

B.TECH/BT/7TH SEM/BIOT 4142/2018
ENVIRONMENTAL BIOTECHNOLOGY
(BIOT 4142)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group - A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Waste water treatment which uses microorganisms to reduce the BOD of waste water
(a) Primary Treatment (b) Secondary Treatment
(c) Tertiary Treatment (d) All of these.
- (ii) The most toxic VOC is
(a) Carbon tetrachloride (b) Trichloroethylene
(c) 1, 2 Dichloroethane (d) Vinyl chloride.
- (iii) Anaerobic bacteria often play important roles in bioremediation. Which of the following is not an electron acceptor used by anaerobes during biodegradation reactions?
(a) NO₃⁻ (b) Fe(III) (c) H₂O (d) SO₄⁻²
- (iv) Spray Tower is used for removal of
(a) Waste water (b) Gaseous air pollutant
(c) Particulate matter (d) None of these.
- (v) Bioaugmentation is a process that involves
(a) Using plants for bioremediation
(b) Bioventing
(c) Sludge removal
(d) Adding microbes to a cleanup site.
- (vi) The term Municipal Solid Waste (MSW) is generally used to describe
(a) Wastes from industrial processes, construction and demolition debris
(b) Wastes from Private homes, commercial establishments and institutions
(c) Mining wastes
(d) Agricultural wastes.

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- (vii) Which of the following is used in the production of Plastic?
(a) Mercury (b) Lead
(c) Vinyl chloride (d) None of these.
- (viii) Which of the following microbes is widely used in treatment of industrial waste?
(a) Trichoderma sp (b) Aspergillus niger
(c) Pseudomonas putida (d) All of these.
- (ix) 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.
- (x) Chlorella sp is widely used in the removal of
(a) Organic wastes (b) Hydrocarbons
(c) Heavy metals (d) All of these.

Group - B

2. (a) A cylindrical electrostatic precipitator having a diameter of 1.0 m handles dust particles of 2.5 μm in standard air with an efficiency of 99 percent. The volumetric flow rate of air is 0.2 m³/s. For an electric field strength of 1,50,000 v/m and q_p = 1.0 × 10⁻¹⁵ coulomb, determine the required length of the precipitator.
(b) Write notes on Tape sampler. **6 + 6 = 12**
3. (a) Write notes on Centrifugal Scrubbers.
(b) Explain a typical adsorption Break-through curve. **6 + 6 = 12**

Group - C

4. (a) How can you remove the dissolved solids from water sample by solvent extraction method?
(b) Explain how heat plays an important role in water pollution.
(c) What do you mean by NBOD? **5 + 4 + 3 = 12**
5. (a) Briefly describe the working principle of Trickling filter. Give diagram.

(b) The dissolved oxygen in an unseeded sample of diluted waste having an initial DO of 9.0 mg/L is measured to be 3.0 mg/L after 5 days. The dilution factor P is 0.030 and the reaction rate constant k is 0.22/day.

(i) What is the 5-day BOD of the waste?

(ii) What would be the ultimate carbonaceous BOD?

(iii) What would be the remaining oxygen demand after 5 days?

$$6 + 6 = 12$$

Group - D

6. (a) What are in-situ and ex-situ bioremediation? Explain each types with examples.

(b) Describe the pathway of sub-terminal oxidation of n-alkane in petroleum hydrocarbon.

$$(4 + 4) + 4 = 12$$

7. (a) How does the biopile process is used for solid waste treatment?

(b) Write down the advantages and disadvantages of biopile processes.

$$6 + (3 + 3) = 12$$

Group - E

8. (a) Mention three physico-chemical processes for removal of metal from industrial effluent.

(b) What is biosorption of metals? What are the advantages and disadvantages of the processe?

$$6 + (3 + 3) = 12$$

9. (a) What are the types of pesticides available in market? Give one example of each of the type.

(b) Describe the proposed pathway of DDT biodegradation.

$$(3 + 3) + 6 = 12$$