

Chapter 14: Environmental Chemistry

NCERT Exemplar · Class 11 · Chemistry

Multiple Choice Questions (Type-I)

Question 1

Which of the following gases is not a greenhouse gas?

(i) CO

(ii)



(iii)



(iv)



vapour

Solution

Ans: Option (i) CO is correct since it does not absorb sunlight near the earth's surface and hence it is not radiated back to the earth. Greenhouse gases have this kind of property.

Question 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)



(ii)



(iii)



(iv) Unsaturated hydrocarbon

Solution

Ans: Option (iii)



is correct since photochemical fog is formed in the presence of sunlight in summers when NO and hydrocarbons are present in large amounts in the atmosphere.



is not responsible for photochemical fog.

Question 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 climates.
- (iii) It contains compounds of reducing nature.
- (iv) It contains smoke, fog, and Sulphur dioxide.

Solution

Ans: Option (i) i.e., Its main components are produced by the action of sunlight on emissions of automobiles and factories is the answer since classical smog is a mixture of smoke, fog and sulphur dioxide and occurs in cold humid climates. While the gases released by automobiles and factories are not responsible for classical fog.

Question 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.

Solution

Ans: Option (i) i.e., rich in dissolved oxygen is the answer since the total amount of oxygen consumed by microorganisms in decomposing organic matter present in a certain volume of water is known as Biochemical Oxygen Demand (BOD) of water. If the BOD value is less than 5 ppm, then the sample of water is considered to be pure and is rich in dissolved oxygen.

Question 5

Which of the following statements is wrong?

(i) Ozone is not responsible for the greenhouse effect.

(ii) Ozone can oxidize Sulphur dioxide present in the atmosphere to Sulphur trioxide.

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

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

Solution

Ans: Option (i) i.e., Ozone is not responsible for greenhouse effect is the answer since



is responsible for the greenhouse effect, its contribution is about 8% to 10%. About 75% of the solar energy reaching the earth is absorbed by the earth's surface, which increases its temperature. The rest of the heat radiates back to the atmosphere while some of the heat is trapped by gases such as carbon dioxide, methane, ozone, chlorofluorocarbon compounds (CFCs) and water vapour in the atmosphere. Thus, they add to the heating of the atmosphere. This is the reason behind global warming.

Question 6

Sewage containing organic waste should not be disposed of 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.

Solution

Ans: Option (iii) i.e., Decrease in the amount of dissolved oxygen in water is the answer since organic waste is oxidized by microorganisms in the presence of dissolved oxygen. Hence, oxygen decreases in water as a result it is harmful for aquatic life.

Question 7

Which of the following statements about photochemical smog is wrong?

(i) It has a high concentration of oxidizing agents.

(ii) It has a low concentration of oxidizing agents.

(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.

Solution

Ans: Option (ii) i.e., It has low concentration of oxidizing agents is the answer since the common components of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN). Photochemical smog causes serious health problems and both ozone and PAN act as powerful eye irritants. Photochemical smog contains high concentrations of oxidants.

Question 8

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

(i) Stratosphere

(ii) Troposphere

(iii) Mesosphere

(iv) Hydrosphere

Solution

Ans: Option (ii) Troposphere is correct since the lowest region of atmosphere in which the human beings along with other organisms live is called troposphere. It extends up to the height of approx. 10 km from sea level.

Question 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 temperatures.

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

(iii) oxides of nitrogen are unstable.

(iv)



and



are unreactive.

Solution

Ans: Option (i) the reaction is endothermic and requires very high temperature is correct since dinitrogen and dioxygen are the main constituents of air. These gases do not react with each other at a normal temperature. The dissociation energy of



is very high due to the presence of triple bond and it is very stable.

Question 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

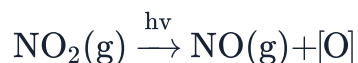
(ii) Hydrocarbon

(iii) Peroxyacetyl nitrate

(iv) NO

Solution

Ans: Option (iii) Peroxyacetyl nitrate is correct since,

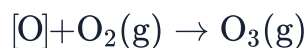


(i)

Oxygen atoms are very reactive and combine with the



in air to produce ozone.



(ii)

The ozone formed in the above reaction (ii) reacts rapidly with the NO(g) formed in the reaction (i) to regenerate



.



is a brown gas and at sufficiently high levels can contribute to haze.



