



BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – M.Sc.(BT)-2022

Course Name – Environmental Biotechnology

Course Code - MBTE304

(Semester III)

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) Which of the following is a biological treatment process used in wastewater treatment?
 - a) a) Chemical precipitation
 - b) b) Reverse osmosis
 - c) c) Activated sludge process
 - d) d) Sedimentation
- (ii) The controlled burning of waste materials in the absence of oxygen is known as:
 - a) Pyrolysis
 - b) Incineration
 - c) Composting
 - d) Landfilling
- (iii) Which of the following is a genetically modified crop designed for environmental benefits, such as reduced pesticide use?
 - a) Bt cotton
 - b) Roundup Ready soybeans
 - c) Golden Rice
 - d) Non-GMO corn
- (iv) What is the primary role of mycorrhizal fungi in environmental biotechnology?
 - a) Breaking down pollutants in soil
 - b) Enhancing plant growth and nutrient uptake
 - c) Producing biofuels
 - d) Treating wastewater
- (v) What is the primary role of a biosensor in environmental monitoring?
 - a) To generate electricity from environmental pollutants
 - b) To remove contaminants from water
 - c) To detect and measure specific substances in the environment
 - d) To purify air in industrial settings
- (vi) Which microorganism is commonly used in bioremediation to degrade hydrocarbons in contaminated sites?
 - a) E. coli
 - b) Saccharomyces cerevisiae
 - c) Pseudomonas aeruginosa
 - d) Bacillus anthracis
- (vii) What is the primary objective of the Kyoto Protocol?
 - a) a) Control soil erosion
 - b) b) Reduce greenhouse gas emissions
 - c) c) Protect endangered species
 - d) d) Promote renewable energy

- (viii) Biodegradation of organic pollutants depends on:
- a) a. Microbial and physical/chemical environments
 - b) b. Wind direction
 - c) c. Temperature of the atmosphere
 - d) d. Geographical location
- (ix) What is phytoremediation?
- a) The use of bacteria to clean up pollutants
 - b) The use of plants to remove contaminants from the environment
 - c) The use of enzymes to degrade toxins
 - d) The use of fungi to break down pollutants
- (x) Which pollutant is associated with the formation of photochemical smog in urban areas?
- a) a. Sulfur dioxide (SO₂)
 - b) b. Nitrogen oxides (NO_x)
 - c) c. Carbon monoxide (CO)
 - d) d. Ozone (O₃)
- (xi) Which molecular method is commonly used for DNA-based pollution monitoring?
- a) A. Polymerase chain reaction (PCR)
 - b) B. Gas chromatography
 - c) C. Mass spectrometry
 - d) D. X-ray crystallography
- (xii) The primary source of atmospheric sulfur dioxide (SO₂) is mainly from:
- a) Volcanic eruptions
 - b) Industrial emissions
 - c) Forest fires
 - d) Bacterial activity
- (xiii) What is the primary function of biodegradable plastics?
- a) To persist in the environment for a long time
 - b) To resist microbial degradation
 - c) To decompose naturally into harmless substances
 - d) To release toxic chemicals when degraded
- (xiv) Which type of bioplastics are derived from renewable resources like corn starch or sugarcane?
- a) Polylactic acid (PLA)
 - b) Polyethylene (PE)
 - c) Polypropylene (PP)
 - d) Polystyrene (PS)
- (xv) What is the term for the process of converting organic waste into valuable products, such as biogas or biofertilizers?
- a) Fermentation
 - b) Anaerobic digestion
 - c) Bioconversion
 - d) Photosynthesis

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Discuss the potential risks associated with the use of genetically modified microorganisms (GMOs) for environmental applications and strategies to mitigate these risks. (3)
3. Assess the primary biodegradation of organic pollutants. (3)
4. How does the process of denitrification affect the nitrogen cycle in agricultural soils, and what are its implications for environmental sustainability? (3)
5. Define bioremediation and provide an example of its application. (3)
6. How do microplastics enter aquatic ecosystems, and what are the ecological consequences of their presence in marine food chains? (3)

OR

How can the application of nanosensors aid in real-time monitoring of environmental parameters such as pollution levels and water quality? (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Describe the principles of anaerobic digestion and its significance in converting organic waste into biogas. (5)

8. Discuss the role of enzymes in environmental biotechnology processes and provide examples of their applications. (5)
9. Describe the role of bioinformatics in analyzing metagenomic data from environmental samples. Provide examples of how metagenomics can aid in bioprospecting and understanding microbial diversity. (5)
10. Elaborate on the principles of bioaugmentation and its role in enhancing microbial degradation of recalcitrant pollutants. (5)
11. Evaluate the role of biofouling in membrane-based water treatment systems and strategies to mitigate its effects. (5)
12. Explain the concept of green chemistry and its integration into environmental biotechnology processes. Provide examples of green chemistry principles in action. (5)

OR

Describe the principles of wastewater reuse and its potential benefits for water conservation and sustainability. Discuss the challenges and treatment processes involved. (5)
