

Exercise :8 A**Page no: 131****1. Define the following terms****(i) pollution (ii) pollutant (iii) air pollution.****Solution:**

- i) Presence or introduction of harmful or poisonous substance into environment is called as pollution.
- ii) Toxic or harmful substances that have adverse effect on the environment and living beings are known as pollutants.
- iii) Degradation of air quality due to increase in concentration of harmful contaminants is called as air pollution.

2. Name any four gaseous pollutants.**Solution:**

Hydrogen sulphide, Carbon monoxide Nitrogen oxide, Sulphur dioxide.

3. Name the compounds of sulphur that cause air pollution. Also state the harmful effects of sulphur compounds.

Sulphur dioxide, Hydrogen sulphide and Sulphur trioxides are the compounds of sulphur that cause air pollution.

- Harmful effects of sulphur compounds are as follows
- Sulphur dioxide affects crop yield and causes damage to lungs. Sulphur dioxide affects crop yield and causes irritation to human eyes.
- Sulphur trioxide combines with water to form H_2SO_4 which causes acid rain.

4. State**i) natural sources of air pollution****ii) man-made sources of air pollution****Solution:**

- i) Volcanoes, decaying vegetation, forest fires and dust storms.
- ii) Automobiles, factories, industrial processes and decay of crop residue in rural areas .

5.

a) How do oxides of nitrogen enter the atmosphere?

b) What are their harmful effects?

Solution:

a)

Oxides of Nitrogen enters the atmosphere in the following ways

On the burning of fuels in furnaces, the temperature increases. At high temperature, nitrogen and oxygen present in the air combine to form oxides of nitrogen.

Oxides of nitrogen are produced during the burning of fuel in an internal combustion engine. They enter the atmosphere as exhaust gases.

During thunderstorms, nitric oxide is formed by the reaction between atmospheric nitrogen and oxygen in the presence of electric discharge.

Nitric oxide further reacts with atmospheric oxygen and ozone to form nitrogen dioxide.

b) Following are the harmful effects caused by the oxides of nitrogen

- Nitrogen oxides causes irritation in mucous membrane.
- Large concentrations of Nitrogen oxide causes lungs problems in humans
- It causes injuries to vegetation by damaging leaves.
- Nitrogen oxide oxidises Hydrocarbons in the presence of sunlight, which causes eye irritation, asthma attacks, nasal and throat infections.

6. State the origin and health impact of smog.**Solution:**

Pollutant which is a combination of oxides of Nitrogen and Sulphur and partially of hydrocarbons produced by industries and automobiles. This forms a dark, thick soot laden fog know as smog.

Impacts of smog

- Smog is noxious and irritating
- Smog reduces visibility
- Smog causes respiratory problems
- Smog can cause suffocation and death.

7. What are the harmful effects of oxides of Sulphur?

Solution:

Below are the harmful effects of oxides of Sulphur

They cause headache, vomiting and even death due to respiratory failure.

Sulphur oxides destroy vegetation

They make buildings and constructions weak.

Sulphur oxides form smog when they combine with smoke.

Sulphur trioxide mixes with water to form sulphuric acid, which causes acid rain.

8. State the main sources and effects of carbon monoxide.

Solution:

Incomplete combustion of fuels in homes, factories and automobiles are the sources of carbon monoxide.

Below are the harmful effects caused by carbon monoxide.

- It decreases the oxygen-carrying capacity of the lungs.
- A high amount of Carbon-monoxide paralyses normal brain function.

9. Give the mechanism of the action of carbon monoxide.

Solution:

When we inhale carbon monoxide, it combines with haemoglobin which carries oxygen to tissues. Haemoglobin binds Carbon monoxide 200 times more strongly than it does with Oxygen. This reduces the Oxygen carrying capacity of the blood by converting Haemoglobin to carboxyhaemoglobin.

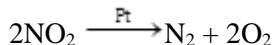
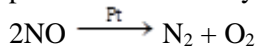
10. How can we control carbon monoxide poisoning?

Solution:

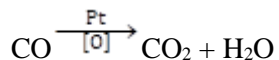
We control carbon monoxide poisoning by taking following measures.

