



35518-44603



LIBRARY
Brainware University
Barasat, Kolkata -700125

BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Sc.(BT)-Hons-2024/B.Sc.(BT)-Hons-2025

Course Name – Emerging Trends in Biotechnology

Course Code - BBT20202

(Semester II)

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) State the principal structural proteins that constitute the nitrogenase complex.
 - a) Azoferredoxin (dinitrogenase reductase) and molybdoferredoxin (dinitrogenase)
 - b) Rubisco and ATP synthase
 - c) DNA polymerase and RNA polymerase
 - d) Nitrite reductase and nitrate reductase
- (ii) Recall the surface-sterilization agent used after 70% ethanol in the explant preparation workflow.
 - a) 0.1% (w/v) mercuric chloride (HgCl₂)
 - b) 10% bleach only
 - c) Phenol red
 - d) Proteinase K
- (iii) Explain why molecular markers are described as 'not affected by environmental factors' in breeding programmes.
 - a) Because markers read DNA-level polymorphisms, which are stable compared with phenotype under varying environments
 - b) Because marker signals depend solely on soil pH at the time of sampling
 - c) Because markers measure chlorophyll concentration directly
 - d) Because markers are created only after flowering occurs
- (iv) Identify the gene primarily responsible for nitrogen fixation in diazotrophic bacteria.
 - a) nifH
 - b) trpE
 - c) lacZ
 - d) luxA
- (v) Define micropropagation.
 - a) The traditional method of growing plants from seeds
 - b) A technique for growing plants using tissue culture methods
 - c) A process of natural plant reproduction
 - d) The cultivation of plants in open fields
- (vi) Select the role of a DNA probe in Southern blotting.
 - a) To digest DNA into smaller fragments
 - b) To separate DNA fragments based on size

- c) To hybridize with a complementary DNA sequence for detection d) To amplify DNA using PCR
- (vii) Identify the technique commonly used in metagenomics.
- a) Western blotting b) PCR amplification
c) Southern blotting d) Metagenomic sequencing
- (viii) Identify the type of biosensor that detects pollutants by using fluorescence changes.
- a) Optical biosensor b) Electrochemical biosensor
c) Microbial biosensor d) Thermal biosensor
- (ix) Name the medium component that is essential for maintaining hESCs in an undifferentiated state.
- a) Retinoic acid b) Leukemia inhibitory factor (LIF)
c) BMP4 d) Insulin
- (x) Explain how does siRNA recognize its target mRNA.
- a) By complementary base pairing b) By binding to ribosomes
c) By modifying DNA sequences d) By interacting with transcription factors
- (xi) Name the commonly used for extracting carotenoids.
- a) Ethanol b) Methanol
c) Hexane d) Water
- (xii) Choose the characteristic feature of restriction enzyme recognition sites.
- a) They are single-stranded RNA sequences b) They vary randomly in the genome
c) They contain palindromic DNA sequences d) They are only found in human DNA
- (xiii) Identify the plant growth regulator (PGR) that plays a crucial role in root induction during in vitro conservation of medicinal plants.
- a) Cytokinin b) Auxin
c) Gibberellin d) Ethylene
- (xiv) Name the plant growth regulators commonly used to induce shoot multiplication in micropropagation.
- a) Ethylene b) Auxin
c) Cytokinin d) Absciscic acid
- (xv) Choose the factor that determines the number and size of DNA fragments produced in an RFLP analysis.
- a) The amount of DNA used in the reaction b) The sequence specificity of the restriction enzyme
c) The duration of electrophoresis d) The temperature at which digestion occurs

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Discuss how can Northern hybridization be used to study gene expression? (3)
3. Briefly discuss the role of the nitrogenase enzyme complex in diazotrophic bacteria. (3)
4. Differentiate MS basal medium from solid MS medium used for culture initiation. (3)
5. Compare homo-fermentative and hetero-fermentative lactic acid bacteria (LAB) using their products from glucose. (3)
6. Analyze why some individuals can carry ETEC without developing diarrhea symptoms. (3)

OR

Deconstruct the chaperone–usher (CU) pathway for ETEC colonization factor assembly into key steps. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. What are the challenges and future prospects of microbial pigment production? (5)

8. Compare dominant and co-dominant molecular markers using segregation patterns in an F2 population. (5)
9. Differentiate between RFLP and RAPD in identification of molecular markers. (5)
10. Describe the principle, mechanism, and applications of antisense RNA technology. (5)
11. Describe the potential mechanisms by which lactic acid bacteria can combat pathogenic infections in the human gut. (5)
12. Schematically describe the method of metagenomic sequencing technique for identification of novel bacteria. (5)

OR

Analyse the various applications of RNA interference in medical research and therapeutics? (5)

LIBRARY
Brainware University
Barasat, Kolkata -700125