CHAPTER

14 Environmental Chemistry I The Atmosphere

Animation 14.1: Atmospheric Chemistry
Source & Credit: Wikipedia

Students Learning Outcomes

Students will be able to:

- Define atmosphere. (Remembering);
- Explain composition of atmosphere. (Understanding);
- Differentiate between stratosphere and troposphere. (Analyzing);
- Summarize the compounds of stratosphere and troposphere. (Understanding);
- Describe major air pollutants.(Understanding);
- Describe sources and effects of air pollutants. (Understanding);
- Explain ozone formation. (Understanding);
- Describe acid rain and its effects (Understanding);
- Describe ozone depletion and its effects. (Understanding) and
- Describe global warming. (Understanding).

Introduction

Our planet the Earth has four natural systems; lithosphere, hydrosphere, atmosphere and biosphere. The knowledge and understanding of these systems is necessary for us to live on the Earth.

In this chapter, we will focus only on atmosphere. The study of composition of atmosphere provides us the knowledge about significance of gases present in the atmosphere. Atmosphere is divided into four regions. Each region has its natural characteristics.

Animation 14.2 : Earth cycle
Source & Credit: Oakland

But human activities are disturbing the natural system. Because of these activities our atmosphere is gradually changing. The effects of these changes will be discussed in this chapter. A lot of efforts are being made worldwide to control the negative effects of pollution.

14.1 COMPOSITION OF ATMOSPHERE

Atmosphere is the envelope of different gases around the Earth. It extends continuously from the Earth's surface outwards without any boundary. About 99% of atmospheric mass lies within 30 kilometres of the surface and 75% lies within the lowest 11 kilometres. Percentage composition of atmosphere by volume is shown in Table 14.1

Table 14.1 Composition of dry air

Gas	% by Volume
Nitrogen	78.09
Oxygen	20.94
Argon	0.93
Carbon dioxide	0.03

Animation 14.3: Global change
Source & Credit: ABC Science

Do you know

- Sunlight has short wavelength radiations.
- Solar energy absorbed by the Earth surface is transformed into heat energy which is of longer wavelength.
- On the average, there is total 32% reflection of light: 6% being reflected from the Earth's surface and 26% being reflected back into space because of clouds, gases and dust particles in the atmosphere. 18% of sunlight is absorbed by atmospheric gases.
- The remaining 50% reaches upto the Earth and is absorbed by it.
- This energy is radiated as heat energy of longer wavelength which is absorbed by water vapours and CO_2 in atmosphere.

14.2 LAYERS OF ATMOSPHERE

Atmosphere consists of four spheres (layers) extending from the surface of the Earth upwards. The concentration of the component gases decreases gradually upwards, that results in gradual decrease of pressure. But temperature of the atmosphere does not change in a gradual way. It varies in a complex way as shown in figure 14.1.

