REV-01
MEV/17/22

2022/07

M.Sc. ENVIRONMENTAL SCIENCE
SECOND SEMESTER
ENVIRONMENTAL BIOTECHNOLOGY
MEV-203

Duration : 3 hrs. **Full Marks: 70**

[PART-A: Objective]

Time : 20 min. **Marks : 20**

Choose the correct answer from the following: *1X20=20*

1. Capnophile is the type of extremophile can survive in the condition of
   a. High acidic environment
   b. High CO_2 concentration
   c. High temperature
   d. Low temperature

2. Stability of an isotope before atomic number 20 measured by,
   a. Neutron=Proton (1:1)
   b. Neutron>Proton (2:1)
   c. Neutron<Proton (1:2)
   d. None of the above

3. Which of the following is used as a biocontrol agent against caterpillar of butterflies?
   a. *Streptococcus sp.*
   b. *Bacillus thuringiensis*
   c. *Saccharomyces cerevisiae*
   d. *Trichoderma sp*

4. Which cleanup approach involves removing groundwater or soil from its natural setting to allow for bioremediation?
   a. *In situ* bioremediation
   b. *Ex situ* bioremediation
   c. Bioaugmentation
   d. Phytoremediation

5. The plants have "coralloid roots" and associated with the N_2 fixing organism
   a. *Pinus, Anabaena*
   b. *Pinus, Agrobacterium*
   c. *Cycas, Anabaena*
   d. *Cycas, Agrobacterium*

6. Third generation pesticides are
   a. Insect hormone analogues
   b. Pathogens
   c. Insect repellents
   d. None of the above

7. The main enzyme responsible for activation of xenobiotics is,
   a. Cytochrome P-450
   b. Glutathione S-transferase
   c. NADPH cytochrome P-450-reductase
   d. Glucuronyl transferase

8. Beta minus (β^-) emitters are located on the stability line in
   a. Right
   b. Left
   c. Middle
   d. Below

9. Which of the following products cannot be used for bio-composting
   a. Fats, Oil, Meat
   b. Diseased plant leaves
   c. Both a & b
   d. Only b

10. Which is the following is not a biofertilizer?
    a. Mycorrhiza
    b. Agrobacterium
    c. Rhizobium
    d. Nostoc

11. Which of the following is the most common source of SCP?
    a. Multicellular yeast
    b. Single-celled yeast
    c. Unicellular algae
    d. Unicellular bacteria

12. What does Chemical Oxygen Demand (COD) indicate?
    a. Biodegradability of waste water
    b. Strength of a sewage
    c. Age of the sewage
    d. Potential for recycling of wastewater

13. The standard Biochemical Oxygen Demand (BOD) of water is taken for
    a. 1 day
    b. 3 days
    c. 5 days
    d. 8 days

14. In tertiary treatment, the dissolved solids can be removed from wastewater by
    a. Granular Activated Carbon contractor
    b. Trickling filter
    c. Rotating Biological Contractor
    d. Ion-exchanger

15. Which of the following microorganisms can oxidize pyrite at 70° C?
    a. *Acidianus brierleyi*
    b. *Sulfolobus acidocaldarius*
    c. Thermophillic archae
    d. All of the above

16. Which of the enzymes are involved in biosynthesis of ethanol?
    a. Pyruvate decarboxylase
    b. Alcohol decarboxylase
    c. Pyruvate kinase
    d. Thiamine pyrophosphatase

17. The absorbance of DNA to measure the GC content is recorded at a wavelength of
    a. 400 nm
    b. 260 nm
    c. 290 nm
    d. 340 nm

18. The most common biopolymer used for packaging is
    a. Polyhydroxyalkanoate
    b. Polytetrafluoroethylene
    c. Polypropylene
    d. Polyhydroxyethylmethacrylate

19. The DNA bands in DGGE can be analyzed by staining the gel with
    a. Gold
    b. Platinum
    c. Silver
    d. Copper

20. To precipitate phosphorous during biological removal of phosphorus, the phosphorous enriched stripper is treated with
    a. Soda ash
    b. Lime
    c. Sodium bicarbonate
    d. All of the above

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[PART-B : Descriptive]

Time: 2 HRS 40 MINS Marks: 50

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

1. What is bioremediation? What are the differences between in situ & ex-situ bioremediation? Define phyto-remediation and myco-remediation. 2+4+4=10

2. What is methanogenes and where do they found? Write about the application of methanogenes. Define methanogenesis. 4+4+2=10

3. What is extremophiles? Define thermophiles, acidophiles and psycrophiles. Write a note on soil microbes with suitable examples. 2+4+4=10

4. What are biofertilizers are biopesticides? Write the differences between them. Mention the steps involves in bio-composting. 4+4+2=10

5. What is FAME analysis? Explain in detail the microbial production of ethanol. 4+6=10

6. Explain Environmental Metagenomics with a diagram. Describe the process of DGGE. 6+4=10

7. Explain the mechanism of microbial bioleaching. Explain an aerobic attached growth treatment process to treat sewage. 5+5=10

8. What does high strength wastewater means? What is a sanitary landfill? Explain a septic tank with a diagram. 2+3+5=10

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