PREVIOUS HSE QUESTIONS AND ANSWERS OF THE CHAPTER 'ENVIRONMENTAL CHEMISTRY'

1. (i) Which of the following is NOT a green house gas ?
   (A) CO_2 (B) CO (C) Ozone (D) CH_4 (1)
   (ii) Define the term Biochemical Oxygen Demand. (2) [December 2021]

   Ans: (i) (B) CO

   (ii) It is the amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water.

2. (i) Name two gases responsible for greenhouse effect. (2)
   (ii) List two harmful effects of Acid rain. (2) [September 2021]

   Ans: (i)CO_2, CH_4 etc.

   (ii) Acid rain is harmful for agriculture, trees and plants.
   - *It causes respiratory ailments and skin cancer in human beings and animals.*
   - *It affects plants and animal life in aquatic ecosystem.*
   - *It corrodes water pipes resulting in the dissolution of heavy metals into the drinking water.*
   - *Acid rain damages buildings and other structures made of stone or metal.* ***[Any 2 required]***

3. ---------- is an example of a green house gas. (1)

   Ans: CO_2 (Or, any other green house gas)

4. Explain the following terms:
   (a) Acid rain (b) BOD (c) Green Chemistry (3) [December 2020]

   Ans: (a) Acid rain: When the pH of the rain water is below 5.6, it is called acid rain.

   (b) BOD [Biochemical Oxygen Demand]: It is the amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water.

   (c) Green Chemistry: It is a branch of Chemistry which involve the production process that would bring about minimum pollution or deterioration to the environment.

5. The combination of smoke and fog is known as _____. (1)

   Ans: Smog

6. Define the following terms:
   (a) Freons (b) BOD (c) Green house effect (3) [March 2020]

   Ans: (a) Freons: Chlorofluorocarbon compounds of methane and ethane.

   (b) BOD: It is the amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water.

   (c) Green house effect: When the concentration of carbon dioxide in the atmosphere increases, it absorbs more infra-red radiation from the solar energy and hence the temperature of the earth's atmosphere increases. This is known as Green house effect.

7. a) Differentiate between classical smog and photochemical smog. (2)
   b) Suggest any two methods to control photochemical smog. (1) [July 2019]

   Ans: a) Classical smog occurs in cool and humid climate. It is a mixture of smoke, fog and sulphur dioxide. It is also called reducing smog.

   Photochemical smog occurs in warm, dry and sunny climate. The main components of the photochemical smog are nitrogen oxides, unburnt hydrocarbons, formaldehyde etc. It is also called oxidising smog.

b) We can control photochemical smog by the following methods:

- *Use catalytic converters in automobiles, which prevent the release of nitrogen oxide and hydrocarbons to the atmosphere.*
- *Certain plants like Pinus, can metabolise nitrogen oxide. So their plantation helps to reduce these oxides.*

8. a) What is meant by acid rain? (1)
   b) Explain the chemistry behind the formation of acid rain. (1)
   c) What are the harmful effects of acid rain? (1) [March 2019]

   Ans: a) When the pH of the rain water is below 5.6, it is called acid rain.

   b) Oxides of nitrogen and sulphur (e.g. SO_2 and NO_2) are mainly responsible for acid rain. These gases dissolve in rain water and forms strong acids as follows:

   $2SO_2\ (g) + O_2\ (g) + 2H_2O\ (l) \longrightarrow 2H_2SO_4\ (aq)$

   $4NO_2\ (g) + O_2\ (g) + 2H_2O\ (l) \longrightarrow 4HNO_3\ (aq)$

   c) The harmful effects of acid rain are:

   - *Acid rain is harmful for agriculture, trees and plants.*
   - *It causes respiratory ailments and skin cancer in human beings and animals.*
   - *It affects plants and animal life in aquatic ecosystem.*
   - *It corrodes water pipes resulting in the dissolution of heavy metals into the drinking water.*
   - *Acid rain damages buildings and other structures made of stone or metal.* ***[Any 2 required]***

9. Which pollutant in water causes brown mottling of teeth? (1)

   Ans: Fluoride (F^-) ion.

10. Define the terms, Biochemical Oxygen Demand (BOD) and Eutrophication. (2) [August 2018]

    Ans: The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water, is called Biochemical Oxygen Demand (BOD).

    Nutrient enriched water bodies support a dense plant population, but kills animal life by reducing the amount of free oxygen. This results in the loss of biodiversity and is known as Eutrophication.