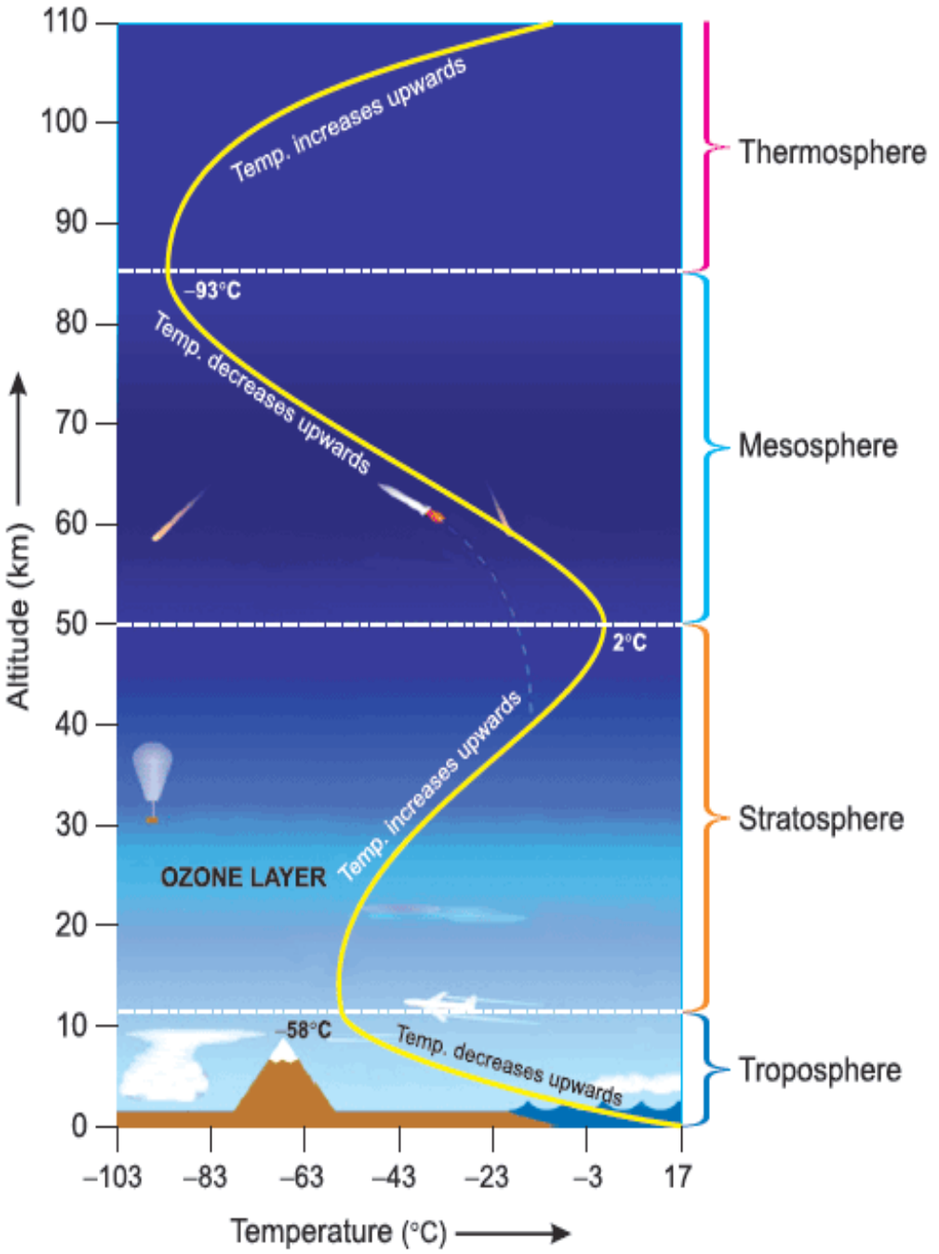


Fig.14.1 Different spheres of atmosphere

Depending upon the temperature variation, atmosphere is divided into four regions.

Temperature decreases from 17°C to -58°C regularly in the lowest layer extending upto 12 km. This layer of atmosphere is called troposphere. Above this layer lies the stratosphere that extends upto 50 km. In this layer, temperature rises upto 2°C. Beyond the stratosphere lies the mesosphere, covering upto 85 km. In this region, again temperature decreases down to -93°C. Beyond 85 km lies the thermosphere, in which temperature goes on increasing upwards.

Animation14.4: Layers
Source & Credit: espere

Characteristics of the four regions of the atmosphere are provided in the **Table 14.2.**

Table 14.2 Characteristics of Atmospheric Regions

Name of region	Height above the Earth's surface	Temperature range and trend
Troposphere	0 — 12 km	17°C — –58°C (decreases)
Stratosphere	12 — 50 km	–58°C — 2°C (increases)
Mesosphere	50 — 85 km	2°C — –93°C (decreases)
Thermosphere	85 — 120 km	> –93°C (increases)

We will discuss the reasons of variations of temperature and other phenomenon in troposphere and stratosphere in detail.

14.2.1 Troposphere

The major constituents of troposphere are nitrogen and oxygen gases. These two gases comprise 99 % by volume of the Earth's atmosphere. Although, concentration of carbon dioxide and water vapours is negligible in atmosphere, yet they play a significant role in maintaining temperature of the atmosphere. Both of these gases allow visible light to pass through but absorb infrared radiations emitted by the Earth's surface. Therefore, these gases absorb much of the outgoing radiations and warm the atmosphere. As the concentration of gases decreases gradually with the increase of altitude, correspondingly temperature also decreases at a rate of 6°C per kilometre. This is the region where all weathers occur. Almost all aircrafts fly in this region.

.

