

Advanced Environmental BioTechnology
(BIOT 5132) 24

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 alternatives for the following 10 x 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) Alginic acid is responsible for
- (a) biosorption
 - (b) enzymatic detoxification
 - (c) intracellular sequestration
 - (d) both biosorption and enzymatic detoxification.
- (iii) Fungi removes heavy metals usually by
- (a) binding the metal with the polysaccharides on the cell wall
 - (b) binding the metal with protein molecules inside the cell
 - (c) enzymatic degradation of the metals
 - (d) binding the metal with the lipid molecule.
- (iv) To regenerate a cation resin it should be washed with
- (a) HCl
 - (b) NaCl
 - (c) NaOH
 - (d) Any of (a) & (b).
- (v) *Nitrosomonas* bacteria converts
- (a) NH_4^+ to NO_2^-
 - (b) NO_2^- to NO_3^-
 - (c) NH_4^+ to NO_3^-
 - (d) None of the above.
- (vi) The enzyme that plays a major role in degradation of phenol is
- (a) hydroxylase
 - (b) Esterase
 - (c) destaurase
 - (d) Dehydrogenase
- (vii) Parathione is used as a
- (a) herbicide
 - (b) pesticide
 - (c) stabilizer in plastic industry
 - (d) organic solvent.

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- (viii) Which is the main process used to remove phosphorus from waste water?
(a) Precipitation (b) ion exchange
(c) chemical oxidation (d) all the above.
- (ix) The bacterium that was used by Anandamohan Chakraborty to create a superbug is
(a) *Pseudomonas putida* (b) *Bacillus subtilis*
(c) *Pseudomonas denitrificans* (d) *Bacillus denitrificans*.
- (x) The most toxic form of chromium is
(a) Cr(III) (b) Cr(0) (c) Cr(VI) (d) Cr(IV).

Group - B

- 2.(a) State the different states in which arsenic is found in nature. Write them in order of increasing toxicity. What are the sources of arsenic pollution in West Bengal?
(b) Discuss the symptoms of arsenic toxicity and discuss the mechanism of action.
 $(2+1+3) + (2+4) = 12$
- 3.(a) What are the different classes of pesticides used in agriculture? Discuss their toxic effects.
(b) Discuss the role of mercury in causing the symptoms of Minamata disease.
 $(3+6)+(3) = 12$

Group - C

- 4.(a) Plastics are recalcitrant solid waste. How can plastics be recovered and recycled?
(b) Explain membrane separation process to treat waste water.
 $6 + 6 = 12$
- 5.(a) Explain role of bio-composting in solid waste management.
(b) What are the methods of collection of solid waste?
 $6 + 6 = 12$

Group - D

- 6.(a) What are in situ and ex situ bioremediation?
(b) Discuss the advantages of in situ bioremediation over ex situ bioremediation. Discuss the limitations of ex situ bioremediation.
 $(2+2) + (4+4) = 12$

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7.(a) Write the sources of cadmium contamination in surface water. Discuss its toxic effect.

(b) Discuss how algae and higher plants can be used for removal of cadmium.

(2+4) + 6 = 12

Group - E

8.(a) Justify the usage of biomass as a source of energy. What are energy crops? Give examples.

(b) Define the terms: biodiversity, bioprospecting, gasohol.

6 + 6 = 12

9. Two areas were sampled for biodiversity of grasshoppers, butterfly and beetles. The observation is listed in the following table.

Order	Description	Number of individuals	
		Area A	Area B
Orthoptera (grasshopper)	Green with green legs	6	25
Orthoptera (grasshopper)	Brown with yellow spots	5	2
Ledioptera (butterfly)	Large blue	1	17
Ledioptera (butterfly)	Small Blue	3	9
Coleoptera (beetle)	Red with blue spots	3	0

Calculate the Shannon Weiner and Simpson index of both the areas. Which area is more diverse?

(5 + 5 + 2) = 12