11. Name the type of smog generally formed during cool and humid climate. (1)

    Ans: Classical smog

12. Write any two applications of green chemistry in day-to-day life. (2) [March 2018]

    Ans: Applications of green chemistry are:

    - ***Dry Cleaning of Clothes****: Liquefied carbondioxide, with a suitable detergent is used for dry cleaning clothes.*
    - ***Bleaching of Paper****: Hydrogen peroxide (H_2O_2) with suitable catalyst is used for bleaching paper.*

13. Ozone layer plays a significant role in protecting earth from harmful UV radiation.
    a) What is mean by ozone layer depletion?
    b) What are the effects of ozone layer depletion? (3) [July 2017]

    Ans: a) The decomposition of ozone layer in the stratosphere by the action of certain substances like chlorofluorocarbons (CFC's or freons) is called ozone layer depletion.

    b) *The effects of ozone layer depletion are:*

    - *It leads to ageing of skin, cataract, sunburn, skin cancer, killing of many phytoplanktons, damage to fish productivity etc.*
    - *It leads to the harmful mutation of cells.*

- *It also increases evaporation of surface water through the stomata of the leaves and decreases the moisture content of the soil.*
- *Increase in UV radiations damage paints and fibres, causing them to fade faster.*

14. Environmental pollution is the effect of undesirable changes in surroundings that have harmful effects on plants, animals and human beings.
    a) Explain the adverse effect of global warming. (2)
    b) Choose the one which is not a component of photochemical smog.
    i) NO_2 ii) O_3 iii) SO_2 (1) [March 2017]

Ans: (a) Due to global warming, the average global temperature will increase. This will lead to the melting of polar ice caps and flooding of low lying areas all over the earth. Increase in the global temperature results in the infectious diseases like dengue, malaria, yellow fever, sleeping sickness etc. (b) ii) SO_2

15. The phenomenon of global warming is due to green house effect.
    a) What is green house effect?
    b) What are the consequences of green house effect? (3) [September 2016]

Ans: a) When *the concentration of carbon dioxide in the atmosphere is above the normal level (0.03%), it absorbs more infra-red radiation from the solar energy and hence the temperature of the earth's atmosphere increases. This is known as Green house effect. It results in global warming.*

b) Due to Green house effect (global warming),

- *the average global temperature will increase. This will lead to the melting of polar ice caps and flooding of low lying areas all over the earth.*
- *Increase in the global temperature results in the infectious diseases like dengue, malaria, yellow fever, sleeping sickness etc.*

16. a) Match the following: (2)

A	B
CFC's	Blue baby syndrome
Oxides of nitrogen	Kidney damage
Cadmium	Eutrophication
Nitrates	Ozone depletion
	Red haze in the traffic

    b) Write any contributions of green chemistry in day to day life. (1) [March 2016]

Ans: a)

A	***B***
CFC's	*Ozone depletion*
Oxides of nitrogen	*Red haze in the traffic*
Cadmium	*Kidney damage*
Nitrates	*Blue baby syndrome*

b) ***Dry Cleaning of Clothes****: Liquefied CO_2, with a suitable detergent is used for dry cleaning clothes.*
Bleaching of Paper*: Hydrogen peroxide (H_2O_2) with suitable catalyst is used for bleaching paper.*

17. 'Smog' is the most common example of air pollution.
    a) The smog that occurs in cool humid climate is called ……. (1)
    b) Explain the cause of 'Green House Effect'. (2) [October 2015]

    Ans: a) Classical smog

    b) Presence of certain gases like CO_2, methane, water -vapour, chlorofluorocarbons (CFC's), nitrous oxide, ozone etc in excess concentration is responsible for Green house effect.

18. The Taj Mahal in India has been affected by 'acid rain'. Explain the causes and harmful effects of acid rain. (3) [March 2015]

    Ans: Refer the Answer of the Question no. 8

19. a) Carbon monoxide is one of the most serious air pollutants. How does it pollute the atmosphere? (2)
    b) Give any two applications of Green Chemistry in day-to-day life. (1) [August 2014]

    Ans: a) Carbon monoxide binds to haemoglobin of our blood to form carboxyhaemoglobin, which is more stable than the oxygen-haemoglobin complex. So it reduces the oxygen carrying capacity of blood. This oxygen deficiency results into headache, weak eyesight, nervousness and cardiovascular disorder.

    b) Refer the Answer of the Question no. 12

20. There are international standards regarding drinking water. Write any three among them. (3) [March 2014]

    Ans: The International Standards for drinking water are given below:

    - *Fluoride: For drinking purposes, water should contain fluoride upto 1 ppm (parts per million).*
    - *Lead: The upper limit concentration of lead in drinking water is about 50 ppb (parts per billion).*
    - *Sulphate: Less than 500 ppm*
    - *Nitrate: The maximum limit of nitrate in drinking water is 50 ppm.*

21. Suppose that your teacher asks you to conduct a seminar on ozone depletion. Give any three harmful effects of ozone depletion that you would present in the seminar. (3) [September 2013]

    Ans: Refer the Answer of the Question no. 13 (b)

22. Pollution of water originates mainly from human activities.
    a) What do you mean by the term PCB? (1)
    b) How do chemical pollutants cause eutrophication? (1)
    c) Mention the adverse effects of high fluoride concentration in drinking water. (1) [March 2013]

    Ans: a) Polychlorinated biphenyls [Pollution Control Board]

    b) Some bacteria fed the chemical pollutants in water and grow rapidly. They use all the dissolved oxygen in water. The lack of oxygen kills all other aquatic life and cause Eutrophication.

    c) Fluoride concentration above 2ppm causes brown mottling of teeth. Excess fluoride (above 10ppm) causes harmful effect to bones and teeth.

