Unit

14

ENVIRONMENTAL CHEMISTRY

I. Multiple Choice Questions (Type-I)

1. Which of the following gases is not a green house gas?

(i) CO

(ii) O_3

(iii) CH_4

(iv) H_2O vapour

2. Photochemical smog occurs in warm, dry and sunny climate. One of the following is not amongst the components of photochemical smog, identify it.

(i) NO_2

(ii) O_3

(iii) SO_2

(iv) Unsaturated hydrocarbon

3. Which of the following statements is **not** true about classical smog?

(i) Its main components are produced by the action of sunlight on emissions of automobiles and factories.

(ii) Produced in cold and humid climate.

(iii) It contains compounds of reducing nature.

(iv) It contains smoke, fog and sulphur dioxide.

4. Biochemical Oxygen Demand, (BOD) is a measure of organic material present in water. BOD value less than 5 ppm indicates a water sample to be _____.

(i) rich in dissolved oxygen.

(ii) poor in dissolved oxygen.

(iii) highly polluted.

(iv) not suitable for aquatic life.

5. Which of the following statements is wrong?

(i) Ozone is not responsible for green house effect.

(ii) Ozone can oxidise sulphur dioxide present in the atmosphere to sulphur trioxide.

(iii) Ozone hole is thinning of ozone layer present in stratosphere.

(iv) Ozone is produced in upper stratosphere by the action of UV rays on oxygen.

6. Sewage containing organic waste should not be disposed in water bodies because it causes major water pollution. Fishes in such a polluted water die because of

(i) Large number of mosquitoes.

(ii) Increase in the amount of dissolved oxygen.

(iii) Decrease in the amount of dissolved oxygen in water.

(iv) Clogging of gills by mud.

7. Which of the following statements about photochemical smog is wrong?

(i) It has high concentration of oxidising agents.

(ii) It has low concentration of oxidising agent.

(iii) It can be controlled by controlling the release of NO_2, hydrocarbons, ozone etc.

(iv) Plantation of some plants like pinus helps in controlling photochemical smog.

8. The gaseous envelope around the earth is known as atmosphere. The lowest layer of this is extended upto 10 km from sea level, this layer is _____.

(i) Stratosphere

(ii) Troposphere

(iii) Mesosphere

(iv) Hydrosphere

9. Dinitrogen and dioxygen are main constituents of air but these do not react with each other to form oxides of nitrogen because _____.

(i) the reaction is endothermic and requires very high temperature.

(ii) the reaction can be initiated only in presence of a catalyst.

(iii) oxides of nitrogen are unstable.

(iv) N_2 and O_2 are unreactive.

10. The pollutants which come directly in the air from sources are called primary pollutants. Primary pollutants are sometimes converted into secondary pollutants. Which of the following belongs to secondary air pollutants?

(i) CO

(ii) Hydrocarbon

(iii) Peroxyacetyl nitrate

(iv) NO

11. Which of the following statements is correct?

(i) Ozone hole is a hole formed in stratosphere from which ozone oozes out.

(ii) Ozone hole is a hole formed in the troposphere from which ozone oozes out.

(iii) Ozone hole is thinning of ozone layer of stratosphere at some places.

(iv) Ozone hole means vanishing of ozone layer around the earth completely.

12. Which of the following practices will **not** come under green chemistry?

(i) If possible, making use of soap made of vegetable oils instead of using synthetic detergents.

(ii) Using H_2O_2 for bleaching purpose instead of using chlorine based bleaching agents.

(iii) Using bicycle for travelling small distances instead of using petrol/ diesel based vehicles.

(iv) Using plastic cans for neatly storing substances.

II. Multiple Choice Questions (Type-II)

In the following questions two or more options may be correct.

13. Which of the following conditions shows the polluted environment.

(i) pH of rain water is 5.6.

(ii) amount of carbondioxide in the atmosphere is 0.03%.

(iii) biochemical oxygen demand 10 ppm.

(iv) eutrophication.

14. Phosphate containing fertilisers cause water pollution. Addition of such compounds in water bodies causes _____.

(i) enhanced growth of algae.

(ii) decrease in amount of dissolved oxygen in water.

(iii) deposition of calcium phosphate.

(iv) increase in fish population.

15. The acids present in acid rain are _____.

(i) Peroxyacetylnitrate

(ii) H_2CO_3

(iii) HNO_3

(iv) H_2SO_4

16. The consequences of global warming may be _____.

(i) increase in average temperature of the earth

(ii) melting of Himalayan Glaciers.

(iii) increased biochemical oxygen demand.