Ozone is a toxic gas and both



and



are strong oxidizing agents and can react with the unburnt hydrocarbons in the polluted air to produce chemicals such as formaldehyde, Acrolein and peroxyacetyl nitrate (PAN) etc.

Question 11

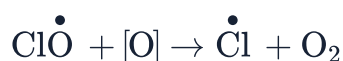
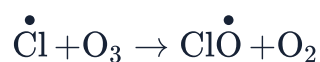
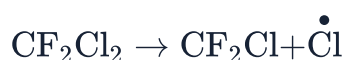
Which of the following statements is correct?

- (i) Ozone hole is a hole formed in the 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 the ozone layer of the stratosphere at some places.
- (iv) Ozone hole means vanishing of the ozone layer around the earth completely.

Solution

Ans: Option (iii) Ozone hole is thinning of the ozone layer of the stratosphere at some places is correct since it was found that a unique set of conditions were responsible for the ozone hole. In summer, nitrogen dioxide and methane react with chlorine monoxide and chlorine atoms forming chlorine sinks, preventing much ozone depletion, whereas in winter, special types of clouds called polar stratospheric clouds are formed over Antarctica.

Following reactions occur in the stratosphere.



Question 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



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.

Solution

Ans: Option (iv) Using plastic cans for neatly storing substances is correct since use of plastic cans for neatly storing substances will not come under green chemistry because plastic is non-biodegradable and causes pollution.

Multiple Choice Questions (Type-II)

Question 13

Which of the following conditions shows the polluted environment?

- (i) pH of rainwater is 5.6.
- (ii) amount of carbon dioxide in the atmosphere is 0.03%.
- (iii) biochemical oxygen demand 10 ppm.
- (iv) eutrophication.

Solution

Ans: Options (iii) and (iv) are correct since clean water has BOD less than 5 ppm and polluted water has BOD value higher than 5 ppm. So, 10 BOD means highly polluted water. This process in which nutrient enriched water bodies support a dense plant population, which kills animal life by depriving it of oxygen and results in subsequent loss of biodiversity is termed as Eutrophication.

Question 14

Phosphate containing fertilizers 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.

Solution

Ans: Options (i) and (ii) are correct since fertilizers contain phosphates as additives. The addition of phosphates in water enhances the growth of the algae. Such profuse growth of algae covers the water

surface and reduces the oxygen concentration in water.

Question 15

The acids present in acid rain are _____.

(i) Peroxyacetyl nitrate

(ii)



(iii)



(iv)

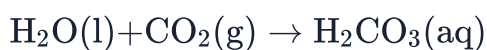


Solution

Ans: Options (ii), (iii) and (iv) are correct since rainwater has a pH of 5.6 due to the presence of



ions formed by the reaction of rainwater with carbon dioxide present in the atmosphere. The reactions can be shown as-



If the pH of the rainwater falls below 5.6 then it is known as acid rain.



and



after oxidation and reaction with water are major contributors to the acid rain.



Question 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.

Solution

Ans: Options (i) and (ii) are correct since 75% of the solar energy reaching the earth is being absorbed by the earth's surface and this increases its temperature. The rest of the heat radiates back to the atmosphere. The average global temperature will increase to a level, and this leads to melting of polar ice caps and flooding of low-lying areas all over the earth. Increase in the global temperature increases the incidence of infectious diseases like malaria, dengue, yellow fever etc.

Short Answer Questions

Question 17

Greenhouse effect leads to global warming. Which substances are responsible for greenhouse effect?

Solution

Ans: Apart from carbon dioxide gas other greenhouse gases are methane, water vapour, oxides of sulphur, nitrous oxide, CFCs, and ozone. Methane is found to be produced naturally when vegetation is burnt, digested, or rotted in the absence of oxygen. Large amounts of methane are released in paddy fields, coal mines, from rotting garbage dumps and by fossil fuels. Chlorofluorocarbons (CFCs) are man-made industrial chemicals used in air conditioning etc. CFCs are also damaging the ozone layer. Nitrous oxide occurs naturally in the environment but is increasing day by day by human activities.

Question 18

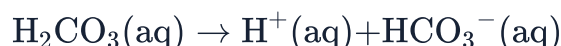
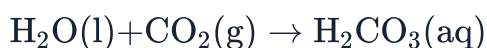
Acid rain is known to contain some acids. Name these acids and where from they come in rain?

