

CHAPTER 8 ATMOSPHERIC POLLUTION

EXERCISE 8A

Q.1 Define the terms:

(i) Pollution (ii) Pollutant (iii) Air Pollution.

Ans. (i) Pollution : “Is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings”

(ii) Pollutant : “Undesirable matter present in excess in the environment” is called pollutant.

(iii) Air Pollution : Air pollution means degradation of air quality due to concentration of harmful contaminants that affects human, plant and animal lives.

Q.2 Name any four gaseous pollutants.

Ans. Four gaseous pollutants are oxides of sulphur, nitrogen, carbon and hydrocarbons.

Q.3 Name the compounds of sulphur that causes air pollution. Also state the harmful effects of Sulphur compounds.

Ans. SO_2 (Sulphur Di Oxide), SO_3 (Sulphur Trioxide) and H_2S (Hydrogen Sulphide)

Harmful Effects

SO_2 (Sulphur Di oxide) – SO_2 causes headache, vomiting and even death because of respiratory ailments in humans.

It destroys vegetation and weakens building material.

It mixes with smoke and fog to form smog which is very harmful.

SO_3 (Sulphur Tri Oxide) – SO_3 combines with water of atmosphere to form sulphuric acid (H_2SO_4) which falls on soil in the form of acid rain and attacks the limestone and materials of the buildings and bridges. Taj Mahal at Agra is facing this problem.

H_2S (Hydrogen Sulphide) – It causes nausea and irritates the eye and throat. It also destroys vegetable matter as it is acidic in nature.

Q.4 State the

(i) natural sources of air pollution

(ii) man-made source of air pollution

Ans. (i) Natural sources of air pollution: Volcanoes, forest fire, vegetation decay, wind, dust storm carrying sand.

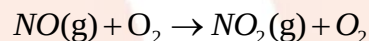
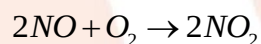
(ii) Man-made resources of air pollution: Factories, decay of crop residue, automobiles, industries processes.

Q.5 (a) How do oxides of nitrogen enter the atmosphere?

(b) What are their harmful effects?

Ans. Nitric oxide(NO) and nitrogen di oxide(NO₂) enter into the atmosphere in following ways.

- (i) On burning the fuels high temperature is produced, at high temperature nitrogen and oxygen present in the air combines to form oxides of nitrogen.
- (ii) When fuels burns, oxides of nitrogen enter the atmosphere as the exhaust gases of automobile engines.
- (iii) Nitric acid is formed by the reaction between nitrogen and oxygen of the air in the presence of electric discharges of thunder storm.
- (iv) The nitric further reacts with atmospheric oxygen (O₂) and (O₃) to form nitrogen dioxide.



Harmful effects of 2 oxides of nitrogen

Nitric Oxide (NO) is less toxic and thus it is less harmful but nitrogen di oxide(NO₂) is harmful to both living and non-living things.

1. It causes in mucous of nitrogen
2. Large concentration of NO₂ may lead to serious lungs.
3. Nitrogen di oxide cause serious injury to vegetation as it damage the leaf.

Q.6 State the origin and health impact of lead and smog.

Ans. Lead : It enters air from motor vehicles using using tetraethyl lead and damages the nervous and digestive systems and can cause cancer.

Smog : It is a combination of oxides of nitrogen and sulphur and of partially oxidized hydrocarbons and their derivatives produced by industries and automobiles from dark, thick dust, dust and soot laden fog.

Q.7 What are the Harmful Effects of Oxides of sulphur?

Ans. (i) SO_3 Combines with water of atmosphere to form Sulphuric Acid (H_2SO_4) which falls on the soil in the form of acid rain and also attacks the limestone.

(II) SO_2 causes headache, vomiting and even death because of respiratory ailments in humans.

It destroys vegetation and weakens building material.

It mixes with smoke and fog to form smog which is very harmful.

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

Ans. Sources of Carbon Monoxide : Due to incomplete combustion of petrol, diesel, wood and cigarettes.

Effects of (CO) : It reduces the oxygen carrying capacity in the blood, it combines with blood and forms carboxy haemoglobin. Its high concentration, CO may kill by paralysing the normal brain action.

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

Ans. Haemoglobin in blood normally carries oxygen to all tissues of the body, but CO passes to through the lungs directly into the blood stream and combines with haemoglobin and bind in over 200 times strongly as oxygen .A low concentration of carbon monoxide in the air has a greatly magnified effect on the body. It reduces the oxygen carrying capacity of blood by an equivalent amount to the haemoglobin converted into Carboxy Haemoglobin.