(iv) eutrophication.

III. Short Answer Type

17. Green house effect leads to global warming. Which substances are responsible for green house effect?

18. Acid rain is known to contain some acids. Name these acids and where from they come in rain?

19. Ozone is a toxic gas and is a strong oxidising agent even then its presence in the stratosphere is very important. Explain what would happen if ozone from this region is completely removed?

20. Dissolved oxygen in water is very important for aquatic life. What processes are responsible for the reduction of dissolved oxygen in water?

21. On the basis of chemical reactions involved, explain how do chlorofluorocarbons cause thinning of ozone layer in stratosphere.

22. What could be the harmful effects of improper management of industrial and domestic solid waste in a city?

23. During an educational trip, a student of botany saw a beautiful lake in a village. She collected many plants from that area. She noticed that villagers were washing clothes around the lake and at some places waste material from houses was destroying its beauty.

After few years, she visited the same lake again. She was surprised to find that the lake was covered with algae, stinking smell was coming out and its water had become unusable. Can you explain the reason for this condition of the lake?

24. What are biodegradable and non-biodegradable pollutants?

25. What are the sources of dissolved oxygen in water?

26. What is the importance of measuring BOD of a water body?

27. Why does water covered with excessive algal growth become polluted?

28. A factory was started near a village. Suddenly villagers started feeling the presence of irritating vapours in the village and cases of headache, chest pain, cough, dryness of throat and breathing problems increased. Villagers blamed the emissions from the chimney of the factory for such problems. Explain what could have happened. Give chemical reactions for the support of your explanation.

29. Oxidation of sulphur dioxide into sulphur trioxide in the absence of a catalyst is a slow process but this oxidation occurs easily in the atmosphere. Explain how does this happen. Give chemical reactions for the conversion of SO_2 into SO_3.

30. From where does ozone come in the photochemical smog?

31. How is ozone produced in stratosphere?

32. Ozone is a gas heavier than air. Why does ozone layer not settle down near the earth?

33. Some time ago formation of polar stratospheric clouds was reported over Antarctica. Why were these formed? What happens when such clouds break up by warmth of sunlight?

34. A person was using water supplied by Municipality. Due to shortage of water he started using underground water. He felt laxative effect. What could be the cause?

IV. Matching Type

In the following questions more than one option of Column I and Column II may match.

35. Match the terms given in Column I with the compounds given in Column II.

	Column I		**Column II**
(i)	Acid rain	(a)	$CHCl_2 - CHF_2$
(ii)	Photochemical smog	(b)	CO
(iii)	Combination with haemoglobin	(c)	CO_2
(iv)	Depletion of ozone layer	(d)	SO_2
		(e)	Unsaturated hydrocarbons

36. Match the pollutant(s) in Column I with the effect(s) in Column II.

	Column I		**Column II**
(i)	Oxides of sulphur	(a)	Global warming
(ii)	Nitrogen dioxide	(b)	Damage to kidney

(iii)	Carbon dioxide	(c)	'Blue baby' syndrome
(iv)	Nitrate in drinking water	(d)	Respiratory diseases
(v)	Lead	(e)	Red haze in traffic and congested areas

37. Match the activity given in Column I with the type of pollution created by it given in Column II.

	Column I (Activity)		**Column II (Effect)**
(i)	Releasing gases to the atmosphere after burning waste material containing sulphur.	(a)	Water pollution
(ii)	Using carbamates as pesticides	(b)	Photochemical smog, damage to plant life, corrosion to building material, induce breathing problems, water pollution
(iii)	Using synthetic detergents for washing clothes	(c)	Damaging ozone layer
(iv)	Releasing gases produced by automobiles and factories in the atmosphere.	(d)	May cause nerve diseases in human.
(v)	Using chlorofluorocarbon compounds for cleaning computer parts	(e)	Classical smog, acid rain, water pollution, induce breathing problems, damage to buildings, corrosion of metals.

38. Match the pollutants given in Column I with their effects given in Column II.

	Column I		**Column II**
(i)	Phosphate fertilisers in water	(a)	BOD level of water increases
(ii)	Methane in air	(b)	Acid rain
(iii)	Synthetic detergents in water	(c)	Global warming
(iv)	Nitrogen oxides in air	(d)	Eutrophication

V. Assertion and Reason Type

In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

39. ***Assertion (A):*** Green house effect was observed in houses used to grow plants and these are made of green glass.

Reason (R) : Green house name has been given because glass houses are made of green glass.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

40. ***Assertion (A) :*** The pH of acid rain is less than 5.6.