Solution

Ans: Rainwater has a pH of 5.6 due to the presence of



ions formed by the reaction of rainwater with carbon dioxide present in the atmosphere. The reaction can be shown as-



If the pH of the rainwater falls below 5.6 then it is known as acid rain.



and



after oxidation and reaction with water are major contributors to the acid rain.



Question 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?

Solution

Ans: The atmosphere is divided into certain levels like troposphere, stratosphere, mesosphere, and thermosphere. The stratosphere consists of a considerable amount of ozone, and this protects us from the harmful ultraviolet radiations coming from the sun. These radiations cause skin cancer in humans. So, it is important to maintain the ozone shield. The main reason for ozone layer depletion is believed to be the release of chlorofluorocarbon compounds (CFCs), also known as Freon. UV radiation can cause genetic mutation and destroy crops, aquatic plants and animals are also affected by ultraviolet radiations.

Question 20

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

Solution

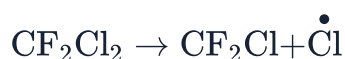
Ans: The bacteria is held responsible for degrading biodegradable detergent feed on it and grows rapidly. While growing, they may use up all the oxygen dissolved in the water. The lack of oxygen kills all other forms of aquatic life such as fish and plants. Fertilizers contain phosphates as additives. The addition of phosphates in water further enhances algae growth. Such profuse growth of algae covers the water surface and reduces the oxygen concentration in water.

Question 21

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

Solution

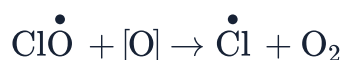
Ans: In the stratosphere, chlorofluorocarbons get broken down by powerful UV radiations, releasing chlorine free radical. This can be shown as-



This chlorine radical then reacts with stratospheric ozone to form chlorine monoxide radicals and molecular oxygen. The reaction involved is-



Reaction of chlorine monoxide radical with atomic oxygen produces more chlorine radicals and can be shown as-



This shows that chlorine radicals are continuously regenerated and cause the breakdown of ozone. Hence, CFCs are transporting agents for continuously generating chlorine radicals into the stratosphere and damaging the ozone layer.

Question 22

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

Solution

Ans: This is observed that the improper disposal of wastes is one of the major causes of environmental pollution. Whenever domestic waste is not properly managed, it goes to the sewers and is eaten by cattle. Non-biodegradable wastes like metals, glass etc, choke the sewers or gut of the ruminants also many a times polythene bags are swallowed by cattle resulting in their deaths. Similarly, when industrial waste is not properly managed it leads to the air, water, and soil pollution.

Question 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?

Solution

Ans: The domestic wastes and organic compounds such as detergents provide nutrients to enhance the growth of algae and aquatic plants. These are decomposed by bacteria and give unpleasant odour. This process is being termed as eutrophication.

Question 24

What are biodegradable and non-biodegradable pollutants?

Solution

Ans: The pollutants which get decomposed by bacteria like waste of vegetable and fruits, sewage, cow dung etc. are known as biodegradable pollutants. Non-biodegradable pollutants are those which do not get decomposed by bacteria e.g., mercury, polythene, aluminium, DDT etc.

Question 25

What are the sources of dissolved oxygen in water?

Solution

Ans: The oxygen reaches water through the atmosphere or by the process of photosynthesis carried out by green plants during daytime. But, during night as photosynthesis stops, the plants continue to respire, resulting in the reduction of dissolved oxygen. This dissolved oxygen is even used by microorganisms to oxidize organic matter. The sources of dissolved oxygen in water can be

- (i) Photosynthesis by aquatic plants.
- (ii) Due to the direct contact of the water surface with air.
- (iii) Mechanical aeration.

Question 26

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

Solution

Ans: The amount of BOD of water is the amount of organic material present in water in terms of how much oxygen will be required to break it down biologically. Clean water has a BOD value less than 5 ppm. While highly polluted water has a BOD value of 17 ppm or more.

Question 27

Why does water covered with excessive algal growth become polluted?

Solution

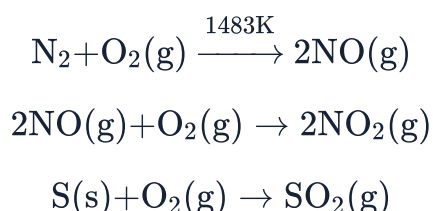
Ans: Due to the excessive growth of algae water contains a lot of phosphate due to the inflow of the fertilizers from the surroundings. The decomposition of algae leads to the bad smell and taste and even makes it unfit for drinking, bathing, washing, swimming, boating etc. and concentration of dissolved oxygen also decreases which may be harmful for aquatic life.

