

B.Sc. BIOTECHNOLOGY
SIXTH SEMESTER (SPECIAL REPEAT)
ENVIRONMENTAL BIOTECHNOLOGY
BBT-603

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs.

Full Marks : 70

[PART-A: Objective]

Time : 20 min.

Marks : 20

Choose the correct answer from the following:

1 × 20 = 20

- To survive in a saline environment, which of the cellular property is enhanced by the Halophiles?
 - proton pumping process
 - internal osmolarity
 - cytosolic acidity
 - both b and c
- Among the following, the extremophile that qualifies to survive under multiple extreme environmental condition (polyextremophile)
 - Thermococcus barophilus*
 - Thermus thermophilus*
 - Both a and b
 - Dodgella priscus*
- The thermoalkaliphilic catalase, which initiates the breakdown of hydrogen peroxide into oxygen and water, was isolated from the extremophile
 - Thermus acidiphilus*
 - Thermococcus barophilus*
 - Thermus thermophilus*
 - Thermus brockianus*
- The linear polyesters produced in nature by bacterial fermentation of sugar or lipids are
 - polyhydroxyalkanoates
 - poly-3-hydroxybutyrates
 - polyhydroxyhexanoates
 - All of the above
- The biosensor that works based on the movement of electrons due to redox reaction is
 - calorimetric biosensor
 - potentiometric biosensor
 - conductimetric biosensors
 - amperometric biosensor
- The incombustible solids generated in fixed grate incinerator are called
 - Schmutzedecke
 - Clinkers
 - Leachate
 - Flocks
- The thermophilic bacterium, growing in acidic hot springs, used in extracting copper from chalcopyrite (CuFeS_2) is
 - Thiobacillus thiooxidans*
 - Sulfolobus acidocaldarius*
 - Thermothrix thioparus*
 - Bacillus licheniformis*
- Bioacids in MEOR operation is/are used for
 - Emulsification
 - Viscosity reduction
 - IFT reduction
 - All of the above
- In cyanidation for extraction of gold, precipitation of gold is done by adding
 - Cu
 - Hg
 - Zn
 - Fe

10. The correct sequence of events in bioleaching process is
 - a. acidolysis -redoxolysis-complexolysis
 - b. redoxolysis-acidolysis-complexolysis
 - c. cidolysis-complexolysis-redoxolysis
 - d. complexolysis-acidolysis-redoxolysis
11. For successful soil bioremediation, C, N and P should be present in the molar ratio of
 - a. 12:10:1
 - b. 100:12:1
 - c. 120:10:1
 - d. 120:1:10
12. Blastofiltration is an important process of phytofiltration in which the metals are absorbed or adsorbed by the use of
 - a. seedlings
 - b. excised plant shoots
 - c. floral buds
 - d. plant roots
13. Methylootrophs are active against a wide range of compounds like chlorinated aliphatics trichloroethylene and 1,2-dichloroethane due to their capacity to secrete the enzyme, having a broad substrate range.
 - a. Methane monooxygenase
 - b. Methanofuran
 - c. Methanopterin
 - d. Methane sulphurase
14. The *ex-situ* bioremediation strategy successfully used for bioremediation of Benzene, Toluene and Xylene is
 - a. Composting
 - b. Slurry Phase bioremediation
 - c. Land farming
 - d. Biopile
15. Which of the following technique allows the direct scrutiny of microbial populations within their three-dimensional ecological niche?
 - a. T-RFLP
 - b. SSCP
 - c. FISH
 - d. Flow Cytometry
16. The idea of cloning DNA directly from environmental samples was introduced in 1985 by
 - a. Schmidt *et al.*
 - b. Healy *et al.*
 - c. Pace *et al.*
 - d. Handelsman *et al.*
17. For Genome Enrichment in Metagenomic studies, DNA or RNA is labeled using
 - a. 5-Bromo-2-deoxyuridine
 - b. 2-Bromo-5-deoxyuridine
 - c. 5-Bromo-2-deoxyguanine
 - d. 2-Bromo-5-deoadenosine
18. The process of grouping reads or contigs into individual genomes and assigning the group to specific species, subspecies or genus, is known as
 - a. Anotation
 - b. Binning
 - c. Pyrosequencing
 - d. Gene Targeting
19. G+C contents are ranked among kingdoms as:
 - i) plants<animals<Archaea<bacteria<protists <fungi;
 - ii) Archaea<bacteria< protists <fungi<plants<animals;
 - iii) protists <plants<animals<Archaea<bacteria<fungi;
 - iv) animals<plants<protists <Archaea<bacteria<fungi;
 - a. Option i)
 - b. Option ii)
 - c. Option iii)
 - d. Option iv)
20. Which of the following is not a compositional based binning algorithm?
 - a. MEGAN
 - b. PCAHIER
 - c. S-GSOM
 - d. ESOM

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(PART-B : Descriptive)

Time : 2 hrs. 40 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

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| 1. What is a biosensor? Discuss the working principle of a typical biosensor. Mention the key features of a successful biosensor. | 2+4+4=10 |
| 2. Define bioremediation. Discuss the important types of <i>in-situ</i> bioremediation strategies for environmental cleaning. | 10 |
| 3. What do you understand by "Environmental Genomics"? Mention the different PCR based techniques used to study ecological condition. | 10 |
| 4. What do you understand by biopesticides? Discuss the essential features of biopesticides. Mention the important types of microbial pesticides used in agriculture sector. | 2+4+4=10 |
| 5. Discuss the major stages of biocomposting leading to the stabilization of organic waste. Mention the important factors affecting the process of biocomposting. | 5+5=10 |
| 6. Define bioleaching. Discuss the biochemical process of direct and indirect bioleaching. | 10 |
| 7. Discuss briefly how spilled oil can adversely affect the aquatic organisms. Add a note on bioremediation of petroleum hydrocarbons using microbes. | 5+5=10 |
| 8. What is an oil-spill? Mention the major causes of oil-spill. Discuss briefly the important strategies applied for reducing the intensity of oil spillage. | 1+4+5=10 |

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