

PLANT MICROTECHNIQUE (BOT 213)

Part I: True or False Questions (25 Questions)

Directions: Read each statement carefully. Write True (T) if the statement is correct and False (F) if the statement is incorrect.

- Q1.** Plant microtechnique is the study of preparing, staining, and examining plant samples under the microscope. []
- Q2.** Dry preparation methods are mainly used for long-term preservation of plant samples in liquid fixatives. []
- Q3.** Fixation aims to preserve plant tissues in a condition as close to their living state as possible. []
- Q4.** A karyotype is the study of the number, size, and shape of chromosomes in a cell. []
- Q5.** The smear method is used to section thick woody plant stems. []
- Q6.** Acidic fixatives generally preserve cytoplasmic structures and mitochondria while dissolving nuclear chromatin. []
- Q7.** Colchicine is used in chromosome preparation to arrest cell division at the metaphase stage. []
- Q8.** In wet preparation, copper acetate is used to preserve the natural green color of plant specimens. []
- Q9.** The squash method is commonly used to study mitosis in onion root tips (*Allium cepa*). []
- Q10.** Coagulant fixatives do not cause protein precipitation in cells. []
- Q11.** Glycerin is often used in semi-temporary microscopic preparations to prevent sample drying. []
- Q12.** Maceration is a technique used to dissolve the middle lamella and separate plant cells from each other. []
- Q13.** Fixative volume should ideally be equal to the volume of the plant tissue sample. []
- Q14.** Acetolysis mixture for pollen analysis consists of acetic anhydride and concentrated sulfuric acid. []
- Q15.** Higher temperatures during fixation always improve tissue preservation without activating autolytic enzymes. []
- Q16.** Clearing agents like chloral hydrate are used to make leaf tissues transparent for vascular study. []
- Q17.** Temporary preparations can be preserved for several years without any damage. []
- Q18.** The pH of most fixative solutions should ideally be slightly acidic (pH < 7). []

- Q19.** Whole mount preparation is suitable for large, thick plant stems without prior sectioning. []
- Q20.** Schultze's maceration method uses concentrated nitric acid and potassium chlorate. []
- Q21.** Microtomy refers to the process of cutting very thin sections of embedded tissues using a microtome. []
- Q22.** Additive fixatives do not form chemical bonds with tissue components. []
- Q23.** Plant roots should be carefully washed with water before preservation to protect the outer cortical layers. []
- Q24.** Feulgen staining is specifically used to stain plant DNA and chromosomes. []
- Q25.** In temporary slides, petroleum jelly (vaseline) can be applied around the coverslip edges to retard evaporation. []

Part II: Multiple Choice Questions (25 Questions)

Directions: Select the single best option (A, B, C, or D) for each question.

- Q1.** Which of the following sciences relies directly on plant microtechnique to examine cell structures?
- A) Plant Anatomy and Cytology
 - B) Plant Ecology only
 - C) Astrophysics
 - D) Meteorology
- Q2.** What is the primary purpose of applying fixation to plant tissue?
- A) To dissolve all cell walls
 - B) To preserve cellular structures in a lifelike state and prevent decay
 - C) To evaporate all water instantly
 - D) To increase cell division
- Q3.** Which chemical solution is added during wet specimen preparation to retain the green color of leaves?
- A) Sodium chloride
 - B) Copper acetate in glacial acetic acid
 - C) Hydrochloric acid only
 - D) Pure acetone
- Q4.** The squash method is most suitable for studying which of the following biological processes?
- A) Mitotic cell division in root tips

- B) Secondary xylem growth in old stems
- C) Bark formation
- D) Transpiration rate in stomata

Q5. Which reagent is used in the colchicine method to study chromosomes?

- A) Colchicine
- B) Iodine solution
- C) Methylene blue
- D) Formalin

Q6. The Erdtman acetolysis method is specifically used for preparing which plant structure?

- A) Pollen grains
- B) Root caps
- C) Leaf trichomes
- D) Woody xylem fibers

Q7. Which preparation technique involves spreading a liquid suspension of cells into a single uniform layer on a slide?