Question 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.

Solution

Ans: The symptoms which were observed in the village indicate that oxides of sulphur and nitrogen are released from the chimneys of the factory. These gases are obtained as the product of combustion of fossil fuels such as coal, gasoline etc. In an automobile engine, at high temperature, when fossil fuel is burnt, dinitrogen and dioxygen get combined to give significant quantities of nitric oxide and nitrogen dioxide. The chemical reactions can be given as-



Question 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 this happens. Give chemical reactions for the conversion of



into



.

Solution

Ans: The uncatalyzed oxidation of



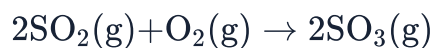
is a slow process. However, the presence of particulate matter in the polluted air catalyses the oxidation of



to



. The reaction for the conversion can be given as-



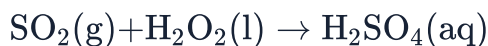
The reaction can be promoted by



or by



.



Question 30

From where does ozone come in the photochemical smog?

Solution

Ans:



absorbs energy from sunlight and breaks up into nitric oxide and free oxygen atom and this can be shown as-



Here the oxygen atom produced is very reactive and combines with oxygen molecule in the air to give rise to ozone.



Here 'M' is an inert gas like Nitrogen gas and ozone gets produced during the formation of smog.

Question 31

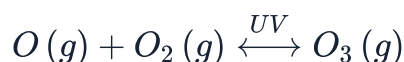
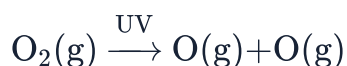
How is ozone produced in the stratosphere?

Solution

Ans: Ozone in the stratosphere is formed when UV radiation falls on the dioxygen (



) molecules. The UV radiations split apart molecular oxygen into free oxygen (O) atoms, these oxygen atoms combine with molecular oxygen to form ozone. The reactions involved can be given as-

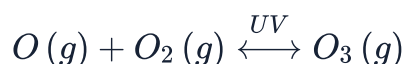
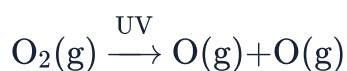


Question 32

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

Solution

Ans: Ozone is found to be thermodynamically unstable and undergoes decomposition into molecular oxygen and a dynamic equilibrium exists between the production and decomposition of ozone. The reactions involved can be shown as-



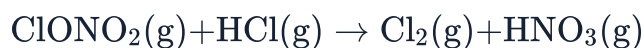
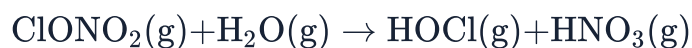
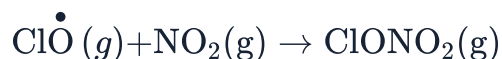
Question 33

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?

Solution

Ans: Scientists working in the Antarctica region reported that depletion of the ozone layer is commonly termed as an ozone hole over the South Pole in the Antarctic region. It was observed that a unique set of conditions were responsible for the ozone hole. In summer, nitrogen dioxide and methane react with chlorine monoxide and chlorine atoms forming chlorine sinks, preventing much ozone depletion, whereas in winter, special types of clouds called polar stratospheric clouds are formed over Antarctica.

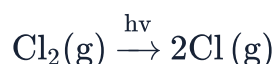
These polar stratospheric clouds provide a surface on which chlorine nitrate gets hydrolysed to form hypochlorous acid. It also reacts with hydrogen chloride produced to give molecular chlorine.



When sunlight returns to the Antarctica in the spring, then the sun's warmth breaks up the clouds and HOCl and



are photolyzed in the presence of sunlight. The chlorine radicals thus formed, initiate the chain reaction for ozone depletion. and the reactions can be given as-



Question 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?

Solution

Ans: Excessive amount of sulphate (i.e., greater than 500 ppm) in drinking water causes laxative effect, otherwise at moderate levels it is harmless.

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

Question 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

Solution

Ans:

Column I	Column II
(i) Acid rain	(c) CO_2 , (d) SO_2
(ii) Photochemical smog	(d) SO_2 , (e) Unsaturated hydrocarbons
(iii) Combination with haemoglobin	(b) CO

(iv) Depletion of ozone layer	(a) $\text{CHCl}_2 \leftrightarrow \text{CHF}_2$
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Question 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.