Animation14.5: Atmosphere
Source & Credit:World Nuclear Association

14.2.2 Stratosphere

This region is next to troposphere and extends upto 50 kilometres. In this region, temperature rises gradually upto 2°C. The presence of ozone (due to absorption of radiation) in this region is responsible for the rise of temperature in stratosphere. Within this region, temperature increases as altitude increases, such as lower layer temperature is about -58°C and upper layer is about 2°C. Thus, stratosphere is layered in temperature as shown in figure 14.2. Since ozone in the upper layer absorbs high energy ultraviolet radiations from the Sun, it breaks down into monoatomic (O) and diatomic oxygen (O_2).

$$O_{3(g)} \longrightarrow O_{2(g)} + O_{(g)}$$

The mid stratosphere has less UV light passing through it. Here O and O_2 recombine to form ozone which is an exothermic reaction. Ozone formation in this region results in formation of ozone layer. Thus, ozone layer exists in mid stratosphere.

$$O_{2\,(g)} + O_{(g)} \longrightarrow O_{3(g)}$$

The lower stratosphere receives very low UV radiations, thus monoatomic oxygen is not found here and ozone is not formed here.

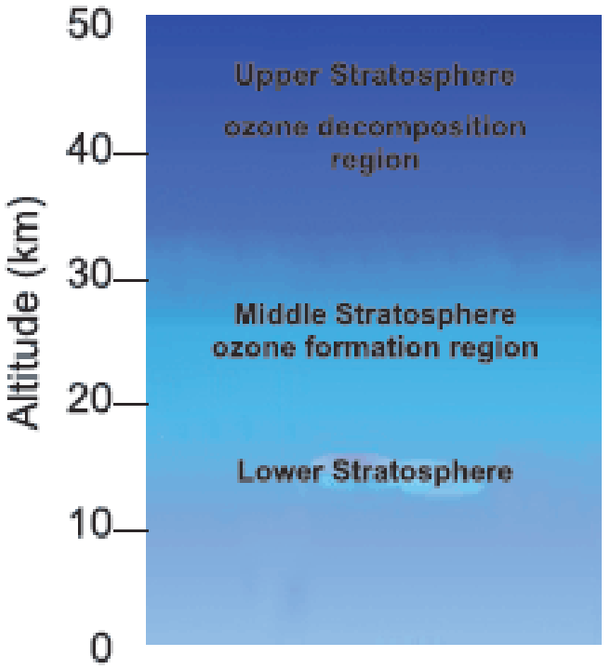


Fig. 14.2 Troposphere and stratosphere regions

Test yourself 14.1

1. What do you mean by atmosphere?
2. What is the difference between atmosphere and environment?
3. Name the major constituents of troposphere.
4. How is the temperature of atmosphere maintained?
5. Where does the ozone layer exists?
6. Why is the temperature of upper stratosphere higher?

14.3 POLLUTANTS

A pollutant is a waste material that pollutes air, water or soil. Three factors determine the severity of a pollutant, its chemical nature, concentration and persistence. These pollutants are being created and discharged to the environment by human activities. They make the environment (air, water or soil) harmful to life. So the **pollutants** are those substances which cause pollution. While **contaminants** are those substances that make something impure.

The harmful substances present in air are called air pollutants. Even a beneficial substance beyond a specific concentration may be harmful. Air pollutants change the weather, badly affect the human health, damage the plants and destroy buildings.

14.3.1 Types of Pollutants

Major air pollutants are classified as primary pollutants and secondary pollutants. **Primary pollutants** are the waste or exhaust products driven out because of combustion of fossil fuels and organic matter. These are oxides of sulphur (SO_2 and SO_3); oxides of carbon (CO_2 and CO); oxides of nitrogen (specially nitric oxide NO); hydrocarbon (CH_4); ammonia and compounds of fluorine. ***Secondary pollutants*** *are produced by various reactions of primary pollutants*. These are sulphuric acid, carbonic acid, nitric acid, hydrofluoric acid, ozone and peroxy acetyl nitrate (PAN).

Animation 14.6: Sick earth
Source & Credit: Oracle

14.3.2 Sources of Air Pollutants

As you know 99% of atmosphere consists of N_2 and O_2 . Although, other gases are minor constituents, they can have major effects on our environment. Because atmosphere determines the environment in which we live. So, these minor constituents are safe upto a concentration limit. But in some areas this limit has been crossed considerably during the last 60 years because of human activities. Different sources of air pollutants are described as:

(i) Oxides of Carbon (CO_2 and CO)

Sources of oxides of carbon are as follows:

- Both of these gases are emitted due to volcanic eruption and decomposition of organic matter naturally.
- However, the major source for the emission of these gases is the combustion of fossil fuels (coal, petroleum and natural gas). Fossil fuels burnt in combustion engine of any type of automobile, kiln of any industry or open air fires emit CO_2 and CO.

