

**BASIC ENVIRONMENTAL ENGINEERING & ECOLOGY  
(CHEM 2001)**

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) The densest region of atmosphere is  
 (a) troposphere (b) stratosphere  
 (c) mesosphere (d) thermosphere.
- (ii) Biosphere reserve is one kind of  
 (a) ex situ conservation (b) hot spot  
 (c) endemism (d) in situ conservation.
- (iii) Which one is a primary air pollutant?  
 (a) SO<sub>2</sub> (b) O<sub>3</sub> (c) PAN (d) HCHO.
- (iv) Human speech is in the range of  
 (a) 20-20000 Hz (b) 2000-5500 Hz  
 (c) 200-3000 Hz (d) none of these.
- (v) Which one is not a greenhouse gas?  
 (a) H<sub>2</sub>S (b) CO<sub>2</sub> (c) O<sub>3</sub> (d) H<sub>2</sub>O vapour.
- (vi) Food chain always starts with  
 (a) decay (b) nitrogen fixation  
 (c) photosynthesis (d) respiration.
- (vii) The lake in which the nutrient status and the productivity of land are low is called  
 (a) mesotrophic (b) oligotrophic  
 (c) eutrophic (d) none of these.
- (viii) The Bhopal gas tragedy occurred in  
 (a) 1984 (b) 1982  
 (c) 1981 (d) 1985.

- (ix) Itai-Itai disease is associated with \_\_\_\_\_ pollution  
 (a) mercury (b) arsenic  
 (c) cadmium (d) lead.
- (x) Lung cancer is related to the exposure of  
 (a) asbestos (b) methyl isocyanate  
 (c) vinyl chloride (d) none of these.

**Group - B**

2. (a) In 1990, India produced  $2 \times 10^{10}$  KWhr of electricity. The average annual growth rate of electricity demand in the previous 20 years was about 0.9%. Estimate the electricity consumption in 2020 if the 0.9% Growth rate per year remained constant over these 30 years.
- (b) What do you mean by Hot spot to biodiversity? Give example.
- (c) Give one example of each of in-situ and ex-situ conservation to biodiversity.
- (d) Give a brief account of nitrogen cycle showing schematic diagram.  
**3 + (2 + 1) + (1 + 1) + 4 = 12**
3. (a) Deduce the expression for the doubling time of population ( $t_d$ ) for exponential growth.
- (b) In an eco-system, the energy flow is unidirectional although the inorganic nutrients are recycled - justify.
- (c) Define Bio-geochemical cycle. What are the macro and micro nutrients?
- (d) Prove that, when population follows logistic function then the maximum sustainable yield will be obtained when population is half the carrying capacity.  
**3 + 3 + (1 + 2) + 3 = 12**

**Group - C**

4. (a) What is global warming? What are the major effects of global warming?
- (b) What are the main constituents of sulphurous smog?
- (c) Write a short note on (i) Bag house filter (ii) Maximum mixing depth.
- (d) Give a brief account of green house effect.  
**(1 + 3) + 1 + (2 + 2) + 3 = 12**

5. (a) Write down the cause and effect of ozone layer depletion.  
 (b) Why are CO<sub>2</sub> and H<sub>2</sub>O vapour greenhouse gases, but N<sub>2</sub> and O<sub>2</sub> are not?  
 (c) What is atmospheric stability? What are the important criterions of atmospheric stability?  
 (d) What are criteria pollutants? What is the difference between pollutants and contaminants?

$$3 + 2 + (1 + 2) + (2 + 2) = 12$$

#### Group - D

- 6 (a) What are nutrients? What are the effects of eutrophication on environment?  
 (b) What is five day BOD test? A waste water sample has a BOD<sub>2</sub> equal to 150 mg/l and the BOD reaction rate constant is 0.30/day. Calculate ultimate BOD.  
 (c) Write the basic features of rotating biological contractor.  
 (d) Discuss in details the different types of noise.

$$(1 + 2) + (2 + 2) + 3 + 2 = 12$$

7. (a) By drawing figure discuss in detail the water treatment process by Oxidation Pond.  
 (b) Differentiate between BOD and COD tests.  
 (c) Name the cations responsible for hardness of water.  
 (d) What are the technical processes for controlling noise pollution?  
 (e) How much a sound of 2000dB is louder than a sound of 100dB?

$$3 + 3 + 1 + 3 + 2 = 12$$

#### Group - E

8. (a) Define hazardous waste. How hazardous waste can be disposed using secure landfill?  
 (b) What do you mean by solid waste management? How waste can be managed using reduce, reuse and recycling?  
 (c) Write short note on 'Three Mile Island disaster'.  
 (d) What do you mean by Environmental Auditing?

$$(1 + 2) + (1 + 3) + 3 + 2 = 12$$

9. (a) What are the major sources of land pollution?  
 (b) How does sanitary land filling differ from open dumping?  
 (c) What is the usefulness of green chemistry? Define green solvent with example.  
 (d) Write the cause and after-effect of Chernobyl Disaster.

$$3 + 3 + (1 + 2) + 3 = 12$$