

M.TECH/BT/1ST SEM/BIOT 5132/2016
ADVANCED ENVIRONMENTAL TECHNOLOGY
(BIOT 5132)

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) Hydrocarbons are considered to be
(a) xenobiotic compounds
(b) persistent organic pollutants
(c) both persistent organic pollutants and xenobiotics
(d) biodegradable compounds.
- (ii) The process of collection of volatile component to condense them to produce a liquid fuel or bio-oil is called.....
(a) solvolysis (b) pyrolysis
(c) composting (d) liquefaction.
- (iii) The most toxic form of mercury is
(a) Hg(II) (b) Hg(0)
(c) Hg(I) (d) R-Hg.
- (iv) To regenerate a cation resin it should be washed with
(a) HCl (b) NaCl
(c) NaOH (d) Any of the above.
- (v) *Nitrosomonas* bacteria converts
(a) NH⁴⁺ to NO₂⁻ (b) NO₂⁻ to NO₃⁻
(c) NH⁴⁺ to NO₃⁻ (d) none of the above.
- (vi) Glutathione is mainly involved in
(a) scavenging free radicals (b) binding proteins
(c) hydrolysis of pesticides (d) hydrolysis of alkanes.

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- (vii) Parathione is used as a
(a) herbicide (b) pesticide
(c) stabilizer in plastic industry (d) organic solvent.
- (viii) Xenobiotics are compounds which are
(a) toxic to living system
(b) produced during metabolic action
(c) secreted by a cell
(d) foreign to living system.
- (ix) The protein involved in removal of heavy metals by intracellular sequestration in plant is
(a) phytochelatin (b) phytic acid
(c) phytokinin (d) auxin.
- (x) Fungi remove heavy metals by
(a) adsorption and complexation
(b) adsorption and volatilization
(c) enzymatic detoxification only
(d) adsorption and precipitation.

Group - B

2. Define ROS. Which chemical species are considered ROS? Name the pollutants that damage living systems by production of ROS. Discuss the role of antioxidant defence systems in destroying ROS. **1 + 3 + 1 + 7 = 12**
3. (a) What are the common forms of chromium in nature? State the sources of chromium in environment. Discuss the mode of action of chromium as a toxic substance.
(b) Discuss how lead toxicity is associated with anemia. **(3 + 6) + 3 = 12**

Group - C

4. (a) What is activated sludge?
(b) Derive an expression for determination of sludge age in an activated sludge process. **2 + 10 = 12**
5. (a) What are the different conventional techniques for industrial waste management?

- (b) Explain in detail ion-exchange process and precipitation to chemically treat waste water.

6 + 6 = 12

Group - D

6. Define bioaugmentation and biostimulation. Citing examples from case studies, discuss the advantage of these two processes over ordinary bioremediation.

2 + 2 + 8 = 12

7. (a) What are heavy metals? Discuss the consequences of accumulation of heavy metals in soil.

- (b) What is sorption? How sorption helps in removal of heavy metals from soil?

(2 + 4) + (2 + 4) = 12

Group - E

8. (a) Work out the value of Simpson's index of biodiversity for a single quadrat sample of ground vegetation in a woodland.

Species	Total number of individuals of a particular species (n)
Woodrush	2
Holly (seedlings)	8
Bramble	1
Yorkshire Fog	1
Sedge	3
Total (N)	15

- (b) What are the two main factors taken into consideration during measurement of biodiversity?

8 + 4 = 12

9. Discuss the objectives of the IUCN Red List. Classify different species following the IUCN Red List.

4 + 8 = 12