Animation 14.7: Air pollution
Source & Credit:Thinkquest

- Forest fires and burning of wood also emit CO_2 and CO. Especially, when supply of oxygen is limited, emission of CO dominates.

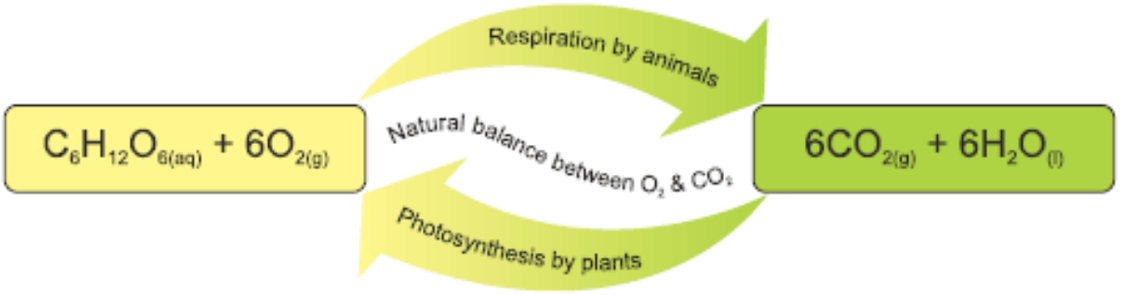
Greenhouse Effect and Global Warming

The CO_2 forms a layer around the Earth like an envelope. It allows the heat rays of the Sun to pass through it and reach upto the Earth. These rays are reflected from the Earth surface and go back to upper atmosphere as shown in figure 14.3(a). Normal concentration of CO_2 layer retains enough heat to keep the atmosphere warm. So, normal concentration of CO_2 is necessary and beneficial for keeping the temperature warm. Otherwise, the Earth would have been uninhabitable. The Earth's average temperature would be about -20°C, rather than presently average temperature 15°C. CO_2 is not an air pollutant. Rather, it is an essential gas for plants as O_2 is essential for animals. Plants consume CO_2 in photosynthesis process and produce O_2.

While animals use O_2 in respiration and give out CO_2 . In this way, a natural balance exists between these essential gases as represented here.

Animation 14.8: Indicator of global warming
Source & Credit: rollins.edu

But this balance is being disturbed by emitting more and more CO_2 in air through different human activities.



Although, **CO_2** is not a poisonous gas, yet its increasing concentration due to burning of fossil fuels in different human activities is alarming. CO_2 in the atmosphere acts like a glass wall of a green house. It allows UV radiations to pass through it but does not allow the IR radiations to pass through it. It traps some of the infrared radiations emitted by the Earth.

Hence, increased concentration of CO_2 layer absorbs the infrared radiations emitted by the Earth's surface that prevents heat energy escaping from the atmosphere.

Animation14.9 : Plant activity
Source & Credit: Next.cc

Animation14.10: Greenhouse effect
Source & Credit: elte

It helps to stop surface from cooling down during night. As the concentration of CO_2 in air increases, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called **greenhouse effect** as shown in figure 14.3(b). This effect is proportional to amount of CO_2 in air. Greater is amount of CO_2, more is trapping of heat or warming. Due to increased warming this phenomenon is also called **global warming.**

