

BOTANY
BSc Part III (Pass Course Syllabus)

Scheme

Min. Pass Marks : 36

Paper I

Paper II

Paper III

Practical Min. Marks: 18

3 hrs. duration

3 hrs. duration

3 hrs. duration

4 hrs, duration

Max Marks: 100

Max. Marks 33

Max. Marks 33

Max. Marks 34

Max. Marks 50

3 hours

4 hours

Duration of examination of each theory paper-

Duration of examination of practicals-

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.
2. Q.No. 1 (objective / short answer type) will have 20 questions covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

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Paper I
PLANT MORPHOLOGY AND ANATOMY
(2 hrs or 3 periods per week)

Unit-1

The basic body plan of flowering plant-modular type of growth. Diversity of Plant form in annuals, biennials and perennials; branching pattern; monopodial and sympodial growth; canopy architecture; meristematic, simple, complex and secretory tissues, tissue systems.

Unit-2

The Shoot system: The shoot apical meristem and its histological organization; vascularisation of primary shoot in monocotyledons and dicotyledons; its functions; formation of secondary xylem; a general account of wood structure growth rings; sapwood and heartwood; secondary phloem-structure and function; periderm. Anomalous secondary growth.

Unit-3

The Leaf; origin, development, arrangement and diversity in size and shape; Stomata-Structure and types, stomatal index, vascularisation of leaf-nodal structure and venation. Senescence and abscission.

The root system: Root apical meristem; differentiation of primary and secondary tissues and their functions; structural modification for storage, respiration, reproduction and for microbial interaction.

Unit-4

Morphology and anatomy of seed (monocotyledons and dicotyledons). Significance of seed-suspended animation; dispersal strategies. Vegetative propagation.

Suggested readings :

Cutter, E.G. 1969. Part I Cells and Tissues. Edward Arnold, London.

Cutter, E.G. 1971. Plant Anatomy : Experiment and interpretation, part-II, organs. Educated Arnold; London.

Esau, K. 1977. Anatomy of Seed Plants, 2nd edition, John Wiley & Sons, New York.

Fahn, A. 1985. Plant Anatomy, Pergamon Press, Oxford.

Hartman, H.T. and Kostler, D.E. 1976. Plant Preparation : Principles and of India Pvt. Ltd., New Delhi.

Manseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Co. Inc. Menlo Park, California, USA.

Raven, P.M. Evert, R.F. and Eichlein, S.E. 1999. Biology of Plants, W.H. Freeman and Co. Worth Publishers, New York.

Thomas, P. 2000. Trees Their National History. Cambridge University Press, Cambridge.

Suggested Laboratory Exercises :

1. Study of any commonly occurring dicotyledonous plant to understand the body plan and modular type of growth.
2. Life forms exhibited by flowering plants (by visit to a forest or a garden).
3. L.S. of shoot tip to study the organization of meristem and origin of leaf primordium.
4. Monopodial and sympodial types of branching in monocots & dicots.
5. Anatomy of primary and secondary growth in monocots and dicots using hand out sections of sunflower, maize, cucurbita stem and roots.
6. Anamolous secondary growth in stem: Salvadora, Bignonia, Bougainvillia, Bouhaenia, Myctanthes, Leptadenia, Deacena.
7. Study of diversity in leaf shape and size. Internal structure of leaf-Dorsiventral and isobilateral leaves; study of stomatal types.
8. Examination of seed (monocot and dicot). Structure, seed viability test.
9. Specimen study of modifications of plant parts for Vegetative reproduction.

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Paper-II
Ecology & Economic Botany
(2 hrs or 3 period/week)

Unit-1

Plants and Environment: Atmosphere (four distinct zone viz, stratosphere, troposphere, mesosphere and thermosphere). Adaptation (Morphological, anatomical and physiological responses) of plants to water (Hydrophytes and Xerophytes). Light (global radiation, photosynthetically active radiation. Zonation in water body: littoral, limnetic and profoundal zones; photoperiodism, heliophytes and sciophytes) Temperature (Raunkier's classification of plants: megatherm, mesotherm, microtherm, heikistotherm; themoperiodicity and vernalisation). Soil (soil profile, development-weathering and maturation). Soil texture, soil types, role of pH, organic matter, soil water, soil nutrients. Interactions among organisms (neutralism, amensalism, allelopathy), competition, predation, parasitism, protocoooperation, mutualism. Environmental protution act.

Unit-2

Population, Community, Ecosystem and Phytogeography: Population ecotypes, ecades. Community characteristics: stratification, life forms and biological spectrum, frequency density and cover. Ecological succession: types (primary and secondary) mechanism nudation, migration, ecesis, reaction and climax: xerosere, hydrosere, Ecosystems: Structure-abiotic and biotic components, trophic level, food chain, food web, ecological pyramids, energy flow (Box and Pipe model of Odum). Biogeochemical cycles of carbon, and phosphorus: Vegetation types of Rajasthan Endengered plants of Rajasthan.

Unit-3

Basic concept of center of origin of cultivated plants. Food plants-rice, wheat, maize, potato, sugarcane. Vegetables : General account with a note on radish, onion, garlic, cabbage, spinach, cauliflower. cucumber,

tomato, lady finger and pea. Fruits: General account with a note on apple, banana, ber, mango, mulberry, jamun, watennelon, muskmelon, guava and orange. Vegetable oil : groundnut, mustard and coconut.

