6. Botany

B.Sc. Botany-II **Total Mark: 100**

Appendix 'A'

(Outlines of Tests)

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

Note:

(a) The 60% portion of question paper will be subjective type and 40% objective type, the question paper will be section wise and each question will be divided in parts.

(b) The choice in attempting the question will be minimized to some extent.

Appendix 'B'

(Syllabi and Courses of Reading)

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

Cell Biology:

1. Structures and Functions of Bio-Molecules
   Carbohydrates
   Lipids
   Proteins
   Nucleic Acids
2. Cell: The Physico-chemical nature of Plasma membrane and cytoplasm.
3. The ultra structure of plant cell with a brief description and functions of the following organelles
   i. Endoplasmic reticulum
   ii. Plastids
   iii. Mitochondria
   iv. Ribosomes
   v. Dictyosomes
   vi. Vacuole
   vii. Microbodies (Glyoxysomes + Peroxysomes)
4. Nucleus: Nuclear membrane, nucleolus, ultrastructure and morphology of chrosomes, karyotype analysis

1. Reproduction in somatic and embryogenic. cell, mitosis & meiosis, cell cycle

2. Chromosomal aberrations.
    i. Change tin the number of chromosomes. Apeuptoidy and euploidy
    ii. Changes in the structure of chromosomes, deficiency, duplication, inversion and translocation.

Genetics:

1. Introduction scope and brief history of genetics. Mendelian inheritance; Laws of segregation and independent assortment, back cross, test cross, dominance and incomplete dominance.
2. Sex linked inheritance, sex linkage in. Drosophila and man (colour blindness. XO. X Y. WZ mechanism, sex limited and sex linked characters, sex determination.
3. Linkage and crossing over: Definition, linkage groups, construction of linkage maps, detection of linkage.
4. Molecular genetics ; DNA replication- Nature of gene, genetic code, transcription, translation, protein synthesis, regulation of gene expression (e.g. lac operon).
5. Transmission of genetic material in Bacteria: Conjugation ami gene recombination in E. coli transduction and transformation.
6. Principles of genetic engineering biotechnology; Basic genetic engineering techniques.
7. 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.
8. Introduction of genetic conservation
9. Evolution

Paper-B: Physiology and Ecology 35 Marks

Physiology:

1. 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.
2. Wafer relations (water potential, osmotic potential, pressure potential, matric potential) Absorption and translocation of water. Transpiration, factors affecting transpiration. Stomatal structure and functions.
3. Mineral nutrition: Soil as a source of minerals. Passive and active transport of nutrients. Essential mineral elements, their role and deficiency sympotoms withemphasis onN.K.P & Ca.
4. Enzymes: Definition, nature, classification and properties.
5. 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, Glycolsis. 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, gravitrepism and their mechanisms. Nastie movements.

Ecology:

1. Concepts of Ecology
2. Brief history of Ecology (General., Pakistan)
3. Ecophysiology

(a) Light and temperatureresponses

i. Quantity of light
ii. Variation in light (temperature)
iii. Ecophysiological responses

(b) Edaphology

i. Brief introduction of soil forming process
ii. Texture, structure, and water
iii. Chemicl Properties
iv. Biological components: Soil Organisms. Organic matters

(c) Water

i. Precipitation: kinds, and affectivity.
ii. Distribution of vegetation in relation to moisture.

(d) Wind-Ecological importance of wind

4. Population Ecology

A brief introduction, history and background. Seed dispersed. Seed bank, demography, reproductive strategy.

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

Paper-C: Practical-I **15 Marks**

Cell Biology:

1. Study of cell structure using compound microscope ami elucidation of ultra-structure from electron microphotographs
2. Measurement of cell size.
3. Study of mitosis and meiosis by smear squash method and from prepared slides.
4. Study of chromosome morphologv and variation in chromosome number.
5. Extraction and estimation of carbohdrate, protein. RNA. DNA from plant sources.

Genetics :

1. Genetical problems related to transmission and distribution of genetic material.
2. Identification of DNA in plant material. Carmine, orcein staining.
3. Study of salivary gland chromosomes of Drosophila.

Recommended Books:

1. Hoelzel. A.R. 2001. Conservation Genetics.Kluwar Academic Publishers.
2. Dyonsager, V.R. (1986). Cytology and Genetics. Tata and McGraw Hill Publication Co. Lid.. New Dehli,
3. Lodish. H. 2001. Molecular Coil Biology. W.H. Freeman and Co.
4. Sinha, U. and Sinha, S. (1988). Cytogenesis Plant Breeding and Evolution. Vini Educational Books, New Dehli.
5. Strickberger, M.V. (1988), Genetics, MacMillan Press Ltd, London.

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

Paper-D: Practical-II 15 Marks

Physiology:

1. Preparation of solutions of specific normality of acids/bases, salts, sugars, molal and molar solutions and their standardization.
2. Determination of uptake of water by swelling seeds when placed in sodium chloride of different concentrations.
3. Measurement of leaf water potential by the dye method.
4. Determination of the temperature at which beet root cells lose their permeability.
5. 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.
6. Tests for sugars (Reducing and non-reducing). Glucose, maltose, fructose.
7. Chemical tests for the following cell constituents:
   i. Starch
   ii. Cellulose
   iii. Lignin
   iv. Proteins
8. Extraction of chlorophyll from the leaves and separation of component pigments no a paper chromatogram. Study of absorption spectra using spectrophotometer.
9. Comparison of the effects of green, red and blue-coloured light on the amount of oxygen evolved by a photosynthesizing plant.
10. Estimation of oxygen utilized by a respiring plant by Winkler's method.
11. Extraction of amylase from germinating wheat seeds and study of its effect on starch breakdown.
12. Measurement of carbon dioxide evolution during respiration of germinating seeds by the titration method.
14. Measurement of growth by leaf area increase method.
15. Study of different stages of seed germination.

Recommended Books:

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

3. Taiz, L and Zeiger, E. 1998. Plant Physiology. 2nd Ed. Sinauers Publ, Co .lnc.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 Wilcy& sans 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 Plan Ecology, The Benjamin. Gumming 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 Plan 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. 19S6. 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. Subrahmanyarm. 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