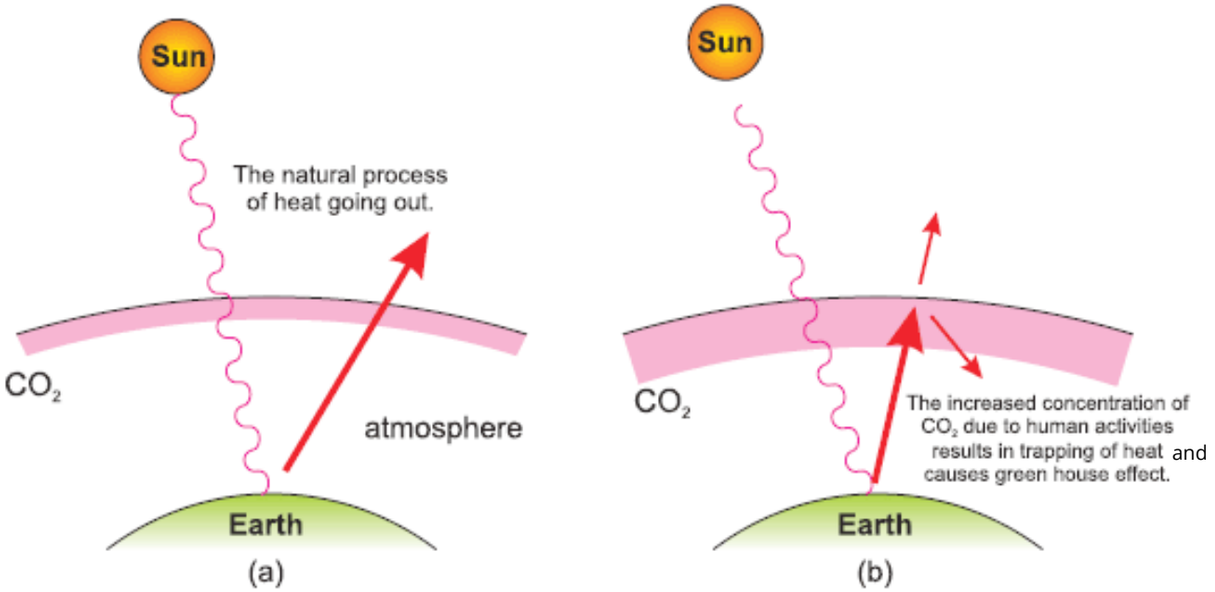


Fig.14.3: Greenhouse effect

Effects of global warming

1. Accumulation of carbon dioxide in air is resulting in increasing atmospheric temperature about 0.05 °C every year.
2. It is causing major changes in weather patterns. Extreme weather events are occurring more commonly and intensely than previously.
3. It melts glaciers and snow caps that are increasing flood risks and intense tropical cyclones.
4. Sea-level is rising due to which low lying areas are liable to be submerged, turning previously populated areas no longer habitable.

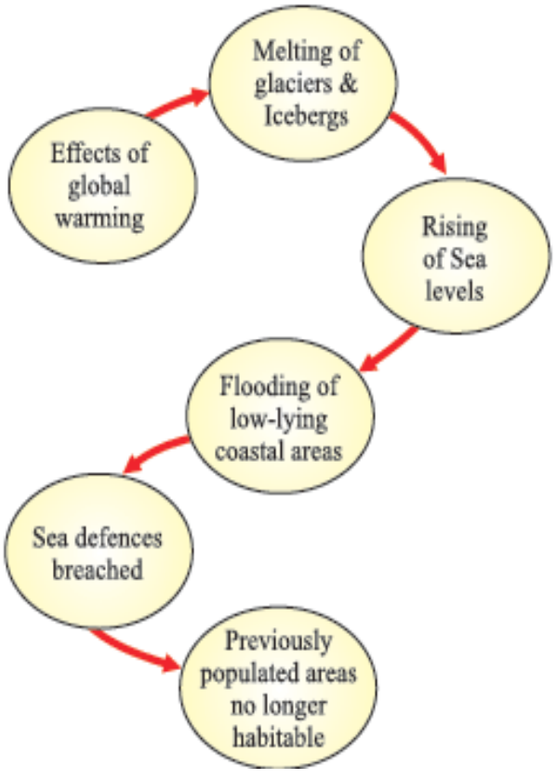


Fig. 14.4: Effect of global warming

Animation 14.11 : Catalytic converter
Source & Credit: chemwiki

Do you know

CO is an air pollutant. It is a health hazard being highly poisonous gas. Being colourless and odourless, its presence cannot be noticed easily and readily. When inhaled, it binds with the haemoglobin more strongly than oxygen. Thus, hindering the supply of oxygen in body. Exposure to higher concentration of CO causes headache and fatigue. If inhaled for a longer time it results in breathing difficulties and ultimately death. This is the reason why burning is not allowed in closed places. It is advised to switch off coal or gas heaters, cooking range, etc., before going to sleep.

Do you know

Converters should be used in automobile exhaust so that theyconvert CO to CO_2 and oxides of nitrogen NO_x to N_2 . before it enters in air. Catalytic converters as shown in figure 14.5 are attached to automobile exhausts. When hot gases pass through the converters, harmful pollutants are converted to harmless substances. Such as, carbon monoxide is oxidized to carbon dioxide, unburn hydrocarbons are oxidized to carbon dioxide and water, while oxides of nitrogen are reduced to nitrogen.

