

Time: 2 Hours 30 minutes

Total Marks: 75

1. Attempt **all** questions.
2. **All** questions carry **equal** marks.
3. Draw **neat labelled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculators** is **allowed**.

Q.1 Select the correct alternative: (Any Fifteen)

- 1 Which plant was first used in the development of plant tissue culture by Gottlieb Haberlandt?
a) Tobacco b) Tomato c) Potato d) Wheat
- 2 Totipotency refers to the ability of a plant cell to:
a) Develop into a complete plant under proper conditions
b) Grow only in the presence of nutrients
c) Resist pathogens and diseases
d) Generate seeds and fruits without sexual reproduction
- 3 Somatic hybridization in plant tissue culture is primarily used to:
a) Produce genetically identical clones of a plant
b) Fuse protoplasts from two different species to create a hybrid
c) Increase the resistance of plants to pests
d) Regenerate plants from single cells
- 4 Which of the following is a major cause of somaclonal variation in plants?
a) Mutation during tissue culture
b) Cross-pollination between species
c) Exposure to sunlight
d) Use of high concentrations of plant growth regulators
- 5 Cryopreservation is an important technique for plant tissue culture because it:
a) Enables the storage of plant material at very low temperatures without damaging it
b) Speeds up the growth process of plants
c) Helps in the immediate propagation of plants
d) Increases the size of plant tissues
- 6 Which of the following is a defense mechanism that involves lignin in plants?
a) Lignin helps in the formation of callus to seal off infection sites
b) Lignin directly degrades the pathogen's DNA
c) Lignin activates the hypersensitive response (HR)
d) Lignin enhances the plant's immune recognition of pathogens
- 7 Which of the following is an example of a non-specific phytotoxin?
a) fusaric acid b) T-Toxin c) HC-toxin d) Viccorin

- 8 Which of the following is a strategy employed by fungal pathogens to infect plants?
- Secretion of toxins to degrade plant cell walls
 - Rapid reproduction through viral replication
 - Production of systemic signals to trigger immune responses
 - Formation of biofilms to prevent immune recognition
- 9 What is one of the primary effects of chilling stress on plant cells?
- Increase in membrane fluidity
 - Increase in photosynthetic efficiency
 - Disruption of cellular functions due to phase transition of membrane lipids
 - Stimulation of rapid cell division
- 10 Which of the following is responsible for detecting environmental stress signals and activating stress response pathways in plants?
- Chloroplasts
 - Receptor-like kinases (RLKs)
 - Cytoskeleton
 - Mitochondria
- 11 What is the reason for adding glutamine to cell culture media?
- To prevent contamination
 - As an energy source and nitrogen donor
 - To enhance antibiotic activity
 - To regulate pH
- 12 What is the standard osmolality maintained for human cell cultures?
- 310 mosmol/kg
 - 290 mosmol/kg
 - 250 mosmol/kg
 - 350 mosmol/kg
- 13 How do continuous cell lines differ from primary cultures?
- Require serum
 - Have an indefinite lifespan
 - Are diploid
 - Need CO₂ buffering
- 14 A sudden drop in media pH may indicate:
- Optimal growth
 - Microbial contamination
 - Serum depletion
 - High cell viability
- 15 Which method is commonly used for cryopreserving cells?
- Dry ice with HEPES
 - Liquid nitrogen with DMSO
 - FBS at -20°C
 - Antibiotics at 4°C
- 16 What type of animal model is used for testing new drugs before human trials?
- Experimental
 - Natural
 - Predictive
 - Surgical
- 17 Which of the following is considered a classic model organism in genetic research?
- Human
 - Fruit fly (*Drosophila melanogaster*)
 - Elephant
 - Dog
- 18 The African clawed frog, *Xenopus laevis*, is mainly used for research in:
- Protein structure
 - Early developmental processes
 - Immune responses in humans
 - Human neurological diseases

- 19 Which of the following is the main objective of the "Replace" principle in the 3Rs of animal research?
 a) To use fewer animals by improving experimental design
 b) To avoid using animals in experiments by using alternative methods
 c) To reduce the cost of animal experimentation
 d) To refine the care and housing of animals
- 20 Which ethical principle suggests that animals should not be subjected to unnecessary harm or suffering in research?
 a) Utilitarianism
 b) Speciesism
 c) The 3Rs (Replacement, Reduction, Refinement)
 d) Anthropocentrism
- Q2A) Elaborate on the stages involved in micropropagation, and explain the advantages of this technique in mass-scale plant production. 8
- Q2B) Schematically explain the protocol for callus culture, highlighting the key steps involved from explant selection to plant regeneration. 7
- OR**
- Q2C) What is the composition of Plant tissue culture medium? Discuss the role of nutrients, plant growth regulators, and carbon sources in enhancing growth and regeneration. 8
- Q2D) With reference to protoplast culture in plant tissue culture discuss the isolation methods of protoplast, purification and determination of its viability. 7
- Q3A) Give a general account of stress on plants by temperature. 8
- Q3B) Discuss fungal and viral infection stress on plant with one example each of fungi and viruses. 7
- OR**
- Q3C) Briefly describe the response of plant to water stress. 8
- Q3D) What is the role of antioxidants in protecting plants from photo oxidative damage? 7
- Q4A) Differentiate between Primary cultures and cell lines. 8
- Q4B) Describe composition of animal cell culture media. 7
- OR**
- Q4C) Elaborate how to subculture adherent mammalian cell lines. 8
- Q4D) Explain in detail Techniques for Detachment of Cells. 7
- Q5A) Explain types of animal model in scientific research. 8
- Q5B) What are the merits and demerits of using non-human primate? 7
- OR**
- Q5C) Discuss how the selection of an animal model influences the ethical considerations in scientific research. 8
- Q5D) What are the benefits and limitation of Arabidopsis as plant model? 7