- By switching over from internal combustion engines to electrically powered cars.
- Many pollution control devices are now installed in cars. Most of these devices help reduce pollution by burning gasoline completely. Complete combustion of gasoline produces only carbon dioxide and water vapour.

$$2C_8H_{18} + 5O_2 \rightarrow 16CO_2 + 18H_2O$$
- By using substitute fuels for gasoline: Natural gas in both compressed (CNG) and liquefied (LNG) forms is now increasingly being used as fuel. Alcohols are other feasible substitutes.
- By using catalytic converters:
 - Nitrogen oxide is reduced to nitrogen and oxygen in the presence of finely divided platinum or palladium as a catalyst.



ii. Carbon monoxide changes to carbon dioxide in the presence of finely divided platinum as catalyst.

**Exercise :8 B****Page no: 133****1. Why does rain water have p^H less than 7?****Solution:**

Carbon dioxide in the atmosphere combines with rain water to give carbonic acid which is acidic in nature. Hence the P^H of the rain water is acidic in nature.

2. pH of acid rain is sometimes as low as 2.**Solution:**

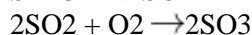
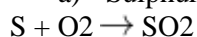
PH of rain water is neutral in nature but when rain comes rain water combine with Carbon dioxide in the atmosphere to form carbonic acid which reduces the P^H of rain water from 3.5 – 5.6 which sometime may reach as low as 2.

3. Explain the formation of acid rain due to:

- 1. Oxides of sulphur**
- 2. Oxides of nitrogen**

Solution:

a) Sulphur dioxide and Sulphur trioxide react with water to form H₂SO₄ which causes acid rain .



b) Nitrogen dioxide combines with water to form mixture of nitrous acid and nitric acid which causes acid rain.

4. What are the causes of acid rain?**Solution:**

Formation of mineral acids such as carbonic acid, nitric acid, nitrous acid and Sulphuric acid and their mixture with rain is the main cause of acid rain.

5. Give the impact of acid rain:

1. on plants
2. on soil
3. on water bodies

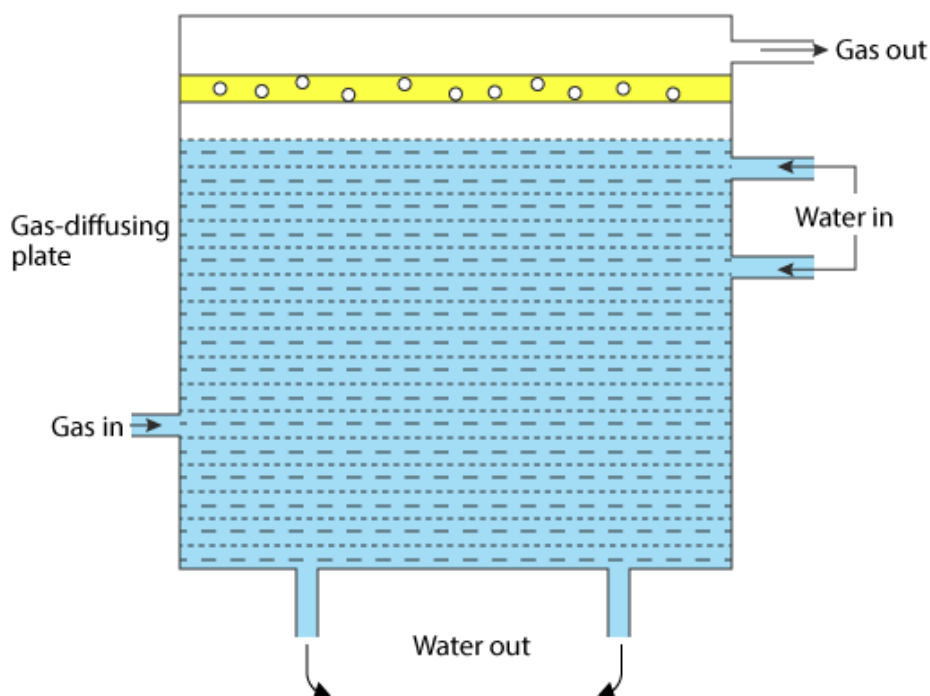
Solution:

Impact on acid rain are as follows

- 1) Acid rain causes nutrient loss and causes damage to leaves.
- 2) Acid rain results in calcium and potassium loss from soil which affects the soil fertility.
- 3) Acid rains make the water acidic which will affect the aquatic life adversely.