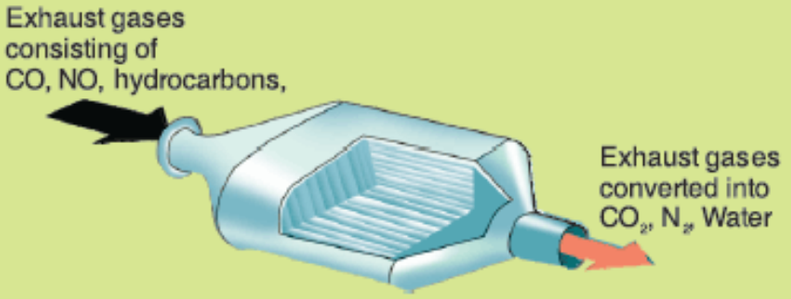


Fig.14.5: Catalytic Converter Used in automobile vehicles.

(ii) Sulphur Compounds:

Naturally occurring sulphur containing compounds are emitted in the bacterial decay of organic matter, in volcanic gases and forest fires. But the concentration of sulphur containing compounds in the atmosphere because of natural sources is very small as compared to the concentration of those compounds emitted by fossil fuel combustion in automobiles and industrial units. About 80% of the total SO_2 is released by the combustion of coal and petroleum products as shown in figure 14.6.

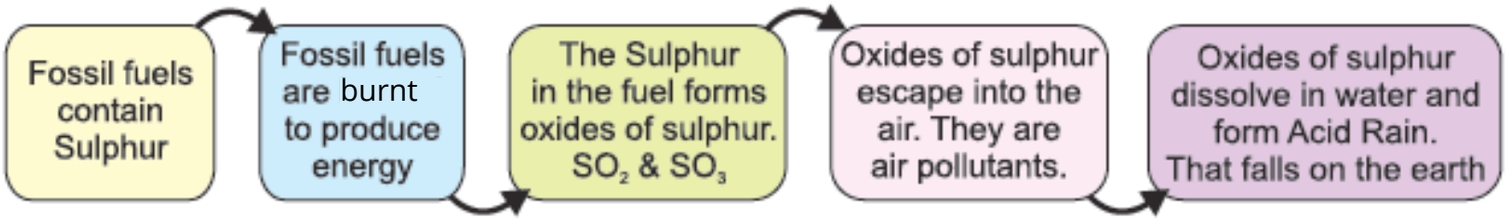


Fig.14.6: Formation of SO_3 and SO_2 on combustion of fossils fuel and causing air pollution

Interesting Information

- *CO_2 is the 'life gas'for plants as O_2 is for the human beings and animals.*
- *CO_2 absorbs infrared radiations emitted by the Earth. Although CO_2 is negligible as compared to N_2 and O_2, yet its heat retaining capacity is tremendous. Without CO_2, life on earth would have been impossible.*

Effects of SO_2:

(i) SO_2 is a colourless gas having irritating smell. It causes suffocation, irritation and severe respiratory problems to asthmatic people.

(ii) SO_2 forms sulphuric acid which damages buildings and vegetations. Detail of it will be discussed in section 14.4. To control pollution because of SO_2 , it is necessary to remove sulphur from fossil fuels before they are burnt.

(iii) Nitrogen Compounds (NO_x):

Naturally occurring oxides of nitrogen, mainly nitric oxide (NO), are produced by the electrical lightening in air.

Animation 14.12 : precipitation
Source & Credit: indiana.edu

Interesting Information

Acidic gases (pollutants) from nearby industrial units contribute to the wearing away of the famous marble building, the Taj Mahal in India.

Animation 14.13 : Nitrates
Source & Credit:outdoors

Combustion of fossil fuels in internal combustion engines, in thermal power stations and factories where huge amount of coal is burnt, NO is formed by the direct combination of nitrogen and oxygen as shown in figure 14.7.

$$N_{2(g)} + O_{2(g)} \longrightarrow 2NO_{(g)}$$

However, it quickly reacts with air to form nitrogen dioxide. NO_2 is highly toxic gas.

$$2NO_{(g)} + O_{2\,(g)} \longrightarrow 2NO_{2\,(g)}$$

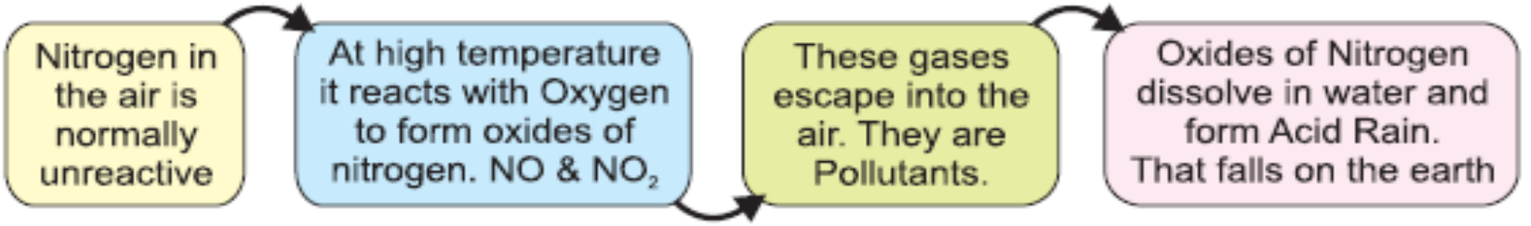


Fig.14.7: Formation of NO and NO_2 on combustion of fossils fuel and causing air pollution