- A) Smear method
- B) Microtomy
- C) Dry pressing
- D) Maceration

Q8. What is the primary function of maceration in microtechnique?

- A) To fix proteins
- B) To dissolve the middle lamella and separate individual cells
- C) To stain DNA
- D) To dehydrate the tissue

Q9. Which reagent is commonly used for clearing leaf tissues to examine vein architecture?

- A) Chloral hydrate
- B) Eosin
- C) Fast green
- D) Petroleum ether

Q10. What is the recommended ratio of fixative fluid volume relative to the volume of the tissue sample?

- A) 1 : 1
- B) 2 : 1
- C) 10 to 20 times the tissue volume
- D) Equal weight

Q11. Basic fixatives are best suited for preserving which cellular components?

- A) Chromatin and chromosomes
- B) Cytoplasm and mitochondria
- C) Starch grains only
- D) Lignified secondary cell walls

Q12. Which type of fixative causes structural proteins to fold and precipitate into a meshwork?

- A) Non-coagulant fixative
- B) Coagulant fixative
- C) Isotonic solution
- D) Buffer solution

Q13. Which stain is specifically paired with acid hydrolysis in the Feulgen reaction for DNA?

- A) Basic fuchsin (Schiff reagent)
- B) Safranin O
- C) Aniline blue
- D) Crystal violet

Q14. What medium is commonly used in semi-temporary preparations to prevent rapid drying?

- A) Pure water
- B) Glycerin
- C) Absolute alcohol
- D) Xylene

Q15. What is the proper sequence of steps in the standard paraffin embedding (sectioning) method?

- A) Fixation -> Dehydration -> Clearing -> Embedding -> Sectioning -> Staining -> Mounting
- B) Sectioning -> Fixation -> Mounting -> Dehydration
- C) Staining -> Fixation -> Dehydration -> Sectioning
- D) Embedding -> Fixation -> Staining -> Dehydration

Q16. Why should plant tissue samples generally not exceed 5 mm in thickness during fixation?

- A) To ensure rapid and complete penetration of the fixative chemical
- B) To make the tissue lighter in weight
- C) To allow direct viewing without a microscope
- D) To change the color of the tissue

Q17. Which method is best suited for preparing epidermal peels to observe stomata?

- A) Maceration
- B) Stripped epidermis / Whole Mount
- C) Paraffin sectioning
- D) Acetolysis

Q18. Schultze's maceration mixture is composed of which two chemicals?

- A) Concentrated nitric acid and potassium chlorate
- B) Ethanol and acetone
- C) Acetic acid and sodium hydroxide
- D) Glycerin and formalin

Q19. How should fresh root samples be collected and prepared before fixation?

- A) Scraped vigorously with a sharp scalpel
- B) Gently washed with water using a fine brush to remove soil
- C) Dried in an oven at 100°C
- D) Frozen immediately without washing

Q20. An additive fixative is defined as one that:

- A) Chemically binds to tissue components and becomes part of the tissue
- B) Evaporates immediately upon contact with tissue
- C) Removes water without reacting chemically
- D) Dissolves all cell wall materials

Q21. Which technique is recommended to isolate pure microalgae from a water sample?

- A) Streak plate or capillary pipette method
- B) Paraffin wax embedding
- C) Acid acetolysis
- D) Pressing with a Strand press

Q22. What is the effect of an hypotonic or hypertonic fixative solution on plant cells?

- A) It causes cellular swelling or shrinkage (plasmolysis)
- B) It instantly turns cells bright blue
- C) It increases cell division rate
- D) It converts cellulose to starch

Q23. Which stain is commonly used in acetocarmine squash preparations?

- A) Carmine in acetic acid
- B) Iodine in potassium iodide
- C) Methylene blue in water
- D) Sudan IV in ethanol

Q24. Herbarium specimens are an example of which type of preparation?

- A) Dry preparation
- B) Wet museum jar preparation
- C) Permanent paraffin section
- D) Semi-temporary mount

Q25. According to Sass (1958), recording microtechnique results involves which of the following?

- A) Scientific drawing or photomicrography
- B) Heating samples to high temperatures
- C) Measuring soil pH only
- D) Drying specimens in an oven