6. How does a scrubber help in reducing the formation of acid rain?**Solution:**

The impact of acid rain can be reduced by checking the root cause of acid rain, i.e. by reducing the emission of oxides of sulphur and nitrogen. This can be done by using coal or oil with low sulphur content. We can also reduce such emissions by using a scrubber, a device that absorbs gaseous pollutants. A scrubber used for removing sulphur dioxide from a smoke stack usually consists of a fine spray of water and gas rising from the stack, which is passed through the scrubber, when water absorbs sulphur dioxide. Thus the formation of this constituent of acid rain is reduced.



Exercise :8 C**Page no: 134****1. What do you understand by Green House effect?****Solution:**

Green house effect is the heating of earth and its environment as a result of trapping solar radiations by carbon dioxide and water vapour.

2. What are green house gases? How are they responsible for global warming?**Solution:**

Gases which contribute for the green house effect are called as green house gases. Green houses gases are carbon dioxide, water vapour, oxides of Nitrogen, methane, chloro fluoro carbons etc.

Mechanism:

Sunlight reaching Earth consists of three types of radiation-UV radiation, visible radiation and IR radiation. As sunlight passes through the atmosphere, most UV radiation is absorbed by ozone; 30% of IR radiation reaches the Earth's surface, heating it up. As the Earth's surface becomes hot, it starts emitting radiation with less energy than the incoming radiation and thus with longer wavelength. Some emitted IR radiation escapes from the Earth's surface and some are absorbed by CO₂, thus remaining on the Earth. Trapped radiation warms the Earth's surface and lower layers of the atmosphere.

3. State the sources and effects of the following gases:

- 1. Carbon dioxide**
- 2. Methane**
- 3. Water vapour**

Solution:**1. Carbon dioxide:**

- Burning of fossil fuels like Coal, natural gas and petroleum
- Industrial processes like manufacture of lime and these seen in fermentation units.
- Biological decay of plants
- Respiration by animals and humans beings

2. Methane

- During anaerobic decomposition of organic matter in soil, water and sediments.
- Incomplete combustion of fossil fuels.

3. Water vapour

- Burning of hydrocarbons

4. State the ways of reducing the presence of green house gases.**Solution:**

Below are a few steps to reduce the presence of greenhouse gases.

- Use of automobiles should be reduced by using public transport, bicycles and electric vehicles.
- Trees should be planted and grown
- Burning of dry leaves and wood should be avoided.
- Smoking should be avoided
- Educate the people about the harmful effects caused by the greenhouse effect.

5. State the effects of green house gases on the atmosphere.**Solution:**

Effects of the greenhouse effect on the atmosphere are as follows.

- The rise in temperature:
- Greenhouse gases lead to an increase in temperature, which is called global warming.
- Increase in temperature leads to the melting of glaciers, and polar ice caps are taking place which is leading to an increase in the sea level. This poses a threat of floods in the coastal areas.
- Global warming increases the evaporation of water from water bodies which will increase water vapour in the atmosphere. Increase in water vapour further increases the temperature.
- Global warming leads to change in rain pattern, which in turn results in a climatic shift and adversely affects plants and animals.
- Greenhouses gases are responsible for ozone depletion

6. State the role of a greenhouse in growing plants.**Solution:**

Greenhouse gases increase the temperature of the earth to the optimum level. Temperature moderation provides a controlled environment for plants to grow and thrive.

7. Our atmosphere acts as a greenhouse. Explain.**Solution:**

Atmosphere comprises of greenhouse gases such as CO₂, water vapour, O₃, CH₄, oxides of nitrogen and CFCs. These greenhouse gases allow the sunrays to get trapped inside the earth. Sunlight reaching the Earth consists of three types of radiation-UV radiation, visible radiation and IR radiation. As sunlight passes through the atmosphere, most UV radiation is absorbed by ozone; 30% of IR radiation reaches the Earth's surface, heating it up. As the Earth's surface becomes hot, it starts emitting radiation with less energy than the incoming radiation and thus with a longer wavelength. Some emitted IR radiation escapes from the Earth's surface and some are absorbed by CO₂, thus staying in the Earth. Trapped radiation warms the Earth's surface and lower layers of the atmosphere. Thus atmosphere acts as a greenhouse.

