

**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) Ozone is a an essential component of
(a) troposphere (b) stratosphere
(c) mesosphere (d) ionosphere.
- (ii) The hardness of water is caused due to the presence of
(a) D₂O (b) Ca²⁺ and Mg²⁺ salts
(c) dissolved oxygen (d) FeCl₃.
- (iii) The greenhouse effect is pronounced in Venus due to presence of
(a) CO₂ (b) H₂O(vapour)
(c) N₂ (d) CH₄.
- (iv) Minamata disease is associated with
(a) Mercury (b) Arsenic
(c) Cadmium (d) none of these.
- (v) Unit of intensity of sound is
(a) Watt/m² (b) N/m²
(c) Decibel (d) Bel.
- (vi) The maximum sustainable yield is obtained when
(a) removal of population will reduce the population size
(b) population size is half the carrying capacity
(c) birth rate decreases or death rate increases
(d) all of the above.
- (vii) Which one of the following is true for a waste water sample?
(a) BOD>COD (b) COD>BOD
(c) BOD=COD (d) BOD=1/COD.

- (viii) Hazardous waste should have characteristics such as
(a) Reactivity (b) Corrosivity
(c) Toxicity (d) All the above.
- (ix) Aircraft noise is measured by
(a) $L_e P_n$ (b) L_{eq}
(c) L_{10} (18 hrs) index (d) none of these.
- (x) The best method of biomedical waste disposal is
(a) incineration (b) composting
(c) landfill (d) all of these.

Group - B

2. (a) What is homeostatic mechanism of environment? [(CO1)(LOCQ)]
(b) Write short note on Chernobyl Disaster. [(CO1)(LOCQ)]
(c) What is green solvent? Give examples. [(CO3)(IOCQ)]
(d) Following logistic growth of population derive the expression:
 $N=K/(1+e^{r(t^*-t)})$ Terms have their usual meaning. [(CO3)(LOCQ)]
(e) What do you mean by Environmental audit? [(CO6)(LOCQ)]
2 + 2 + 2 + 4 + 2 = 12
3. (a) What do you understand by green chemistry. Discuss the main objectives of green chemistry. [(CO1)(Understand/LOCQ)]
(b) In how many categories can resources be classified? Discuss in brief. [(CO1)(Remember/LOCQ)]
(c) What do you mean by sustainable development? How the goal of sustainable development can be achieved? [(CO6)(Remember/LOCQ)]
(2 + 2) + 4 + 4 = 12

Group - C

4. (a) What is atmosphere? What are the major regions of atmosphere? Draw the temperature profile curve of the atmosphere. [(CO1)(Understand/LOCQ)]
(b) Why is troposphere lapse rate reversed to that of stratospheric lapse rate? [(CO2)(Understand/LOCQ)]
(c) How is acid rain formed? What are the effect of acid rain on soil and plants? [(CO4)(Apply/IOCQ)]
(d) What is greenhouse effect? Why CO_2 is considered as a greenhouse gas whereas O_2 is not? [(CO4)(Understand/LOCQ)]
(1 + 1 + 2) + 2 + 2 + (2 + 2) = 12
5. (a) Consider the sun as a perfect sphere of radius 6.8×10^8 m. Calculate the energy radiated by the sun in one minute. (Surface temperature of the sun = 5800 K. Stefan's constant = 6.8×10^{-8} $Jm^{-2} S^{-1}K^{-4}$.) [(CO3)(HOCQ)]

- (b) Write short notes on: (i) Catalytic converter and (ii) Kyoto protocol. [(CO5)(LOCQ)]
- (c) What is PAN? Using a schematic diagram describe PAN formation. [(CO3)(LOCQ)]
- (d) What do you understand by suspended particulate matter? [(CO3)(LOCQ)]
- 3 + 4 + (1 + 2) + 2 = 12**

Group - D

6. (a) Discuss the effects of Eutrophication in lake water. [(CO1)(Analyze/IOCQ)]
- (b) What do you mean by Chemical Oxygen Demand (COD)? Write down two differences between BOD and COD methods. A waste water sample has its BOD₂ equal to 200 mg/L. The reaction rate constant k is 0.39/day. Find out its BOD₅. (Suppose temperature remains constant) [(CO2)(Evaluate/HOCQ)]
- (c) Discuss in detail the Rotating Biological Contractor used in the secondary treatment of waste water. What do you understand by activated sludge? [(CO2)(Understand/LOCQ)]
- 3 + (1 + 2 + 2) + (3 + 1) = 12**
7. (a) What do you understand by thermal pollution of water? Discuss the adverse effects of thermal pollution of water. [(CO3)(LOCQ)]
- (b) What is the importance of Biological Oxygen Demand (BOD) test? The duration of BOD test is very high while a little time is required for a COD test – Justify the statement. [(CO5)(LOCQ)]
- (c) Draw a flow diagram showing the steps of Surface water treatment. Distinguish between hard water and soft water. [(CO3)(LOCQ)]
- (1 + 3) + (2 + 2) + (2 + 2) = 12**

Group - E

8. (a) What are the adverse effects of open dumping of municipal solid wastes on environment? [(CO5)(Remember/LOCQ)]
- (b) What are the main solid wastes generated from various places? Discuss in brief the importance of recycling of these wastes. [(CO5)(Understand/LOCQ)]
- (c) Classify anthropogenic noise according to their source. What is the human detectable frequency range of sound? [(CO6)(Remember/LOCQ)]
- (d) Calculate the intensity of 60 dB sounds. (Reference intensity = 1×10^{-12} w/m²) [(CO6)(Evaluate/HOCQ)]
- 3 + (2 + 2) + (2 + 1) + 2 = 12**
9. (a) Describe the different types of thermal treatment available for disposal of solid waste. [(CO6)(LOCQ)]
- (b) What is vermicomposting? Write a short note on composting. [(CO5)(LOCQ)]
- (c) Give a brief account of different types chemical treatment involved in treatment of hazardous waste. [(CO3)(LOCQ)]
- 6 + (1 + 2) + 3 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	82.29	7.29	10.42

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