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Barasat, Kolkata - 700125

Term End Examination 2025-2026

Programme – B.Sc.(BT)-Hons-2024

Course Name – Plant Biotechnology

Course Code - BBT40105

(Semester IV)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Interpret what is the term ORGANOGENESIS means in plant tissue culture
 - a) Formation of callus culture
 - b) Micropropagation from nodal sections
 - c) Formation of organ
 - d) None of these
- (ii) Cite the term given to the ability of single cells to divide and produce all the differentiated cell in the organism?
 - a) Unipotent
 - b) Pluripotent
 - c) Multipotent
 - d) Totipotency
- (iii) Select the primary role of hormones in plant development?
 - a) Maintaining turgor pressure
 - b) Communication between plant cells
 - c) Photosynthesis regulation
 - d) DNA replication
- (iv) Determine what is meant by cryopreservation in the context of plant tissue culture?
 - a) Preservation of plant cells at ultra-low temperatures
 - b) Preservation of plant cells in liquid nitrogen
 - c) Preservation of plant cells in a freezer
 - d) Preservation of plant cells in a greenhouse
- (v) Identify the phenomenon happening to the cells during callus culture
 - a) Differentiation
 - b) Dedifferentiation
 - c) Redifferentiation
 - d) Meristem culture
- (vi) Name that is NOT a stage of micropropagation
 - a) Acclimatization
 - b) Rooting
 - c) Pollination
 - d) Multiplication
- (vii) In plant tissue culture explain what is embryogenesis commonly referred to as
 - a) Somatic embryogenesis
 - b) Zygotic embryogenesis
 - c) Sporophytic embryogenesis
 - d) Gametophytic embryogenesis
- (viii) Identify the principle on which somatic hybridization is based on

- a) Recombinant DNA technology
 - b) Sexual reproduction
 - c) Fusion of cells from different sources
 - d) Gene silencing mechanisms
- (ix) Explain a cybrid
- a) Cytoplasms of two different plants.
 - b) Genomes and cytoplasms of two different plants.
 - c) Cytoplasms of two different plants and the genome of one plant.
 - d) Genomes of two different plants.
- (x) Explain the role of somaclonal variations in crop improvement
- a) They introduce novel traits into cultivated plants.
 - b) They increase susceptibility to diseases.
 - c) They decrease crop yield.
 - d) They disrupt natural ecosystems.
- (xi) Identify the end products of the thylakoid reactions in photosynthesis.
- a) ATP and NADPH
 - b) Glucose and Oxygen
 - c) CO₂ and H₂O
 - d) Light and Heat
- (xii) Explain the significance of the Red Drop Effect in photosynthesis.
- a) It indicates decreased efficiency in photosynthesis beyond 680 nm wavelength.
 - b) It shows the peak absorption of red light.
 - c) It measures the energy of photons.
 - d) It describes the quantum yield of light.
- (xiii) Choose from the following statements that is not true for ATP synthase
- a) ATP synthase is also called complex V
 - b) Made up of two distinct components F₁ and F₀
 - c) F₁ is the catalytic subunit while F₀ is the proton conducting unit
 - d) F₁ is the integral membrane protein while F₀ is the peripheral membrane protein
- (xiv) Determine the functional group present at the 3' end of a DNA strand after restriction cutting.
- a) Free hydroxyl (–OH) group
 - b) Free phosphate (–P) group
 - c) Free amine (–NH₂) group
 - d) Free sulfhydryl (–SH) group
- (xv) Choose the enzyme that adds a phosphate to a free 5' hydroxyl group on DNA ends.
- a) DNA polymerase I (E. coli)
 - b) Terminal deoxynucleotidyl transferase
 - c) T4 polynucleotide kinase
 - d) S1 nuclease

Group-B

(Short Answer Type Questions)

 $3 \times 5 = 15$

2. State the chemiosmotic principle used in chloroplast ATP formation. (3)
3. Distinguish cyclic electron flow from linear electron flow and state one reason cyclic flow is useful. (3)
4. Describe the citric acid cycle steps and explain the energy-rich products generated per acetyl-CoA. (3)
5. Apply vernalization and seed dormancy concepts to design a practical strategy to synchronize flowering and germination in a biennial crop. (3)
6. Distinguish SSR and SNP markers by allelic richness, cost structure, and mapping density. (3)

OR

Examine why RAPD is considered laboratory dependent and how SCAR markers reduce this limitation. (3)

Group-C

(Long Answer Type Questions)

 $5 \times 6 = 30$

7. Partition the main factors influencing somaclonal variant frequency into genotype, explant, culture duration, and hormone regime components. (5)

8. Evaluate the regulatory step in glycolysis and the significance of phosphofructokinase-1 (PFK-1). How does this enzyme control the glycolytic pathway and contribute to metabolic regulation? (5)
9. Apply the ABC model to predict organs if B genes are absent. What happens to petals and stamens? (5)
10. Define a molecular marker and list four desirable properties of a good marker. (5)
11. Apply the method descriptions to choose between electroporation and particle bombardment for transforming cereal crops. (5)
12. Examine the trade-offs among chemical, mechanical, and electrical fusion in terms of throughput, control, and cellular injury. (5)

OR

Infer why hybrid identification and selection strategies must be matched to the biological differences between parental protoplasts. (5)

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