8. How can we reduce global warming?**Solution:**

We can reduce global warming by taking the following measures.

- Use of automobiles should be reduced by using public transport, bicycles and electric vehicles.
- Trees should be planted and grown
- Burning of dry leaves and wood should be avoided.
- Smoking should be avoided
- Educate people about the harmful effects caused by global warming.

Exercise :8 D**Page no: 137****1. What is a pollutant?****Solution:**

Toxic or harmful substances that have adverse effect on the environment and living beings are known as pollutants.

2. What is the effect of the following pollutants on living beings (one in each case)?

- a. Fluorides**
- b. Smoke particles**
- c. Lead**
- d. Mercury compounds**
- e. Smog**
- f. Nitrogen oxide**

Solution:

- a. Fluorides adversely affect teeth and bone
- b. Smoke particles cause asthma and other respiratory diseases.
- c. Lead impairs our metabolic process, thereby affecting our health
- d. Mercuric compounds cause Minamata disease
- e. Smog can cause respiratory diseases and also leads to suffocation.
- f. Nitrogen oxides cause cancer in humans.

3. What is air pollution? How does this pollution take place?

Solution:

Degradation of air quality due to the increase in the concentration of harmful contaminants is called air pollution.

Air pollution takes place due to the presence of gaseous pollutants such as oxides of sulphur, hydrocarbons, smoke, oxides of carbon, oxides of nitrogen, dust and particulate pollutants such as mist, spray and fumes. Air pollution takes place because of the burning of fossil fuels, the release of industrial waste as gases.

4. What are the components of clean, dry air?

Solution:

Pure Air Components	By Volume (% Proportion)	Concentration (ppm)
Nitrogen	78.09	780900
Oxygen	20.94	209400
Inert gases		
Argon	0.93	9300
Neon		18
Helium		5
Krypton		1
Xenon		1
Carbon dioxide	0.03	315
Methane		1
Hydrogen		0.5
Natural pollutants		
Oxides of Nitrogen		0.52
Ozone		0.52

5. Name some particulate pollutants.

Solution:

Dust, smoke, mist, spray and fumes are examples of some particulate pollutants.

6. Why is cigarette-smoking harmful?

Solution:

Cigarette smoking is harmful because it increases the environmental pollution and smoking causes asthma, respiratory diseases and cancer in humans.

7. What is smog? State its damaging effects.**Solution:**

Pollutant which is a combination of oxides of Nitrogen and Sulphur and partially of hydrocarbons produced by industries and automobiles. This forms a dark, thick soot laden fog known as smog.

Impacts of smog

- Smog is noxious and irritating
- Smog reduces visibility
- Smog causes respiratory problems
- Smog can cause suffocation and death.

8. What do you understand by ppm?**Solution:**

ppm is parts per million. It describes the concentration of a substance.

9. Describe the major air pollutants. How does carbon monoxide pollute our environment?**Solution:**

Major air pollutants are a. Sulphur dioxide b. Hydrogen sulphide c. Fluorides d. Nitrogen oxides e. Carbon monoxide f. Lead g. cotton dust particles h. smog h. Nitric oxides j. sulphur oxides.

Carbon monoxide combines with atmospheric oxygen to increase carbon dioxide concentration in the atmosphere. This will adversely affect the environment by leading to global warming and ozone depletion. Thus, carbon monoxide pollutes our environment

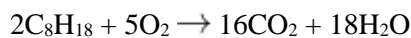
10. How do you propose to control:

- a. carbon monoxide emission**
- b. SO_x emission**

Solution:

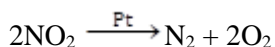
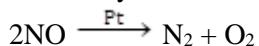
a. Carbon monoxide pollution can be controlled in the following ways:

- By switching over from internal combustion engines to electrically powered cars.
- Many pollution control devices are now installed in cars. Most of these devices help reduce pollution by burning gasoline completely. Complete combustion of gasoline produces only carbon dioxide and water vapour.

