

7. BOTANY

3S- BOTANY

ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY

UNIT I: Angiosperm Systematics and Biodiversity.

- 1.1 Angiosperms: Origin and Evolution (**Pteridospermean and Bennettitalean Theory**)
- 1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.
- 1.3 Herbarium i Concept & significance, Royal Botanical Garden, Kolkata.
- 1.4 Concept of biodiversity, Ex situ and In situ conservation
- 1.5 Concept & importance of Biodiversity.

UNIT II: Angiosperm Systematics

- 2.1 Systems of Classification: Bentham and Hooker's System, Engler and Prantle's system.
- 2.2 Systematic studies & economic importance of following Families
Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,

UNIT III: Angiosperm Systematics

- 3.1 Systematic studies & economic importance of following Families
Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.
- 3.2 Dicotyledons (Monoclamydeae): Euphorbiaceae.
- 3.3 Monocotyledons: Liliaceae, Poaceae.

UNIT IV: Anatomy

- 4.1 Types of Tissues:
Meristematic i Types of meristems
Permanent i Simple and complex.
- 4.2 Characteristics of growth rings, Sapwood and heartwood.
- 4.3 Anatomy of root: Primary structure in dicot and monocot root, normal secondary growth in dicot root.

UNIT V: Anatomy

- 5.1 Anatomy of stem: Primary structure in monocot and dicot

stem, normal secondary growth in dicot stem.

- 5.2 Anomalies in primary structure in *Boerhavia* stem, secondary structure in *Bignonia* and *Dracaena* stem.
- 5.3 Leaf Anatomy: Internal structure in *Nerium* and *Maize* leaf.

UNIT VI : Embryology

- 5.1 Microsporangium, microsporogenesis, development of male gametophyte.
- 5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte (monosporic, Bisporic & tetrasporic).
- 5.3 Double fertilization and triple fusion.
- 5.4 Embryo i Classification of embryo.
- 5.5 Endosperm types & significance, Suspended animation

LABORATORY EXERCISES

- 1) Embryology of Angiosperms:
 - i) Observation of wide range of flowers available in the locality and methods of their pollination.
 - ii) Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of *Capsella*.
 - iii) Mounting of T.S. of anthers, Pollen grains and pollinia.
- 2) Anatomy of angiosperms : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus.
- 3) Taxonomy : Description of ten plants belonging to different families in technical language and identification upto family level.
- 4) Long and short excursion is essential

Note : Field tour reports should be supported by exhaustive field notes and photographic representation of plant species studied

Brassicaceae- *Brassica*, **Malvaceae-** *Hibiscus*, *Sida*, *Malvastrum*, **Fabaceae-** *Crotalaria*, *Indigifera*, *Tephrosia*, **Caesalpinoidae-** *Caesalpineae*, *Cassia*, **Mimosoidae-** *Prosopis*, *Acacia*, **Apiaceae-** *Corindrum*,

Apocynaceae- *Vinca*, *Thevetia*, **Asclepiadaceae-** *Cryptostegia*, *Calatropis*, **Solanaceae-** *Datura*, *Solanum*, *Withania*, **Euphorbiaceae-** *Croton*, *Jatropha*, *Euphorbia*, **Lamiaceae-** *Oscimum*, *Hyptis*, **Asteraceae-** *Tridax*, *Lagasca* **Verbanaceae** – *Lantana*, *Clerodendron*

PRACTICAL EXAMINATION

Time;- 5 Hours

Max. Marks- 50

- Q.1 Preparation of double stained permanent micropreparation of given angiospermic Material Identification with reasons
10 Marks
- Q.2 Description of given angiospermic plant in technical language, identification up to family, floral formula, floral diagram (two Plants)
20 Marks
- Q.3 Spotting (taxonomy-1, anatomy-2, Embryology-2) 10 Marks
- Q.4 Class record, Excursion report with plant photographic submission 06 Marks
- Q.5 Submission of micropreparation and viva voce 04 Marks

Books Recommended :

- 1) **A.C.Dutta** : Text Book of Botany.
- 2) **Andrews A.N.** : Studies in Paleobotany.
- 3) **Arnold C.A.** : Introduction of Paleobotany.
- 4) **Bhojwani & Bhatnagar** : Embryology of Angiosperms.
- 5) **Chandurkar** : Plant Anatomy
- 6) **Cutter E.G.**, 1971 : Plant Anatomy Experiment and Interpretation Part-II, Organs, Edward Arnold, London.
- 7) **Davis P.H.**, and Heywood V.H., 1993 : Principles of Angiosperm Taxonomy : Oliver and Boyd, London.
- 8) **Eames E.J.** : Morphology of vascular Plants. edition, prentice Hall of India Pvt.Ltd. New Delhi.
- 9) **Esau K.** : 1977, Anatomy of seed plant, 2nd Edition, John Wiley and Sons, New York.
- 10) **Gangulee & Kar** : College Botany Vol.II
- 11) **Gangulee Das and Dutta** : College Botany, Vol.I
- 12) **Gifford E.M. and Foster A.S.**, 1988 : Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.
- 13) **Hartmann H.T. and Kestler D.E.**, 1976 : Plant Propagation Principles and practices, 3rd
- 14) **Heyhood V.H. and Moore D.M.** (Eds) 1984 : Current concepts in plant Taxonomy. Academic Press, London.
- 15) **Jeffrey C.**, 1982 : An introduction to Plant Taxonomy, Cambridge University Press, Cambridge, London.

