

ENVIRONMENTAL SCIENCES
(EVS2016)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Bhopal Gas Tragedy occurred due to leakage of
(a) DDT (b) MIC
(c) Dioxins (d) CFC
- (ii) The logistic growth rate curve look like
(a) V-shape (b) s-shape
(c) U-shape (d) None of these
- (iii) Which one among the following is a room temperature ionic liquid?
(a) Ethylammonium nitrate (b) Methyl mercury
(c) Lead arsenate (d) None of these
- (iv) The primary air pollutant is
(a) O₃ (b) PAN
(c) CO₂ (d) HCHO
- (v) The catalyst used in catalytic converter is
(a) Ni (b) Pt
(c) Fe (d) Cu
- (vi) Eutrophication means
(a) Thermal change in water
(b) Filling of water body with aquatic plants due to extra nourishment
(c) Solid waste present in water
(d) Increase of heavy metal contamination
- (vii) Temporary hardness of water is due to the presence of
(a) Cl⁻ (b) HCO₃⁻ (c) NO₃⁻ (d) SO₄²⁻
- (viii) Earth worm is an important component in the disposal method called
(a) Incineration (b) Sanitary landfill
(c) Composting (d) Open dumping

- (ix) The worst method of non-hazardous solid waste management is
 (a) Open dumping (b) Sanitary land filling
 (c) Incineration (d) Composting
- (x) The measurement of sound pressure level (SPL) the reference pressure taken is
 (a) $2 \times 10^{-5} \text{ Nm}^{-2}$ (b) $1 \times 10^{-5} \text{ Nm}^{-2}$
 (c) $9 \times 10^{-5} \text{ Nm}^{-2}$ (d) $5 \times 10^{-5} \text{ Nm}^{-2}$

Fill in the blanks with the correct word

- (xi) The Chernobyl disaster occurred in the year of_____.
- (xii) Oleic acid is an example of _____ solvent.
- (xiii) _____ disease was caused due to consumption of mercury contaminated fish.
- (xiv) _____ has affinity for haemoglobin 210 times more than oxygen.
- (xv) Pyrolysis is the thermal treatment of waste disposal done in _____ of oxygen.

Group - B

2. (a) Derive the expression $N_t = N_0(1+R')^t$, where terms have their usual significance. In 1990 India produced 2×10^{10} kWh of electricity. The average annual growth rate of electricity demand in the previous 20 years was about 0.9%. Estimate electricity consumption in 2020 if the 0.9% growth rate per year remained constant over these 30 years. [[CO5](Apply/IOCQ)]
- (b) What are the negative impacts of human advancement on environment that require implementation of Green chemistry? Why Green chemistry can be considered as sustainable chemistry? [[CO6](Remember/LOCQ)]
- (c) What do you mean by homeostatic mechanism observed in natural environment? [[CO1](Remember/LOCQ)]
- (2 + 3) + (3 + 2) + 2 = 12**
3. (a) What do you mean by atom economy related to green chemistry? Give mathematical expression of percent atom economy. [[CO3](Analyse/HOCQ)]
- (b) Explain the logistic growth of population by drawing a suitable sigmoid curve and mentioning various segments involved in it. [[CO5](Remember/LOCQ)]
- (c) Give an account of Bhopal Gas Tragedy. [[CO2](Remember/LOCQ)]
- (2 + 2) + (2 + 3) + 3 = 12**

Group - C

4. (a) What are the gaseous constituents of stratosphere? Draw the temperature profile curve of the atmosphere. [[CO1](Apply/IOCQ)]
- (b) What do you mean by smog? How sulphurous smog formed? Mention the adverse effect of sulphurous smog. [[CO2](Remember/LOCQ)]
- (c) What short technologies are involved in controlling particulate matter and flue gas emission? Write short note on cyclone separator. [[CO6](Remember/LOCQ)]
- (1 + 3) + 4 + (2 + 2) = 12**

5. (a) Explain the formation of acid rain with chemical reactions. What is the effect of acid rain on aquatic life? [[C03](Remember/LOCQ)]
- (b) Write short note on 'scrubber' technology to control air pollution. [[C06](Apply/IOCQ)]
- (c) What is global temperature model? Prove on the basis of simple global temperature model that the earth's surface temperature is -19°C . [[C01](Remember/LOCQ)]
- (3 + 2) + 3 + 4 = 12**

Group - D

6. (a) What are pesticides? Discuss briefly the harmful effects of biodegradable and non- biodegradable pesticides. [[C01](Remember/LOCQ)]
- (b) Define Biological Oxygen Demand. Suppose Ganga water has a BOD_5 equal to 200 mg/L at 20°C . The reaction rate constant 'k' at 20°C is 0.39day^{-1} . Find out (i) Reaction rate constant at 0°C , (ii) Ultimate BOD(C_0) and (iii) BOD_5 at 0°C . [[C03](Apply/IOCQ)]
- (c) Explain the 'Filtration' and 'Disinfection' processes in surface water treatment. [[C04](Remember/LOCQ)]
- (1 + 3) + (1 + 3) + (2 + 2) = 12**
7. (a) Write down the sources of generation of lead (Pb) in water and describe the harmful effects of lead (Pb) contamination. [[C01](Remember/LOCQ)]
- (b) Write down the effects of depletion of dissolved oxygen from a water body. What is its importance as water quality parameter? [[C02](Remember/LOCQ)]
- (c) Discuss with diagram the 'Oxidation Pond' used in sewage water treatment along. Mention the advantage and disadvantage of the process. [[C04](Remember/LOCQ)]
- (1 + 3) + (2 + 2) + 4 = 12**

Group - E

8. (a) Discuss with diagram the working principle of sanitary landfill process for the safe disposal of solid waste. How does sanitary land filling differ from open dumping? [[C03](Remember/LOCQ)]
- (b) Discuss the impact of noise pollution on human health and migratory bird. [[C04](Remember/LOCQ)]
- (c) In a work area, noise level are read as 100 dBA for 3 hours a day, 85 dBA for 2 hours a day and 80 dBA for remaining 3 hours a day. Analyse noise exposure. Is the sound tolerable to human ear? [[C05](Apply/IOCQ)]
- (4 + 2) + (2 + 1) + 3 = 12**
9. (a) How much is a sound of 150 dB louder than a sound of 90 dB? What is the unit of measurement of sound? [[C05](Apply/IOCQ)]
- (b) Briefly discuss the working principle of Bioreactor landfill. What is leachate? Mention the steps involved in the solid waste management. [[C04](Remember/LOCQ)]

- (c) The measured noise in an area is 70 dB for 2 hours, 90 dB for 45 minutes, 100 dB for 30 minutes and 110 dB for 10 minutes. Find out the noise threshold limit values and predict whether the working environment is healthier from the point of noise pollution.

[[CO6)(Apply/IOCQ)]

$$(2 + 1) + (3 + 1.5 + 1.5) + (2 + 1) = 12$$

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	69.8	26	4.2