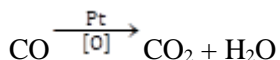


- By using substitute fuels for gasoline: Natural gas [both compressed (CNG) and liquefied (LNG)] is now increasingly being used as fuel. Alcohols are other feasible substitutes.

- By using catalytic convertors
- Nitrogen oxide is reduced to nitrogen and oxygen in the presence of finely divided platinum or palladium as a catalyst.



- Carbon monoxide changes to carbon dioxide in the presence of finely divided platinum as a catalyst.



b. Oxides of sulphur emission can be reduced,

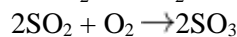
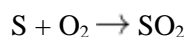
- By using coal or oil which has low sulphur content.
- By using a scrubber, a device which absorbs gaseous pollutants.

11. Give the composition, causes and effects of acid rain.

Solution:

Composition:

Sulphur dioxide and Sulphur trioxide react with water to form H₂SO₄ which causes acid rain .



Causes:

Fossil fuels contain compounds of Nitrogen, Sulphur, and Carbon. A large amount of oxides of Nitrogen, Sulphur, and Carbon are discharged into the atmosphere. These oxides dissolve in rain water to form mineral acids like carbonic acid, nitric acid, and sulphuric acid. These mineral acids are the main causes of acid rain.

Effects:

- 1) Acid rain causes nutrient loss and causes damage to leaves.
- 2) Acid rain results in calcium and potassium loss from the soil, which affects soil fertility.
- 3) Acid rains make the water acidic, which will affect the aquatic life adversely.

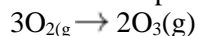
12. Explain the effect of sulphur dioxide on the atmosphere.**Solution:**

Effects of Sulphur dioxide on the atmosphere are as follows

- It destroys vegetation and weakens building materials and constructions
- It mixes with the smoke to form smog, which is harmful to the environment and living beings.
- Sulphur dioxide combines with atmospheric oxygen to form Sulphur trioxide, which causes acid rain.

13. Explain the formation of ozone in the atmosphere.**Solution:**

In the atmosphere, ozone is formed by the action of ultraviolet rays of the Sun on oxygen.



Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen molecule. The higher energy UV radiation split apart some molecular oxygen into free oxygen atoms. These atoms then combine with the molecular oxygen to form ozone.

14. What is the function of ozone in the atmosphere?**Solution:**

Following are the functions of ozone in the atmosphere

- Ozone acts as a blanket in the atmosphere above 16 km from the earth's surface.
- Ozone absorbs the harmful UV rays coming from the sun and prevents them from reaching the earth's surface. Thus it protects the life on earth from harmful effects of ultra-violet rays than can cause skin cancer.

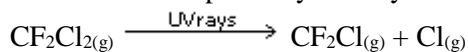
15. State the chemicals responsible for ozone layer destruction.**Solution:**

Chemicals responsible for destruction of the ozone layer:

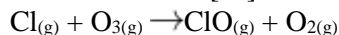
(1) Excessive use of CFCs:

CFCs enter the atmosphere because of their excessive use in solvents, aerosol sprays, propellants, refrigerants and blowing agents for plastic foams.

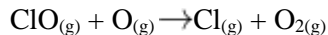
CFCs are decomposed by UV rays to highly reactive chlorine which is produced in the atomic form.



This free radical [Cl] reacts with ozone, and chlorine monoxide is formed.



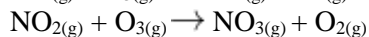
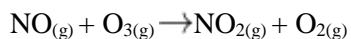
This causes depletion of ozone, and chlorine monoxide further reacts with atomic oxygen to produce more free radicals of chlorine.



Again this free radical [Cl] destroys ozone, and the process continues giving rise to large-scale ozone depletion.

(2) Fuel of planes:

When the fuel of planes burns, a large quantity of nitric oxide and other gases is emitted in the atmosphere. Nitric oxide reacts with ozone to form nitrogen dioxide and nitrogen trioxide.



This also causes depletion of ozone.

16. Name any two:

a. Natural sources of atmospheric pollution.

b. Gases which are responsible for the formation of acid rain.