Solution

Ans:

Column I	Column II
(i) Oxides of sulphur	(d) respiratory diseases
(ii) Nitrogen dioxide	(e) Red haze in traffic and congested areas.
(iii) Carbon dioxide	(a) Global warming
(iv) Nitrate in drinking water	(c) 'Blue baby' syndrome
(v) Lead	(b) Damage to kidney

Question 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 humans.
(v) Using chlorofluorocarbon compounds for cleaning computer parts	(e) Classical smog, acid rain, water pollution, induce breathing problems, damage to buildings, corrosion of metals.

Solution

Ans:

Column I (Activity)	Column II (Effect)
(i) Releasing gases to the atmosphere after burning waste material containing Sulphur.	(e) Classical smog, acid rain, water pollution, induce breathing problems, damage to buildings, corrosion of metals.
(ii) Using carbamates as pesticides	(d) May cause nerve diseases in humans.

(iii) Using synthetic detergents for washing clothes	(a) Water pollution.
(iv) Releasing gases produced by automobiles and factories in the atmosphere.	(b) Photochemical smog, damage to plant life, corrosion to building material, induce breathing problems, water pollution.
(v) Using chlorofluorocarbon compounds for cleaning computer parts	(c) Damaging ozone layer.

Question 38

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

Column I	Column II
(i) Phosphate fertilizers 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

Solution

Ans:

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

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.

Question 39

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

Reason (R): Greenhouse 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.

Solution

Ans: Option (iii) i.e., Both A and R are not correct is the answer since in cold places, sunlight required to grow plants is less. Due to which plants are kept in a glass house so that sunlight enters in the greenhouse to heat up the soil and plants. The warm soil and plants emit infrared radiations which are partially absorbed and partially reflected by the glass.

Question 40

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

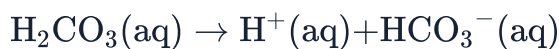
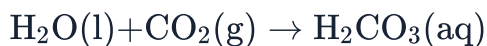
Reason (R): Carbon dioxide present in the atmosphere dissolves in rainwater and forms carbonic acid.

- (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.

Solution

Ans: Option (ii) i.e., Both A and R are correct, but R is not the correct explanation of A is the answer the pH of rainwater is 5.6 because of the presence of hydronium ions produced due to the dissolution of

carbon dioxide in rainwater from atmosphere and when the pH of rainwater drops from 5.6, it is being referred as acid rain. This can be shown as-



Question 41

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

Reason (R) : Photochemical smog contains



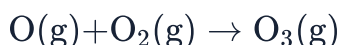
and



, 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.

Solution

Ans: Option (i) i.e., Both A and R are correct, and R is the correct explanation of A is the answer since a photochemical smog has high concentration of oxidizing agents and is known as oxidizing smog. Two of the pollutants that are emitted are hydrocarbons (unburned fuels) and nitric oxide (NO). When these pollutants build up to sufficiently high levels, a chain reaction occurs from their interaction with sunlight in which NO is converted into nitrogen dioxide and this in turn absorbs energy from the sunlight and breaks up into nitric oxide and free oxygen atoms. This is shown as-



Question 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.

Solution

Ans: Option (ii) i.e., Both A and R are correct, but R is not the correct explanation of A is the answer since the increased amount of carbon dioxide in the air is the main cause for global warming. Excess of carbon dioxide gets released into the atmosphere and is removed by green plants which maintains an appropriate level of carbon dioxide into the atmosphere.

Question 43

Assertion (A) : Ozone is destroyed by solar radiation in the 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.

Solution

Ans: Option (iv) i.e., A is not correct, but R is correct since ozone in the stratosphere is a product of ultraviolet radiations falling on oxygen molecules. The main cause of ozone layer depletion is the release of CFCs i.e., freons. With the depletion of the ozone layer, more ultraviolet radiation filters into the troposphere. These radiations lead to ageing of skin, cataract, sunburn, skin cancer etc.

Question 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.

Solution

Ans: Option (i) i.e., Both A and R are correct, and R is the correct explanation of A is the answer since pesticides are the synthetic toxic chemicals with ecological repercussions and their repeated use gives rise to pests that are resistant to that group of pesticides and hence making the pesticides ineffective. Therefore, as insect resistance of DDT increased, other organic toxins such as Aldrin and Dieldrin got introduced in the market by the pesticide industry. Most of the organic toxins are water insoluble and are non-biodegradable.

