Soil and Water.
6. Measurement of wind velocity.
7. Population demographic techniques.
8. Measurement of vegetation by Quadra: and plotless methods
9. Determination of productivity by harvest method
10. Several trips to ecologically diverse vegetations.

Recommended Books:

1. Ricklefs. R.E. 2000. Ecology. W.H. Freeman & Co. U.K.
2. Ricklefs. E.R. 2001. The Economy of Nature W.H. Freeman & Co. U.K.
3. Barbour, M. G., J.H. Burke and W.D. Pitts, 1999. Terrestrial Plant Ecology, The Benjamin. Gunning Publishing Co. Palo Alto California. U.S.A.
4. Chapman, J.L. and Reiss MJ. Ecology: principles and application. Cambridge University Press,
5. Hussain P. 1989. Field and Laboratory Manual of Plant Ecology National Academy of Higher Education, Islamabad.
6. Krebs. C.J. 1997. Ecology. Harper and Row Publishers.
7. Moore, P.D. and S. B. Chapman. 1986. Methods in Plant Ecology Blackwell Scientific Publication, Oxford.
8. Smith. R.L. 1996. Ecology and Field Biology. Addison Wesley Longman Inc., New York.
9. Smith. R.L. 1998 Ecology of Elements. Harper & Row Publisher) New York.
10. Stiling O.D. 1996. Ecology: Theories and applications. Prentice Hall, New Jersey.
11. Subrahmanyam. N.S. and Sambamurthy, A.V.S.S. 2000. Ecology Narosa Publishing Houses, New Delhi.

12. Townsend. C.R. Harper J.L. and Begon M.E. 2000. Essentials Ecology. Blackwell Scientific Publications, UK