23. a) Write any two differences between classical smog and photochemical smog. (2)
    b) How the Green Chemistry is useful in bleaching of paper? (1) [September 2012]

    Ans: a) Refer the Answer of the Question no. 7 (a)

    b) Hydrogen peroxide (H_2O_2) with suitable catalyst is used for bleaching paper in Green Chemistry.

24. Particulate pollutants are the minute solid particles or liquid droplets in air.
    a) Suggest two examples for non-viable particulate pollutants. (1)
    b) Write any two adverse effects of photochemical smog. (2) [March 2012]

    Ans: a) smoke, fumes, mist, dust etc.

b) The adverse effects of photochemical smog are:

- *It leads to cracking of rubber and extensive damage to plant life.*
- *It also causes corrosion of metals, stones, building materials, rubber and painted surfaces.*

25. Ozone in the stratosphere is produced by the help of ultraviolet radiations. It protects us from harmful ultraviolet radiations.
    a) Write equation for the formation of ozone in stratosphere. (1)
    b) Explain with chemical equation, the destruction of ozone by chlorofluro carbons causing ozone hole. (2)

    [October 2011]

    Ans: a) Ozone is formed in the upper stratosphere by the interaction of uv radiation on dioxygen.

    $O_2(g) \xrightarrow{\text{sun light}} O(g) + O(g)$

    $O(g) + O_2(g) \rightleftharpoons O_3(g)$

    b) In stratosphere, CFC's get broken down by UV radiations, releasing chlorine free radical.

    $CF_2Cl_2(g) \xrightarrow{uv} Cl^{\bullet}(g) + {}^{\bullet}CF_2Cl(g)$

    The chlorine radical then react with ozone to form chlorine monoxide radicals and molecular oxygen. $Cl^{\bullet}(g) + O_3(g) \longrightarrow ClO^{\bullet}(g) + O_2(g)$

    Reaction of chlorine monoxide radical with atomic oxygen produces more chlorine radicals.

    $ClO^{\bullet}(g) + O(g) \longrightarrow Cl^{\bullet}(g) + O_2(g)$

    The chlorine radicals are continuously regenerated and cause the breakdown of ozone.

26. Organic matters such as leaves, grass, trash etc. are major pollutants in water.
    a) How do organic pollutants affect aquatic life? (2)
    b) What is Biological Oxygen Demand (BOD)? (1) [March 2011]

    Ans: a) As the amount of organic matter in water increases, more oxygen is required to decompose them by bacteria. So the amount of dissolved oxygen in water decreases. This causes oxygen dependent aquatic life to die.

    b) The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water, is called Biochemical Oxygen Demand (BOD).

27. When the pH of the rain water drops below 5.6, it is called acid rain.
    a) What are the major compounds responsible for acid rain? (1)
    b) What are the harmful effects of acid rain? (2) [September 2010]

    Ans: Refer the Answer of the Question no. 8

28. Atmospheric pollution increases the global average temperature and the phenomenon is called global warming.
    a) What are the major gases which contribute towards global warming? (1)
    b) What can we do to reduce global warming? (2) [March 2010]

    Ans: a) CO_2, methane, water -vapour, chlorofluorocarbons (CFC's), nitrous oxide and ozone.

    b) Global warming can be reduced by the following methods:

    - *Reduce the burning of fossil fuels by minimizing the use of automobiles.*
    - *Plant trees and encourage afforestation.*
    - *Avoid burning of dry leaves, wood etc.*
    - *Aware the public about the bad effects of global warming.*

29. a) What is mean by the green house effect? (1½)

b) Explain what is mean by green house gases? (1½) [March 2009]

Ans: a) Refer the Answer of the Question no. 15 (a)

b) The gases responsible for green house effect are called green house gases. They are CO_2, methane, water -vapour, chlorofluorocarbons (CFC's), nitrous oxide and ozone.

30. How do pollutants that reach the stratosphere affect life on earth? (2) [June 2008]

Ans: Pollutants like CFC's reach the stratosphere and cause the depletion of ozone layer. Due to this, more UV radiation reaches into troposphere and leads to the following harmful effects:

- *It leads to ageing of skin, cataract, sunburn, skin cancer, killing of many phytoplanktons, damage to fish productivity etc.*
- *It leads to the mutation of cells.*

31. 'Use of DDT pollutes the environment.' Justify. (2) [February 2008]

Ans: DDT is water insoluble and non-biodegradable. Therefore it is transferred from lower trophic level to higher trophic level through food chain. It results in serious metabolic and physiological disorder in higher animals.