Mixture of these gases represented as NO_x enters in the air through automobile exhaust and chimneys of thermal power station and factories. It irritates breathing passage. These oxides form nitric acid combining with water vapours in air. Nitric acid is a component of acid rain. Its effects will be discussed in section 14.4.

Test yourself 14.2

i) What do you mean by an air pollutant?
ii) Name three primary air pollutants.
iii) Identify as primary or secondary air pollutant.
SO_2, CH_4, HNO_3,NH_3,H_2SO_4,O_3
iv) Why is CO_2 called a greenhouse gas?
v) Why are the flood risks are increasing?
vi) Comment: burning in open air is preferred.
vii) How are sulphur containing compounds are emitted naturally?
viii) How does combustion of fossil fuels in internal combustion engine produce oxides of nitrogen?

Role of Government to control pollution:

Causing air pollution through auto-exhaust is almost the most common air polluting act which an average citizen commits daily for hours without considering its consequences. Poisoning the air is creating a big problem that has local, regional and global effects.

Government should do short term as well as long term planning to preserve the natural world, because without a healthy natural environment, there will be no healthy human, plant, or animal.

(i) First of all, quality of fuel must be improved by adding anti-knocking agents in fuels. At the same time, automobiles combustion engines must be efficient so that they should burn the fuel completely. No unburned hydrocarbon molecules (fuel) should come out of the exhaust. So government must guide the people to use converters in auto- exhausts.

(ii) Fossil fuels produce a number of air pollutants because of impurities and complex molecule nature of hydrocarbons. Government should promote the use of alternative fuels such as methanol, ethanol and bio-diesel. These fuels are less polluting than hydrocarbons fuel, as their molecules are simple, and burn completely in the engine. Their burning produces less carbon monoxide, soot and other pollutants.

(iii) The government must plan to avoid using carbon dioxide producing fuels as it is a greenhouse gas. It should go to battery-powered electric vehicles.

(iv) Government should provide efficient transport in the big cities, so that people should avoid using their own vehicles.

14.4 ACID RAIN AND ITS EFFECTS

As you have studied, burning of fossil fuels produces oxides of sulphur and nitrogen in air. Rain water converts SO_2 into H_2SO_4 and NO_x to $HNO_2$and HNO_3 . Normal rain water is weakly acidic because it consists of dissolved CO_2 of the air. Its pH is about 5.6 to 6. But rain water on dissolving air pollutants (acids) becomes more acidic and its pH reduces to 4 .Thus, acid rain is formed on dissolving acidic air pollutants such as sulphur dioxide and nitrogen dioxide by rain water.

Figure 14.8 shows how oxides of sulphur and nitrogen are converted into acids. These acids dissolve in rain water and damage soil, animals, plants and aquatic life.

