UGCF- B. Sc. (Programme) Life Science, Botany DSC-for LS-III Semester **Paper: Plant Cell and Developmental Biology Theory and Practical Guidelines**

Theory

Unit 1. Introduction to Plant Cell: structure and function

Structure of plant cell, Structure and functions of cell organelles: cell wall (primary and secondary wall), nucleus, chloroplast, mitochondria, dictyosomes, endoplasmic reticulum

Unit 2. Polarity in plant growth

Growth through primary meristems, and secondary meristems (discuss briefly), Organisation of shoot apex (Tunica-Corpus theory, Waiting meristem theory) and root apex (Körper-Kappe theory)

Unit 3. Differentiation of tissues: vegetative organs

Structure and functions of tissues (simple and complex), Structure of stem, root, and leaf (dicot and monocot), Brief mentioning of anomalous secondary growth in stem of Salvadora/Bignonia and Dracaena, Epidermal system: classification of stomata (Metcalfe and Chalk), trichomes

Unit 4. Differentiation of tissues: reproductive organs

Flower development (ABCDE model), Anther and its wall layers (ontogeny not to be included), microsporogenesis and microgametogenesis, pollen wall (intine, exine), male germ unit; Ovule: General structure, megasporogenesis (monosporic, bisporic, tetrasporic) and megagametogenesis (only Polygonum type), ultrastructure and significance of female germ unit

Unit 5. Pollination and Fertilization

Pollination types (Self and Cross; agencies of pollination not to be included); Pollen-pistil interactions with brief overview of incompatibility, pollen tube pathway, pollen tube entry into ovule and embryo sac (porogamy, mesogamy and chalazogamy); double fertilization

Unit 6. Development of Embryo and Seed

Endosperm structure (Free nuclear, Cellular and Helobial type, one example of each) and functions; development of embryo from zygote in monocot and dicot; establishment of apical, basal and radial organisation; development of seed (general account only)

4 hours

3 hours

4 hours

6 hours

7 hours

6 hours

Practical:

- 1. To study cytoplasmic streaming in *Hydrilla*.
- 2. a. Study of cell organelles through electron micrographs nucleus, mitochondria, chloroplast, mitochondria, dictyosomes, endoplasmic reticulum
 b. Study of cell organelles (through permanent slides/photographs)– nucleus (Feulgen/acetocarmine staining); mitochondria (Janus green B staining); cell wall (PAS staining)
- **3.** Study of plant cells: types of stomata (through peel mounts), trichomes, sclerenchyma, xylem (through maceration).
- **4.** Study of shoot apical meristem and root apical meristem, parenchyma, collenchyma, phloem, laticifers through permanent slides/micrographs.
- 5. Study organs structure through temporary preparations
 - a. Transverse section of dicot stem- *Helianthus/Cicer*, stem with secondary growth *Helianthus/Cicer* etc., Transverse section of monocot stem *Zea mays*
 - b. Transverse section of dicot root: primary and with secondary growth- *Cicer/Vigna* etc., monocot root *Zea mays*
 - c. Vertical section of dicot and monocot leaf
- **6.** Study anomalous secondary growth through permanent slides/photomicrographs: *Salvadora/Bignonia, Dracaena*
- **7.** Study reproductive structures through photographs/ micrographs/permanent slides/specimens:
 - a. Transverse section of anther with wall layers, secretory and amoeboid tapetum
 - b. Microsporogenesis through micrographs of transverse section anther
 - c. Pollen exine patterns (any four types)
 - d. Types of ovule, associated structure (obturator, aril, caruncle)
 - e. Mature Polygonum type of embryo sac and ultrastructure of egg apparatus
- 8. Study of pollen viability (TTC/FDA).
- **9.** Calculation of percent pollen germination in any one medium through sitting drop culture/ /Hanging drop culture.
- **10.** Dissection of embryo/endosperm from developing seeds.

UGCF-Practical Exam Guidelines B. Sc. (Programme) Life Science, Semester 3 Paper: Plant Cell and Developmental Biology (Botany-DSC III)

Time duration: 5 Hours

1. Study the anatomical characteristics of the given plant material 'A' (Dicot: stem/rootprimary secondary; Monocot: Stem/root) with the help of temporary stained preparation (students to be given material alternatively). 7 Marks

Preparation	2	
Well Labelled diagram (A part cellular)	2	
Comments	2	
Identification with reasons	1	
2. Identify any two cells in the given mac	erated material 'B' .	3 Marks
Preparation	2	
Labelled Diagram	1	

3. Calculate the percentage of germinated pollen grains in the given medium 'C' through hanging drop/ sitting drop culture. **5** Marks

Preparation	1
Observation	2
Result and Discussion	2

4. Dissection of young embr	vo/endosperm from th	ne given material 'D '	2. 4 Marks
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Preparation	3
Labelled Diagram	1

5. Comment on the spots (E-K).

(3 marks: Identification-0.5 mark; Diagram- 0.5 mark; Comments-2 marks; 5 minutes to be given for each spot. 5 minutes extra may be given at the end)

- a. Cytoplasmic Streaming
- micrograph of Nucleus/ b. Transmission electron any cell organelle: Mitochondria/Endoplasmic reticulum/Chloroplast/ Dictyosomes
- c. Photomicrograph of Feulgen staining/PAS staining/Janus green staining
- d. SAM/ RAM
- e. Anomalous secondary growth in Salvadora/Bignonia/Dracaena
- f. Transverse section of anther showing pollen grains at any stage of development/secretory tapetum/amoeboid tapetum/Exine pattern
- g. Type of ovule/ obturator/ aril/caruncle/ultrastructure of egg apparatus

Maximum Marks: 80

3X7=21 Marks

6. Viva-Voce (based on practical syllabus)

7. Continuous assessment

Laboratory Record : 10 Marks Test : 10 Marks

Committee:

Convenor:

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Members:

Dr Anjana Rustagi, Gargi College

Dr Pooja Jha Maity, Hansraj College

Dr Yash Mangla, Kirori Mal College

20 Marks 20 Marks