Haemoglobin + CO $\rightarrow$ Carboxy haemoglobin since the brain and heart are the 2 tissues most sensitive to oxygen depletion, they show the most serious effect from CO exposure.

Q.10. How can we control carbon monoxide poisoning?

Ans. Methods to control carbon monoxide poisoning.

- (i) To switch over from the internal combustion to engine from electrically powered cars.
- (ii) Complete combustion of petrol produces only CO_2 and water vapour, hence such devices are being installed in the latest models of cars.
- (iii) CNG, LNG should be used as fuels. Alcohols are also used.
- (iv) To use catalytic mufflers or converters also using lead free gasoline.

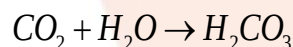
EXERCISE 8(B)

Q.1 Why rain water have pH less than 7?

Ans. Rain water is slightly acidic as CO_2 gas reacts with rainwater forming weak H_2CO_3 and pH has pH about 5.6 hence pH is less than 7.

Q.2 pH of acid rain is sometimes as low as 2 explain.

Ans. Normal rain is slightly acidic, having pH about 3.5 to 5.6; this is because of carbon dioxide reactions with it. During rain carbon dioxide reacts with it form weak carbonic acid.



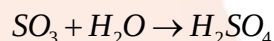
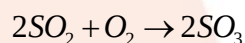
Sometimes pH can be as low as 2.

Q.3 Explain the formation of acid rain due to

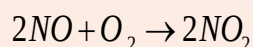
(i) oxides of sulphur

(II) oxides of nitrogen

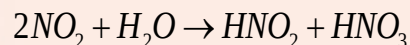
Ans. (i) Oxides of sulphur : SO_2 combines with oxygen of air to form SO_3



(ii) Oxides of nitrogen : In the atmosphere NO gets oxidized to NO_2



Which combines with rain water to form HNO_3



Q.4 What are the causes of acid rain?

Ans. SO_3 Combines with water of atmosphere to form Sulphuric Acid (H_2SO_4) which falls on the soil in the form of acid rain.

Q.5 Give the impact of acid rain : (i) on plants (ii) on soil (iii) on water bodies.

Ans. (i) Acid rains cause the easing o nutrients from plants and thus it damages the leaves of plants and trees

(ii) It removes calcium and potassium minerals i.e basic ingredients from the soil thus losing their fertility.

(iii) The water of lakes and rivers is becoming acidic, which may no longer support aquatic life.

Q.6 How a scrubber does helps in reducing the formation of the acid rains?

Ans. To reduce the formation of acidic rain, a scrubber (device that absorbs gaseous pollutants) is used. Gas arising from the stack is passed through the scrubber where water absorbs SO_2 . Thus constituent of acid rain is reduced.

EXERCISE 8(C)

Q.1 What do you understand by green House effect?

Ans. When the carbon dioxide and water vapors in the atmosphere trap the solar radiations which are reflected back by the earth's surface and cause the heating effect, that phenomenon is known as the green house effect.

Q.2 What are green house gases. How are they responsible for global warming?

Ans. Green House Gases: The gases like CO_2 , water vapour, oxides of nitrogen, O_3 , CH_4 , (CFC) chlorofluoro carbon which contribute to green house effect called Green House Gases.

Mechanism of Global Warming Effects: The sun light after passing the atmosphere reaches earth and heat earth's surface. UV radiations are absorbed by atmosphere. When earth's Surface become hot, it starts radiations longer wave length I R radiations. Some part of I R radiation is absorbed by CO_2 and this remains on earth. These trapped radiations warm the earth's surface and the lower atmosphere.

Q.3 State the source and effects of the following gases.

(i) Carbon dioxide (ii) Methane (iii) Water vapour.

Ans. (a) Sources of CO_2 : (a) Burning fossil fuels (coal, petrol, natural gas)
(b) Death and decay of plants and animals.
(c) In the process of Respiration by animals human being and plants.
(d) Industrial process such as manufacture of lime and other fermentation units.

Effect of CO_2 : (a) Green House (b) Global warming.

(ii) **Source Of Methane:** It is emitted in large quantities during anaerobic decomposition of organic matter in soil, water and sediments. Incomplete combustion of fossil fuels also emit hydrocarbons. **Effect of Methane** Green House Effect and Global warming.

(iii) **Source of water Vapours:** Main Source of water vapour is burning of hydrocarbons.

Effects of water vapours: Green House Effect and Global warming.

Q.4 State the effects of green house gases on the atmosphere.