Solution:

a. Decay of plants and animals
Disintegration of rocks and soil

b. SO_2 and NO_2 are gases responsible for acid rain

17. Explain the term 'global warming'. State two ways by which global warming can be reduced.

Solution:

Global warming is the increase in temperature of Earth due to enhanced concentration of greenhouse gases (CFCs) in the atmosphere.

- Use of automobiles should be reduced by using public transport, bicycles and electric vehicles.
- Trees should be planted and grown
- Burning of dry leaves and wood should be avoided.
- Smoking should be avoided
- Educate people about the harmful effects caused by global warming.

18. State two effects of ozone depletion.

Solution:

Effects of ozone depletion are as follows

- It causes respiratory problems
- It damages plants and trees.

19. What is the cause of acid rain? Give any two impacts of acid rain.

Solution:

Fossil fuels contain compounds of Nitrogen, Sulphur, and Carbon. A large amount of oxides of Nitrogen, Sulphur, and Carbon are discharged into the atmosphere. These oxides dissolve in rain water to form mineral acids like carbonic acid, nitric acid, and sulphuric acid. These mineral acids are the main causes of acid rain.

- 1) Acid rain causes nutrient loss and causes damage to leaves.
- 2) Acid rain results in calcium and potassium loss from the soil, which affects soil fertility.
- 3) Acid rains make the water acidic, which will affect the aquatic life adversely.

20. Explain the methods of preventing acid rain.

Solution:

Following are the methods to prevent acid rain

- By reducing the emission of Sulphur and Nitrogen oxides.
- By using a scrubber for removing sulphur dioxide from smoke.

21. State an advantage of CNG (Compressed Natural Gas).

Solution:

CNG is a complete fuel, and it burns without soot and emission of greenhouse gases.

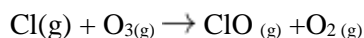
22. State how CFC break ozone layer.

Solution:

CFC'S are decomposed by UV rays to highly reactive chlorine, which is produced in its atomic form.



This free radical of chlorine reacts with ozone to form chlorine monoxide



This causes Ozone depletion.

23. Describe the methods of saving ozone layer.

Solution:

Following are the methods to protect the Ozone layer

- Using alternative products such as HCFCs (hydrochlorofluorocarbons)
- Montreal Protocol, an international treaty, helps prevent ozone depletion.

24. Fill in the blanks:

The pollutants such as NO_2 , SO_2 and SO_3 dissolved in the moisture of air are the cause of _____.

Excessive release of carbon dioxide in the atmosphere is the cause of _____ effect which produces global warming.

The ozone layer prevents the harmful _____ radiation of the sun to reach the earth.

Decrease of the concentration of ozone in the stratosphere is the cause of formation of _____ holes.

Ozone depletion is mainly caused by the active _____ atoms generated from CFC in the presence of UV radiation.

Solution:

The pollutants such as NO_2 , SO_2 , and SO_3 dissolved in the moisture of air are the cause of **acid rain**.

Excessive release of carbon dioxide in the atmosphere is the cause of **greenhouse** effect which produces global warming.

The ozone layer prevents the harmful **ultraviolet** radiation of the sun to reach the earth.

Decrease of the concentration of ozone in the stratosphere is the cause of formation of **ozone** holes.

Ozone depletion is mainly caused by the active **chlorine** atoms generated from CFC in the presence of UV radiation.

25. Select the correct answer:

a) Excessive release of carbon dioxide in the atmosphere is the cause of

- Depletion of ozone
- formation of polar vortex
- global warming
- formation of smog

b) Inhalation of air polluted with carbon monoxide is dangerous because:

- CO combines with O_2 dissolved in blood.
- CO combines with haemoglobin of blood.
- CO removes water from the body and causes dehydration.
- CO causes coagulation of proteins in the body

- c) Decrease of amount of ozone in stratosphere is called depletion of zone and it is caused by
- i) UV radiations of sun
 - ii) Use of CFC compounds
 - iii) excessive use of detergents
 - iv) Use of polychlorinated biphenyls

Solution:

- a) (iii) global warming
- b) (ii) CO combines with haemoglobin of blood.
- c) (ii) Use of CFC compounds