Question 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.

Solution

Ans: Option (iii) i.e., Both A and R are not correct since the amount of oxygen required by bacteria to breakdown the organic matter present in a certain volume of a sample of water, is called BOD i.e., Biochemical Oxygen Demand. If the BOD of the water is < 5 ppm then it is clean but if it increases then the water pollution increases.

Long Answer Questions

Question 46

How can you apply green chemistry for the following:

- (i) to control photochemical smog.
- (ii) to avoid use of halogenated solvents in dry cleaning and that of chlorine in bleaching.
- (iii) to reduce use of synthetic detergents.
- (iv) to reduce the consumption of petrol and diesel.

Solution

Ans: Many techniques are used to control or reduce the formation of photochemical smog.

(1) If we control the primary precursors of photochemical smog, such as nitrogen dioxide and hydrocarbons, the secondary precursors such as ozone and PAN of the photochemical smog will automatically get reduced.

(2) Mostly catalytic converters are used in automobiles to prevent the release of nitrogen oxide and hydrocarbons to the atmosphere.

(3) Certain plants e.g., Pinus, Juniparus, Quercus, Pyrus and Vitis metabolise nitrogen oxide and hence their plantation could help in this.

Ans: The organic solvents like- benzene, carbon tetrachloride , toluene etc., are highly toxic in nature. Everyone needs to be careful while using them. For bleaching the cloth hydrogen peroxide is used which is not harmful. Earlier chlorine was used for bleaching the clothes.

Ans: The synthetic detergents are found to be non-biodegradable and hence their use in daily life is to be avoided. Good quality soaps need to be prepared from vegetable oil as they are biodegradable in nature.

Ans: In place of petrol and diesel, the use of CNG and LPG should be preferred as they are pollution free fuels. The other sources such as hydrogen, ethanol etc. can also be used in place of petrol and diesel.

Question 47

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

Solution

Ans:



gas is confined to the troposphere only and it forms nearly 0.03 per cent by volume of the atmosphere. With the increased use of fossil fuels, a large amount of carbon dioxide gets released into the atmosphere. Excess of carbon dioxide in the air is removed by the green plants and this maintains an appropriate level of it in the atmosphere. Green plants require carbon dioxide for the process of photosynthesis and which in turn emits oxygen, thus maintaining the balance in nature. Deforestation

and the burning of fossil fuels increase the level of carbon dioxide, and this disturbs the balance in the atmosphere. The increased amount of carbon dioxide in the air is mainly responsible for global warming.

Question 48

Explain how greenhouse effect causes global warming.

Solution

Ans: Since the earth's surface is heated by the sunlight, it radiates a part of this energy back to the space as longer Infrared wavelengths and some of the heat gets trapped by CFCs and water vapours present in the atmosphere. They absorb IR radiations and block a large portion of earth's emitted radiations. This radiation, absorbed, is partly remitted to the earth's surface. Therefore, the earth's surface gets heated up by the phenomenon called greenhouse effect. Thus, the greenhouse effect is defined as the heating up of the earth's surface due to trapping of infrared radiations reflected by the earth's surface by the carbon dioxide layer in the atmosphere. So, the heating up of the earth through the greenhouse effect is called global warming.

Question 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 a large number of pesticides had accumulated in the tissues of fishes. Explain how did this happen?

Solution

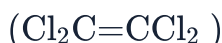
Ans: Pesticides can be defined as the synthetic toxic chemicals which are meant to kill pests. Most of the organic toxins are water insoluble and non- biodegradable in nature. These high persistent toxins are transferred from lower trophic level to the higher trophic level through the food chain. Over time, the concentration of toxins in higher animals reaches a level which merely causes serious metabolic and physiological disorders.

Question 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.

Solution

Ans: Tetrachloroethene



was earlier used as solvent for dry cleaning. This compound contaminates the groundwater and is also suspected carcinogen. The process using this compound is now being replaced by a process where liquefied



is used. Replacement of halogenated solvent by liquid carbon dioxide will result in less harm to the groundwater. These days, hydrogen peroxide is used for the purpose of bleaching clothes in the process of laundry, which gives better results and makes use of a lesser amount of water.

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