Ans. Although green gases are important for the survival of life on earth, but there should be an optimum level of these gases. Even

- (a) We should use bicycles, public transport system or go for car pool to minimize the use of automobiles.
- (b) Avoid burning of dry leaves, wood crackers on festivals and marriages grow more tress.

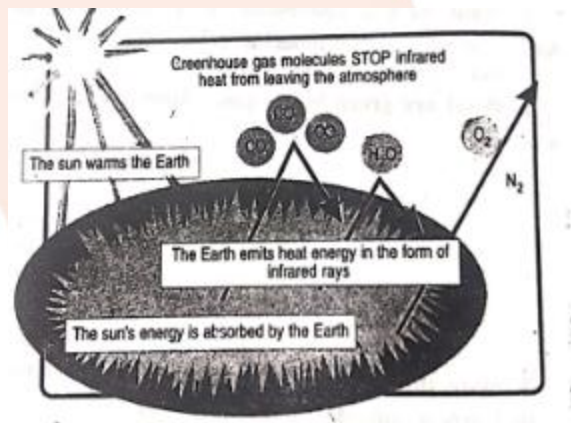
Q.5 Sate the effects of the green house gases on the atmosphere.

Ans. Effects of Green House on Atmosphere

- (a) It is due to green house effect that life is possible on earth without green house effect (green house gases) all the heat coming from sun would have escaped from the earth and it would have become cold and barren as moon
- (b) It is necessary for Evaporation of water and formation of clouds causing rain.

Q.6 Sate the role of green house in growing plants.

Ans. Green house effect is used in growing plants in colder regions of earth. Using green house (glass - structures), sun light reaches inside and IV radians are entrapped, thus heating up the green house.



Q.7 Our atmosphere acts as a green house. Explain.

Ans. Atmosphere act as Green House: Our atmosphere contains green house gases like CO_2 , water vapours O_3 , CH_4 , oxides of nitrogen, CFC etc and allows the sum rays to come in, become hot it start waves length. Emitted I R radiation escapes from the earth's surface. Some part of I R radiations are absorbed by CO_2 and this remain on the earth. These trapped radiations warm the earth's surface and the lower atmosphere.

Q.8 How can we reduce the global warming?

Ans. Global warming can be reduced by reducing the percentage of green house gases in the atmosphere.

Some measures to do so are:

- (a) We should use bicycles, public transport system or go for car pool to minimize the use of automobiles.
- (b) Avoid burning of dry leaves, wood, crackers on festivals and marriages grow more tress.

Exercise 8 (D)

Q.1 What is a pollutant?

Ans. Pollutant: the toxic substances that have an undesirable impact on different components of the environment and are injurious to life and property are known pollutant”.

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

(a) Fluorides

(b) Smoke particles

(c) Lead

(d) Mercury compounds

(e) smog

(f) Nitrogen Oxide.

Ans. Effect of pollutant on living beings

- a) Fluorides : effect teeth and bones
- b) Smoke particles: Cause asthma and lungs diseases.
- c) Lead: Damages the nervous and digestive system and can cause cancer.
- d) Mercury compounds: They cause disease like Minamata commonly found in fishermen.
- e) Smog: It reduces visibility and induces respiratory troubles.
- f) Nitrogen Oxide: Cause death of many plants.

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

Ans. Air Pollution: “Deterioration of quality of air around us is called air pollution.”

Air pollution takes place due to the presence of gaseous us is called air pollutants like oxides of sulphur, hydrocarbons smoke, oxides of carbon, oxides of nitrogen, dust, particular pollutants like mist, spray and fume.

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

Ans. Composition of clean dry air is:

Pure air components	(by volume percent)	Concentration ppm (part per million)
Nitrogen	78.09	780,900
Oxygen	20.94	209,400
Inert Gases		
Argon	0.93	9300
Neon		18

Helium	0.03	5
Krypton		1
Xenon		1
Carbon-dioxide		315
Methane		1
Hydrogen		0.5
Natural pollutants		
Oxides of nitrogen		0.53
Ozone		0.2

Q.5 Name some particle pollutants.

Ans. Smoke, dust, mist, dirt are some particular pollutants.

Q.6 Why cigarette smoking is harmful?

Ans. Cigarette contains tobacco which on burning produces harmful smoke. This can cause various lung diseases such as cancer and asthma.

Q.7 What is smog? State its damaging effects?

Ans. Smog: Smog is formed by the combination of nitrogen oxides, sulphur oxides and hydrocarbons which are partially oxidized. These are produced from smoke produced by various industrial machines and vehicles that contain soot.