- 16) **Maheshwari P.** : Introduction of Embryology of Angiosperms.
- 17) **Pande B.P.** : A Text Book of Angiosperms.
- 18) **Radford A.E.**, 1986 : Fundamentals of Plant Systematics, Harper and Row, New York.
- 19) **Rendle A.B.** : Classification of flowering plants, Vol.I & Vol.II.
- 20) **S.Sundar Rajan** : College Botany, Vol.II & Vol.III.
- 21) **Shukla & Mishra** : Paleobotany.
- 22) **Singh and Jain** : Plant Anatomy.
- 23) **Singh and Jain** : Taxonomy of Angiosperms.
- 24) **Singh, 4.** 1999, Plant Systematics - Theory and Practices, Oxford and IBH Pvt. Ltd., New Delhi.
- 25) **Stace C.A.**, 1989. : Plant Taxonomy and Biosystematics (2nd Edition) Edward Arnold, London.
- 26) **Stewart W.N.**, 1983 : Paleobotany and Evolution of Plants, Cambridge University Press, **Cambridge. Cutter, E.G.** 1969 : Part-I, Cells and tissues, Edward, Arnold, London.
- 27) **Trivedi B.S. & Sharma B.B.** : Introductory Taxonomy.
- 28) **Tyagi & Kshetrapal** : Taxonomy of Angiosperms.
- 29) **Vasistha P.C.** : Plant Anatomy.
- 30) **Vasistha P.C.** : Taxonomy of Angiosperms.
- 31) **Walton** : An Introduction & Study of fossil.
- 32) Modern Practical Botany, Volume-I, Dr.B.P.Pande, S.Chand Publication, New Delhi.
- 33) Modern Practical Botany, Volume-II, Dr.B.P.Pande, S.Chand Publication, New Delhi.
- 34) Modern Practical Botany, Volume-III, Dr.B.P.Pande, S.Chand Publication, New Delhi.

4S- BOTANY

CELL BIOLOGY, GENETICS AND BIOCHEMISTRY

Unit – I: Cell Biology

- 1.1 Cell concept i Prokaryotic and Eukaryotic cell
- 1.2 Cell wall i Structure and Functions
- 1.3 Plasma membrane i Structure (models) and Functions
- 1.4 Nucleus i Ultra structure (nuclear membrane, nuclear pore complex and nucleolus) and functions
- 1.5 Chloroplast- Structure and Functions

Unit-II: Cell Biology Structure and functions of-

- 2.1 Endoplasmic Reticulum
- 2.2 Golgi complex
- 2.3 Vacuole
- 2.4 Ribosome
- 2.5 Peroxisome
- 2.6 Mitochondria
- 2.7 Cell cycle: Mitosis and Meiosis

Unit-III : Genetics

- 3.1 Chromosome- Morphology, Types, Centromere & Telomere
- 3.2 Chromosomal aberrations
 - 3.2.1 Structural aberrations: Deletion, Duplication, Inversion and Translocation
 - 3.2.2 Numerical aberrations: Euploidy and aneuploidy

Unit-IV: Genetics

- 4.1 Mendelism: Mendel's law of Dominance, Segregations and Independent assortment, Incomplete dominance
- 4.2 Interaction of genes- Complimentary, Supplementary and Epistasis
- 4.3 Problems based on Mendelism and Interaction of Genes

Unit- V Genetics

- 5.1 Linkage - Concept, Types and theories
- 5.2 Crossing over: Concept, Types and theories
- 5.3 Gene mutations- Spontaneous and Induced
- 5.4 Extra-nuclear Genome- Mitochondrial DNA and Chloroplast DNA

Unit- VI Biochemistry

- 6.1 Nomenclature of Enzymes
- 6.2 Characteristics of Enzymes
- 6.3 Concept of holoenzymes, coenzymes and cofactors
- 6.4 Theories for Mechanism of action of Enzymes
- 6.5 Structure and functions Carbohydrates: Monosaccharides (Glucose), Disaccharides (Galactose) and Polysaccharides (Starch)

PRACTICAL :**I Cell Biology (Any Two)**

1. Isolation of mitochondria from plants
2. Isolation of chloroplast
3. Squash preparation for the study of various stages of mitosis
4. Smear preparation for the study of various stages of meiosis.

