

**ENVIRONMENTAL SCIENCES**  
**(EVSC 2016)**

**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) Which is not an example of renewable energy source?  
(a) Wind power      (b) Solar power      (c) Fossil fuels      (d) Hydropower.
- (ii) The Chernobyl disaster occurred in  
(a) 1984      (b) 1986      (c) 1981      (d) 1985.
- (iii) Which of the following waste treatment method does not involve extremely high temperature  
(a) Incineration      (b) Pyrolysis      (c) Gasification      (d) Open burning.
- (iv) Water will be considered as fresh water if the TDS value is  
(a) < 1500 mg/L      (b) equal to 2000 mg/L  
(c) > 1500 mg/L      (d) equal to 5000 mg/L.
- (v) Itai Itai disease is associated with  
(a) Mercury      (b) Arsenic      (c) Cadmium      (d) none of these.
- (vi) Acid rain is caused by the oxide of  
(a) Nitrogen and phosphorous      (b) Nitrogen and sulphur  
(c) Sulphur and phosphorous      (d) Nitrogen and carbon.
- (vii) The saturated value of DO is approximately  
(a) 9 mg/lit      (b) 5 mg/lit      (c) 20 mg/lit      (d) 6 mg/lit.
- (viii) 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.
- (ix) Freon is  
(a) CF<sub>3</sub>Cl      (b) CFCl<sub>3</sub>      (c) CF<sub>2</sub>Cl<sub>2</sub>      (d) All of the above.

- (x) In the industrial area noise is measured by  
(a)  $L_{10}$  (18 hour index)    (b)  $L_e P_n$     (c)  $L_{eq}$     (d) None of these.

### Group- B

2. (a) What do you understand by 'Atom Economy'? Write down the usefulness of green chemistry? [(CO5)(Understand/LOCQ)]  
(b) Following logistic growth of population, prove that the maximum sustainable yield will be obtained when population is half the carrying capacity. [(CO3)(Apply/IOCQ)]  
(c) Write down the differences between Environmental Impact assessment and Environmental Audit. [(CO6)(Remember/LOCQ)]  
(d) Write a short note on 'Bhopal Gas Tragedy'. [(CO2)(Remember/LOCQ)]  
**(1 + 2) + 3 + 3 + 3 = 12**
3. (a) Briefly discuss potentially renewable resources providing suitable example. [(CO1)(LOCQ)]  
(b) Prove that in the case of similar growth and decay rates, the half life time and doubling time become equal. In India, the increase in population from 33 billion to 120 billion took 60 years. For exponential growth at constant rate, what will be the growth? [(CO3)(IOCQ)]  
(c) Prove that maximum sustainable yield following logistic growth of population is  $(dN/dt)_{max} = rK/4$ , the terms have their usual meaning. [(CO3)(IOCQ)]  
(d) Define Environment mentioning various ecological factors. [(CO6)(LOCQ)]  
**2 + (2 + 2) + 3 + (1 + 2) = 12**

### Group - C

4. (a) Prove that in case of adiabatic lapse rate the rate of change of temperature with altitude is equal to  $-9.76^\circ\text{C}/\text{km}$ . [(CO3)(HOCQ)]  
(b) Write down the name of two devices for controlling the emission of particulate matter into environment. [(CO5)(LOCQ)]  
(c) Write down the differences between sulphurous smog and photochemical smog. [(CO4)(LOCQ)]  
(d) Explain the mechanism of ozone layer depletion phenomena with chemical reaction. Write down the name of the global agreement established to protect stratospheric ozone. [(CO4)(IOCQ)]  
**4 + 2 + 2 + (3 + 1) = 12**
5. (a) Deduce the chemical formula of CFC-11. Analyze how did ozone hole in the Antarctica region form? [(CO4)(Evaluate/HOCQ)]  
(b) What is global warming? Describe clearly how the green house gases cause global warming? [(CO1)(Analyze/IOCQ)]  
(c) Write a short note on (i) Bag house filter (ii) Criteria pollutants. [(CO5)(Remember/LOCQ)]  
**(2 + 3) + (1 + 2) + (2 + 2) = 12**

**Group - D**

6. (a) Which heavy metal toxicity replaces calcium in our bones? Write the sources of this heavy metal. [(CO3)(LOCQ)]  
 (b) Briefly describe the procedure of measuring chemical oxygen demand of waste water sample providing the working formula. [(CO1)(LOCQ)]  
 (c) Describe using suitable diagram how a "Trickling filter" is used in secondary treatment of waste water. [(CO1)(LOCQ)]  
 (d) What is thermal pollution related to aquatic system? What are the different types of it? How can thermal pollution in aquatic system be controlled? [(CO6)(LOCQ)]  
**(1 + 1) + 3 + 3 + (1 + 1 + 2) = 12**
7. (a) What are pesticides? Discuss briefly the harmful effects of biodegradable and non-biodegradable pesticides. [(CO1)(Remember/LOCQ)]  
 (b) Write down the differences between BOD and COD test? Why the BOD<sub>5</sub> test is run in dark? [(CO5)(Remember/LOCQ)]  
 (c) Suppose Ganga water has a BOD<sub>5</sub> equal to 200 mg/L at 20°C. The reaction rate constant 'k' at 20°C is 0.39day<sup>-1</sup>. Find out (i) Reaction rate constant at 0°C, (ii) Ultimate BOD(C<sub>0</sub>) and (iii) BOD<sub>5</sub> at 0°C. [(CO3)(Evaluate/HOCQ)]  
 (d) Explain the 'Filtration' and 'Disinfection' processes in surface water treatment. [(CO6)(Understand/LOCQ)]  
**(1 + 2) + (2 + 1) + 3 + 3 = 12**

**Group - E**

8. (a) Among 2000 dB and 100 dB which one is more louder sound? [(CO6)(HOCQ)]  
 (b) What is noise? What is the human detectable frequency range? [(CO6)(LOCQ)]  
 (c) What are the radioactive wastes? Write a short note on solid waste management? [(CO5)(LOCQ)]  
 (d) Mention the names of land disposal techniques of hazardous waste? [(CO5)(LOCQ)]  
 (e) What is the full form of MSW? [(CO5)(LOCQ)]  
**2 + (2 + 1) + (2 + 2) + 2 + 1 = 12**
9. (a) If the intensity of a sound source is increased four times its earlier intensity, then find out the increase in Sound Intensity Level (SIL). [(CO5)(Evaluate/HOCQ)]  
 (b) What is Decibel? What are the different equipments used to measure noise? [(CO6)(Remember/LOCQ)]  
 (c) What do you understand by land pollution? Write down the effects of industrial solid waste in land pollution. How does modern agricultural practice affect the soil pollution? [(CO4)(Remember/LOCQ)]  
 (d) What are the characteristics for a waste to be hazardous waste? [(CO3)(Understand/LOCQ)]  
**3 + (1 + 1) + (1 + 1 + 1) + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	64.58	17.7	17.7

### Course Outcome (CO):

The course outcomes of the subject are

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Educate engineers who can work in a multi-disciplinary environment to anticipate and address evolving challenges of the 21st century.
5. Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.
6. Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question