Damaging Effect: Smog is irritating, allergic and noxious. It causes irritation in eyes, respiratory problems and may even cause death due to suffocation.

Q.8 What do you understand by ppm?

Ans. ppm stands for 'parts per million' i.e., share of a particle in 10,00,000 particles.

Q.9 Describe the major air pollutants. How does carbon monoxide pollute our environment?

Ans. Major air pollutants are: Carbon Monoxide, Sulphur dioxides, Chlorine, Hydrocarbons and their partial oxides, particulates and greenhouse gases are the major air pollutants.

Carbon Monoxide when released in air has effects on the greenhouse gases which disturb the temperature of the ecosystem.

Q.10 How do you propose to control.

(a) Carbon monoxide emission? (b) SO_x emission?

Ans. Control of: (i) CO Emission : Emission of CO can be controlled by:

- (a) Using electrical vehicles instead of gasoline/petrol/diesel vehicles.
- (b) Encouraging use of biofuels instead of gasoline.
- (c) By using convertors or catalytic mufflers.
- (d) By mandating the use of many pollution control devices that burn the fuel completely.
- (e) By using lead free petrol.

(ii) (SO_x) oxides of Sulphur emission: Oxides of sulphur (SO, SO₃) emission can be reduced

- (a) By using coal or oil which has very low sulphur content.
- (b) By using devices that help in absorbing gaseous pollutants.

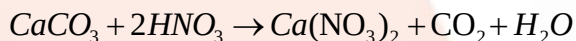
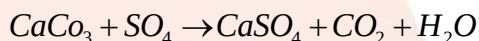
Q.11 Give the composition, cause and impact of acid rain.

Ans. Composition of Acid Rain: "When oxides of Sulphur and Nitrogen of air come in contact with of rain they form corresponding acids constitute Acid Rain".

Cause of Acid Rain:- "The cause of acids rain is the formation of mineral acids like nitric acid, sulphuric acid and carbonic acid".

Impact of Acid Rain

- (i) Acid rain remove Basic Ingredients like calcium and potassium losing their fertility. In this way damage the forests.
- (ii) Makes the water of lakes and rivers acids which may no longer support aquatic life.
- (iii) Acid rain causes extensive damage to buildings and monument or marble, lime stone, slate, mortar etc. These material become pitted and weakened mechanically. The Taj Mahal is one such example



- (iv) It increases corrosion of metals like iron.
- (v) It damage leaves of plants and trees
- (vi) It affects a person's breathing, irritates the upper respiratory tract and injurs lung tissues.

Q.12 Explain the effect to Sulphur dioxide on the atmosphere.

Ans. Sulphur dioxide pollutes the air, effects the yield of crops cause damage to lungs SO₂ gets

gets converted to SO_3 and combines with water drops of air cause acid rain.

Q.13 Explain the formation of ozone in atmosphere?

Ans. Ozone is formed in the atmosphere by the impact of UV rays from the sun that breakdown oxygen molecules(O_2) into Oxygen(O) atoms which again combine to form Ozone(O_3)

This can be understood from the below reactions involved in the process:



molecule atoms.

Oxygen atoms react with oxygen molecule to form ozone



Atom molecules Ozone

Net reaction is



Q.14 What is the function of ozone in the atmosphere.

Ans. Function of ozone in the Atmosphere: ozone layer acts as a blank in the atmosphere by absorbing harmful UV rays coming from the sun and prevents them from reaching the earth ozone absorbs UV radiations of comparatively longer wave length forming oxygen molecule and oxygen atom.

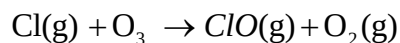


Ozone oxygen molecule atom

Thus it protects the life on earth from harmful effects of Ultra Violet Rays. Which can cause (a) Skin cancer (b) destroy many organic species necessary for life.

Q.15 State the chemical responsible for ozone destruction.

Ans. Chemical responsible for ozone destruction free radical chlorine (Cl) and nitroxide (NO) are responsible for ozone depletion i.e. react with O_3 . Free radical chlorine (Cl) is produced by UV rays from chlorofluorocarbon (**freons**) enter the atmosphere because of excessive use as solvent, Aerosol, Spray, Propellants, Refrigerants and blowing agents for plastic foams.



ClO (g) further reacts with atomic

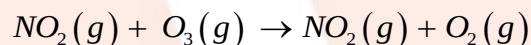
(chlorine monoxide) oxygen and produce

More chlorine free radical



Again [Cl] free radical destroy more O_3

$NO(g)$ produced by burning fuel of planes react with O_3



$NO_2(g)$ reacts with more of O_3



Hence O_3 layer gets depleted.