Reason (R) : Carbon dioxide present in the atmosphere dissolves in rain water and forms carbonic acid.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

41. ***Assertion (A) :*** Photochemical smog is oxidising in nature.

Reason (R) : Photochemical smog contains NO_2 and O_3, which are formed during the sequence of reactions.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

42. ***Assertion (A) :*** Carbon dioxide is one of the important greenhouse gases.

Reason (R) : It is largely produced by respiratory function of animals and plants.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

43. ***Assertion (A) :*** Ozone is destroyed by solar radiation in upper stratosphere.

Reason (R) : Thinning of the ozone layer allows excessive UV radiations to reach the surface of earth.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

44. ***Assertion (A) :*** Excessive use of chlorinated synthetic pesticides causes soil and water pollution.

Reason (R) : Such pesticides are non-biodegradable.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

45. ***Assertion (A) :*** If BOD level of water in a reservoir is less than 5 ppm it is highly polluted.

Reason (R) : High biological oxygen demand means low activity of bacteria in water.

(i) Both A and R are correct and R is the correct explanation of A.

(ii) Both A and R are correct but R is not the correct explanation of A.

(iii) Both A and R are not correct.

(iv) A is not correct but R is correct.

VI. Long Answer Type

46. How can you apply green chemistry for the following :

(i) to control photochemical smog.

(ii) to avoid use of halogenated solvents in drycleaning and that of chlorine in bleaching.

(iii) to reduce use of synthetic detergents.

(iv) to reduce the consumption of petrol and diesel.

47. Green plants use carbon dioxide for photosynthesis and return oxygen to the atmosphere, even then carbon dioxide is considered to be responsible for green house effect. Explain why?

48. Explain how does green house effect cause global warming.

49. A farmer was using pesticides on his farm. He used the produce of his farm as food for rearing fishes. He was told that fishes were not fit for human consumption because large amount of pesticides had accumulated in the tissues of fishes. Explain how did this happen?

50. For dry cleaning, in the place of tetrachloroethane, liquefied carbon dioxide with suitable detergent is an alternative solvent. What type of harm to the environment will be prevented by stopping use of tetrachloroethane? Will use of liquefied carbon dioxide with detergent be completely safe from the point of view of pollution? Explain.

ANSWERS

I. Multiple Choice Questions (Type-I)

1. (i)	2. (iii)	3. (i)	4. (i)	5. (i)	6. (iii)
7. (ii)	8. (ii)	9. (i)	10. (iii)	11. (iii)	12. (iv)

II. Multiple Choice Questions (Type-II)

13. (iii), (iv)

14. (i), (ii)

15. (ii), (iii), (iv)

16. (i), (ii)

III. Short Answer Type

17. Trapping of heat by green house gases, namely carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbons.

19. [**Hint :** Ozone prevents harmful UV radiations of the Sun from reaching to the Earth's surface, thereby it protects life from bad effects of UV radiations.]

21. CFC's are stable compounds. These undergo decomposition in presence of sunlight, as shown below :

Reactions: $CF_2Cl_2\,(g) \xrightarrow{UV} \dot{C}l\,(g) + \dot{C}F_2Cl\,(g)$

$\dot{C}l\,(g) + O_3\,(g) \longrightarrow Cl\dot{O}\,(g) + O_2\,(g)$

$Cl\dot{O}\,(g) + O\,(g) \longrightarrow \dot{C}l\,(g) + O_2\,(g)$

Chain reactions continue in which ozone layer is depleted.

23. [**Hint :** Process of eutrophication is responsible for this. Explain the effect of accumulation of phosphate from detergents and organic matter entering into the lake along with domestic waste.]

24. Biodegradable - which are decomposed by bacteria.

Non-biodegradable - which cannot be decomposed by bacteria.

25. Sources of dissolved oxygen in water

(i) Photosynthesis

(ii) Natural aeration

(iii) Mechanical aeration

26. BOD is the measure of level of pollution caused by organic biodegradable material. Low value of BOD indicates that water contains less organic matter.

IV. Matching Type

35. (i) → (c), (d) (ii) → (e), (d) (iii) → (b) (iv) → (a)

36. (i) → (d) (ii) → (e) (iii) → (a) (iv) → (c) (v) → (b)

37. (i) → (e) (ii) → (d) (iii) → (a) (iv) → (b) (v) → (c)

38. (i) → (a), (d) (ii) → (c) (iii) → (a) (iv) → (b)

V. Assertion and Reason Type

39. (iii) 40. (ii) 41. (i) 42. (ii) 43. (iv) 44. (i)

45. (iii)