II Genetics

1. To prove Mendel's Monohybrid ratio.
2. To prove Mendel's Dihybrid ratio.
3. Problems based on Interaction of genes

III Biochemistry

1. To study the enzyme activity of catalase.
2. To demonstrate test for glucose in grapes, & sucrose in cane sugar / beet root.
3. To demonstrate test for protein.
4. To demonstrate the lipid test in oily seeds.
5. To demonstrate the test for starch / cellulose.
6. To demonstrate the activity of enzyme amylase from germinating Wheat grains.

B. Sc. II : Semester – IV
Practical Schedule

Time : 4 hours**Marks : 50**

Q.1:	Squash/Smear preparation for study of Mitosis/Meiosis stages	10 Marks
Q.2:	Genetics : To perform given experiment	10 Marks
Q.3:	Genetics problem	05 Marks
Q.4:	Biochemistry : To perform given test (Any Two)	10 Marks
Q.5:	Spotting	05 Marks
Q.6:	Class record and viva-voce	10 Marks

Suggested Readings :

- 1) **Ahluwalia K.B** 2005 (First Edition). Genetics. New Age International Private Ltd. Publishers, New Delhi.
- 2) **Buchanan B.B, Gruissem W. and Jones R.L** (2000). Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists Maryland, USA.
- 3) **Dalela & Verma** : Cytology.

- 4) **Darnell J.** 2000. Molecular Cell Biology (Fourth Edition). W.H. Freeman and Company, New USA.
- 5) **De-Robertis** EDP: Cell Biology.
- 6) **Devi P.** 2008-Principle and Methods of plant Molecular Biology, Biochemistry and Genetics Agrobios, Jodhpur, India.
- 7) **Gardner and Simmons Snustad** 2005 (Eighth Edition). Principles of Genetics, John Wiley and Sons, Singapore.
- 8) **Gerald Karp** 1999 Cell and Molecular Biology- Concept and Expts. John Wiley and Scne Inc., USA.
- 9) **Gupta P.K** (1995) Genetics and Cytogenetics. Rastogi Publications, Meerut.
- 10) **Leninger A.C** (1987). Principles of Biochmistry, CBS Publishers and Distributers (Indian Reprint)
- 11) **Lodish Etal** 2004 (Fifth Edition). Molecular Cell Biology, W H Freeman and company, New York.
- 12) **Moore T.C.** 1989. Biochemistry and Physiology of Plant Hormones Springer i Verlag, New York, USA.
- 13) **P.S.Verma & Agrawal V.K.** : T.B. of Cytology.
- 14) **Pawar C.B** 2003 (First Edition). Genetics Vol. I and II. Himalaya Publishing House, Mumbai.
- 15) **Powar C.B** 2005 (Third Edition). Cell Biology, Himalaya Publishing, Mumbai.
- 16) **Roy S.C and KKDe** 2005 (Second Edition). Cell Biology, New central Book Agency Private Ltd., Kolkata.
- 17) **Sharma J.R** 1994 Principles and practices of Plant Breeding. Tata McGraw-Hill
- 18) **Shrivastav H.N.** - Cell Biology and Genetics - New Millenium Edition - Pradip®.
- 19) **Singh B.D** 2004. Genetics. Kalyani Publication, Ludhiana.
- 20) **Strickberger** 2005. (Third Edition). Genetics. Prentice Hall of India Pvt. Ltd., New Delhi.
- 21) **Veebala Rastogi** : Introduction to cytology.
- 22) **Verma P.S and Agarwal V.K** 2006 Cell Biology, Genetics, Molecular Biology, Evolution, Ecology. S.Chand and Company, New Delhi.
- 23) **Verma P.S. and Agarwal V.K.**(1991), Genetics. S Chand Comp. Ltd. Ramnagar, New Delhi.
- 24) **Verma S.K. and Mohit Verma** 2007. A.T.B of Plant Physiology,

- Biochemistry and Biotechnology, S.Chand Publications.
- 25) **Verma S.K. and Verma Mohit** (2007). A.T.B of Plant Physiology, Biochemistry and Biotechnology, S.Chand Publications.
- 26) Modern Practical Botany, Volume-I, Dr.B.P.Pande, S.Chand Publication, New Delhi.
- 27) Modern Practical Botany, Volume-II, Dr.B.P.Pande, S.Chand Publication, New Delhi.
- 28) Modern Practical Botany, Volume-III, Dr.B.P.Pande, S.Chand Publication, New Delhi.