Q.16 Name any two:

- (a) nature source of atmospheric pollution.
- (b) gases which are responding for the formation of acid rain.

Ans. (a) Natural sources of atmosphere (ii) disintegration of rock and Soil.

(i) Decay of plants and animals (ii) Disintegration of rock and soil.

(b). SO_2 and NO_2 are gases responsible for acid rain.

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

Ans. When the level of greenhouse gases in the atmosphere rises, it results in the increase of the temperature of the atmosphere and that in turn increases the temperature of earth. This process is called global warming which causes various problems like melting of glaciers and rising sea levels etc.

Two ways to reduce global warming are:

- (i) Aforestation and planting of more and more plants.

- (ii) Limiting the use of machines and vehicles that emit CFC and high green house gases like AC, refrigerators, vehicles etc.

Q.18 State two effects of ozone depletion.

Ans. Effects of ozone depletion:

- (i) Ultra-violet rays of sun reach the earth and cause skin cancer and sun burn and premature aging of the skin.
- (ii) U.V. Radiation can also damage several parts of the eyes, including the lens, cornea, retina and conjunctiva.

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

Ans. Causes: Sulphur and nitrogen oxides emitting by burning fossil fuels. The smoke and gases coming in touch with the atmosphere make a dilute 'soup' of sulphuric and nitric acids and fall in the form of acid rain on the land surface damaging the things on earth.

Impacts: (i) Acid rain accelerates the decay of building material and paints, including buildings, statues and sculptures that are part of our nation's culture heritages.

- (iii) Acid rain causes respiratory problems in humans, especially to people suffering from asthma. It may cause throat irritation, dry cough and severe headache.

Q.20 Explain the methods of preventing acid rain.

Ans. Method of preventing acid rain:

- (i) By using alternative fuels like oils and coal which have lower sulphur content
- (ii) By using pollution control devices that do not release pollutants in air.

Q.21 State and advantage of CNG.

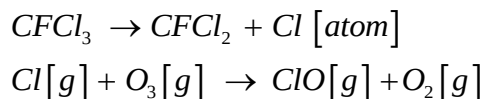
Ans. As CNG does not have lead, it helps in decreasing pollution. Also it is very economical.

Q.22 How CFC breaks Ozone layer?

Ans. Depletion of O_3 (ozone) by CFC can be explained as follows:

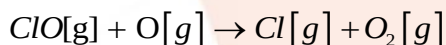
The UV rays from the sun break the CFC [$CFCl_3$] particles to produce the chlorine atom of free radical. As this radical is highly reactive in nature, it forms $ClO[g]$ when reacts with ozone [O_3].

Below reactions are involved in the process:



This causes the depletion of Ozone.

ClO further produces more [Cl] free radical



Q.23 Describe the method of saving ozone layer.

Ans. Method to protect ozone layer: (i) Ozone layer is protected by alternative product like HCFC [hydrochloro-fluoro carbons].

(ii). International treaty [Montreal protocol] was also initiated to prevent ozone depletion.

Q.24 Fill in the blanks:

- (a) The pollutants such as NO_2 , SO_2 and SO_3 dissolved in moisture of air are the cause of
- (b) Excessive release of carbon dioxide in the atmosphere is the cause of Effect which produces global warming.
- (c) Ozone layer prevents that harmful radiation of the sun to reach the earth.
- (d) Decrease of the concentration of ozone in the stratosphere is the cause of formation of holes.
- (e) Ozone depletion is mainly caused by the active atoms generate from CF in the presence of UV radiation.

Ans. (a) Acid rain (b) GREEN HOUSE (c) UV (ULTRA - VIOLET)
(c) OZONE (d) OZONE (e) Chlorine (Cl)

Q.25 Select the correct answer:

- (a) Excessive release of carbon dioxide in the atmosphere is the cause of
 - (i) Depletion of ozone (ii) formation of polar vortex
 - (iii) Global warming (iv) formation of smog

Ans. (iii) Global warming

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

- (i) CO combines with O_2 dissolve in blood.**
- (ii) CO combines with haemoglobin of blood.**
- (iii) CO removes water from the body and cause dehydration.**
- (iv) CO causes coagulation of proteins in the body.**

Ans. (ii) CO combines with haemoglobin of blood.

(c) Decrease of amount of ozone in stratosphere is called depletion of ozone 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.**

Ans. (ii) Use of CFC compounds