



HERITAGE INSTITUTE OF TECHNOLOGY

M. Tech/ 1st year 1st Semester Examination. 2014... Session : ...2014-2015...

Discipline : ...Biotechnology.....

Paper Code : ...BIOT5132 Paper Name : ...Advanced Environmental Biotechnology

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 x 1=10
- (i) Solid waste comprises of
(a) garbage (b) industrial waste
(c) pathological waste (d) all of the above
- (ii) Which of the following is not silviculture?
(a) exploitative (b) conventional extensive
(c) naturalistic (d) crop rotation
- (iii) 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
- (iv) Which is the main process used to remove phosphorus from waste water?
(a) precipitation (b) ion exchange
(c) chemical oxidation (d) all the above
- (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) Heavy metals are metals with
(a) density >5 gm/cc (b) molecular weight > 50
(c) atomic weight > 50 (d) atomic number >25
- (vii) Acetylcholinesterase is inhibited by
(a) organophosphorous pesticide (b) organochlorine pesticide
(c) carbamates (d) polyaromatic hydrocarbons

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- (viii) Biostimulation is the process for decontamination of a site where
(a) microorganisms are added from outside (b) nutrients are added from outside
(c) oxygen is added from outside (d) nothing is added from outside
- (ix) Biosorption of heavy metals by fungi involves
(a) intracellular sequestration (b) adsorption on cell wall
(c) both adsorption and intracellular sequestration (d) enzymatic detoxification
- (x) Which of the following statement is not true for ascorbic acid
(a) it is an antioxidant (b) it is a vitamin
(c) it protects against damage by free radical (d) it is an essential mineral

Group - B

2. (a) Write the different forms of mercury found in nature. Put them in the increasing order of toxicity. Discuss the toxic effects of mercury in mammalian systems.
- (b) Polyaromatic hydrocarbons are often found to be carcinogenic. Explain the observation. (2+1+3) + 6 = 12
3. (a) i) Write the chemical name of DDT. Discuss its mode of action.
ii) Paralysis and difficulties in limb movement were reported in a large number of people in a city. Upon investigation, they were found to have consumed oil contaminated with an organophosphorous pesticide. Do you think consumption of pesticide-contaminated oil is related with the syndromes? Justify your answer.
- (b) Anaemia is a major syndrome of lead toxicity. Discuss how lead toxicity leads to anaemia. ((1+3)+5) + 3 = 12

Group - C

- 4.(a) Plastics are recalcitrant solid waste. How plastics can be recovered and recycled?
- (b) What do you mean by activated sludge process? Discuss about different criteria associated with activated with sludge process design. (3+3) + (2+4) = 12
- 5 (a) What are the different conventional techniques for industrial waste management?



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- (b) Explain in detail ion-exchange process and precipitation to chemically treat waste water. 4 + 8
= 12

Group - D

- 6.(a) Discuss the ortho-cleavage pathway for phenol degradation.
- (b) You are asked for isolation of a soil bacterial strain which can be used for treatment of excess proteins coming out in the effluent of a tannery. Which of the sites given below will you prefer for collection of soil: a) from a village, d) from a site near the tannery itself, c) from a site near a jute mill? Explain your answer.
- (c) Why most of the bacteria do not have capacity to degrade petroleum products? 4 + 3 + 5 =
12
- 7.(a) What is Exxon Valdez disaster? Discuss the use of microbes for controlling the damage.
- (b) What was the major difference between the steps taken for damage control in Exxon Valdez disaster and Mexican Gulf disaster? (3+6) + 3 =
12

Group - E

- 8.(a) Describe ethanol production by fermentation. Mention its usage.
- (b) How is biogas produced by anaerobic digestion? What are energy crops? Give examples. (4+2) +
(4+1+1)
= 12
- 9.(a) How is bio-diesel produced from vegetable oil?
- (b) Define the terms: Environmental Impact Assessment, Bioprospecting, Gasohol. 6 + (2x3) =
12