Unit-4

Spices : General account with an emphasis on those cultivated in Rajasthan (Cumin, Capsicum, Coriander). Beverages : Tea and coffee. Medicinal plants: General accounts with an emphasis on plant species cultivated in Rajasthan (Senna, Isabgol, Safed musli). Fibers: Cotton and jute. Wood: General account of sources of firewood, timber and bamboos; Rubber. Ethnobotany: a general account.

Practical Exercises:

1. Study frequency and density, abundance of plant species of campus vegetation by quadrat method.
2. Variation in soil moisture in relation to depth.
3. To estimate bulk density of grassland and woodland soil.
4. To estimate the porosity of grassland and woodland soil sample.
5. To determine moisture content of grassland and wood land soil.
6. To measure dissolved oxygen content in polluted and unpolluted water samples.
7. To measure temperature of different water bodies.
8. Water holding capacity of the soil.
9. Find out pH of soil sample by Universal Indicator method.
10. Find out pH of water sample by pH meter.
11. Find out transparency of a waterbody by Sechhidisk.
12. Study morphology (external and internal) of hydrophytes (*Hydrilla* stem, *Typha* leaf and *Nymphaea/Eichhornia* petiole) and xerophytes (*Calotropis*, *Capparis* and *Casuarina* stem, *Nerium* leaf) with special reference to their adaptations.

G. V. S.
M. S.

13. Study following specimen with special reference to:
1. Botany of the economically important part.
 2. Processing, if any involved.
 3. Specimen of cereals, pulses, spices beverage (tea & coffee) beans, sugar, oil seeds (mustard, groundnut).
14. Study of starch grain in potato and pea. Histochemical test
Cellulose, lignin, starch, fat, protein and tannin. *Product*
15. Submit 5 specimens of locally important medicinal plants / oil seed plants /
fibre plants / pulses

Paper-III

Angiosperm- Taxonomy and Embryology (2 hrs or 3 periods/week)

Unit-1

Introduction of Taxonomy, Units of classification, Concept of genus and species. Botanical Nomenclature, International Code of Botanical Nomenclature.

Taxonomic literature: Floras, Gardens, Herbaria, Monographs, Icones, Library.

Types of systems of Classification: Linnaeus, Bentham and Hooker's, Engler and Prantle's system.

Diversity of flowering plants illustrated by members and economic importance of the following families: Ranunculaceae, Brassicaceae, Papaveraceae, Malvaceae, Fabaceae, Caryophyllaceae and Apiaceae.

Unit-2

Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, *Sco*
Solanaceae, Acanthaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, *ect*
Liliaceae, Arecaceae and Poaceae.

Unit-3
Ontogeny of the flower parts-development and variations. Structure of anther, microsporogenesis, Tapetum types and functions, development of male gametophyte, structure of pollen grains.

Types of ovule, Megasporogenesis, development of female gametophyte(Embryosac). Pollination, Pollination types, Fertilization, double fertilization, significance of double fertilization.

Unit-4
Development of dicot and monocot embryo. Formation of embryo. Types of Embryo. Endosperm, Types of Endosperm, Endosperm haustoria, Polyembryony, Induced polyembryony, Parthenocarpy, Apomixis and adventive embryony.

Suggested Laboratory Exercises.

(A) Taxonomy:

(I) The following genera are suitable for study of families:

1. Ranunculaceae-*Ranunculus*, *Delphinium*.
2. Fabaceae-*Pisum sativum*, *Cassia* and *Acacia*.
3. Apiaceae:*Coriandrum*
4. Convolvulaceae-*Ipomea*, *Jacquemontia*.
5. Apocynaceae-*Catharanthus*, *Thevetia*
6. - Asclepiadaceae-*Calotropis*.
7. Lamiaceae-*Ocimum*, *Salvia*.
8. Euphorbiaceae-*Euphorbia pulcherrima*, *Ricinus*.
9. Acanthaceae-*Adhatoda*.
10. Asteraceae-*Helianthus*, *Tridax*
11. Rubiaceae-*Hamelia*

13. Herbarium preparation

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12. Poaceae-Triticum

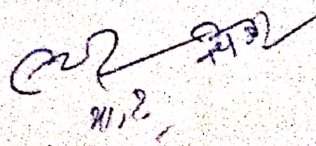
(II) Types of Inflorescence and Fruits:

(III) Embryology

1. T. S. of anther, to study the wall layers and pollen sac with pollen grains.
2. Study the various types of ovule, draw the diagrams.
3. Study the various types of placentations.
4. Study the germination of pollen grain *in situ* and observe the path of pollen tube.
5. Study of various stages of embryo (*Raphanus* fruit)

Suggested Readings:

1. Taxonomy of Angiosperms-V.N. Nair (1995) TMH Publishing Company Limited, New Delhi
2. Introduction to the Principles of Plant Taxonomy V.V. Sivarajan (1984) Oxford & IBH Publishing Co. Pvt.Ltd., New Delhi.
3. Plant Taxonomy-Sushella M.Das (2003) Dominant Publishers and Distributors, New Delhi.
4. Plant systematics. Gurcharan Singh (2001) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Trivedi, P.C. : N. Sharma and J.L. Sharma (2003) Structure, Development and Reproduction in Flowering Plants. Ramesh Book Depot, Jaipur.
6. Bhojwani, S.S. and Bhatnagar, S.P. (2000) The embryology of Angiosperms 4th Edition Vikas Publishing House, New Delhi.
7. An Introduction to the Embryology of Angiosperm. Maheshwari, P.(1950) New Delhi.
8. Recent Advances in the Embryology of Angiosperms. Ed. Maheshwari, P.(1963) New Delhi.


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