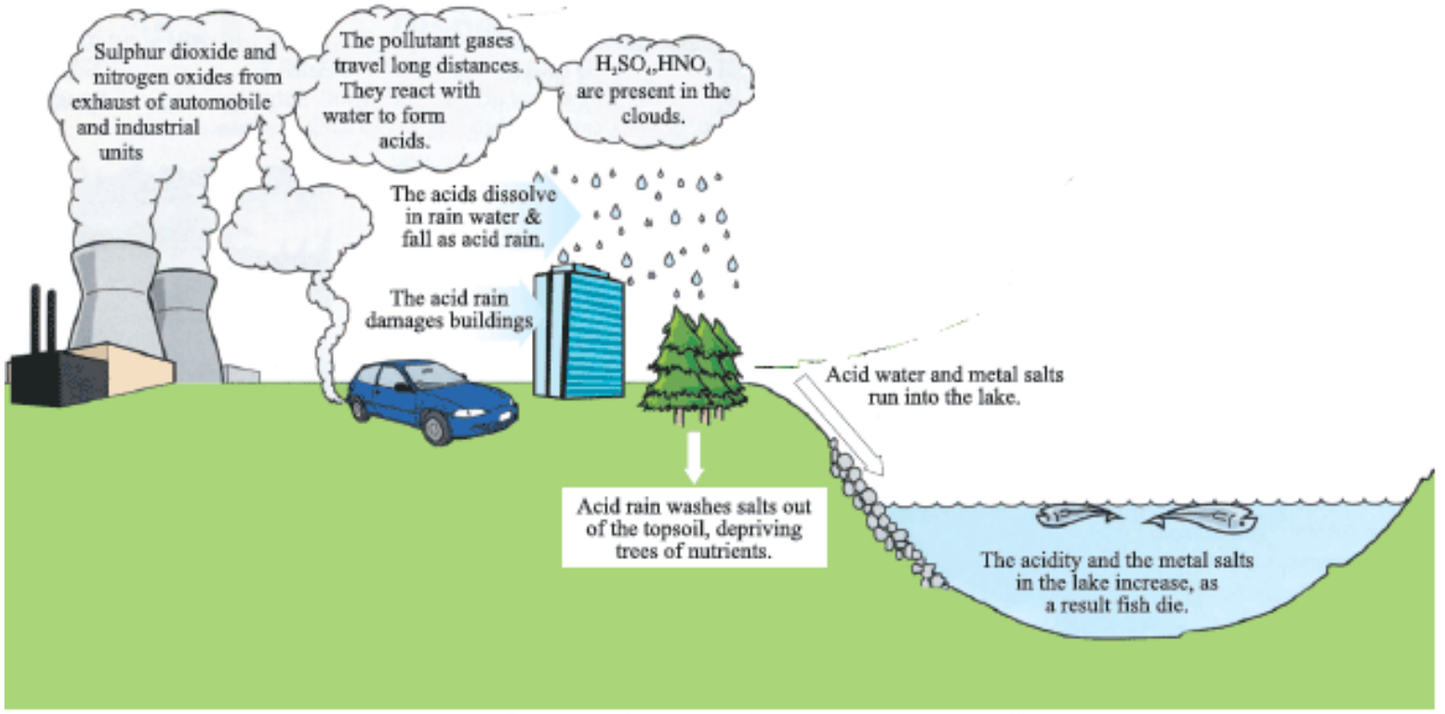


Fig. 14.8 Acid rain formation and its effects

Effects of acid rain

(i) Acid rain on soil and rocks leaches heavy metals (Al, Hg, Pb, Cr, etc) with it and discharges these metals into rivers and lakes. This water is used by human beings for drinking purpose. These metals accumulate in human body to a toxic level. On the other hand, aquatic life present in lakes also suffers because of high concentration of these metals. Especially high concentration of aluminium ions clogs the fish gills. It causes suffocation and ultimately death of fish.
(ii) Acid rain attacks the calcium carbonate present in the marble and limestone of buildings and monuments. Thus, these buildings are getting dull and eroded day by day.

Animation 14. 14: Forest
Source & Credit:umich

(iii) Acid rain increases the acidity of the soil. Many crops and plants cannot grow properly in such soil. It also increases the toxic metals in the soil that poison the vegetation. Even old trees are affected due to acidity of soil. Their growth is retarded. They get dry and die.

(iv) Acid rain directly damages the leaves of trees and plants, thus limiting their growth. Depending upon the severity of the damage, plants growth can be hampered. Plants capability to resist cold or diseases reduces and ultimately they die as shown in figure 14.9

Test yourself 14.3

(i) How is acid rain produced?
(ii) Why does acid rain damage buildings?
(iii) How is aquatic life affected by acid rain?
(iv) Why are plants dying day by day? Comment.

14.5 OZONE DEPLETION AND ITS EFFECTS

Figure 14.9: Effect of acid rain on plants

Ozone is an allotropic form of oxygen consisting of three oxygen atoms. It is formed in atmosphere by the association of an oxygen atom with an oxygen molecule in the mid of stratosphere.

$$O_{(g)} + O_{2(g)} \longrightarrow O_{3(g)}$$

Ozone is present throughout the atmosphere. But its maximum concentration called **ozone layer** lies in stratosphere region about 25 to 30 km away from the Earth's surface. This layer surrounds the globe and protects Earth like a shield from harmful ultraviolet radiations of sunlight as shown in figure 14.10. Otherwise, ultraviolet radiations would cause skin cancer. Thus ozone layer in stratosphere is beneficial for life on the Earth.

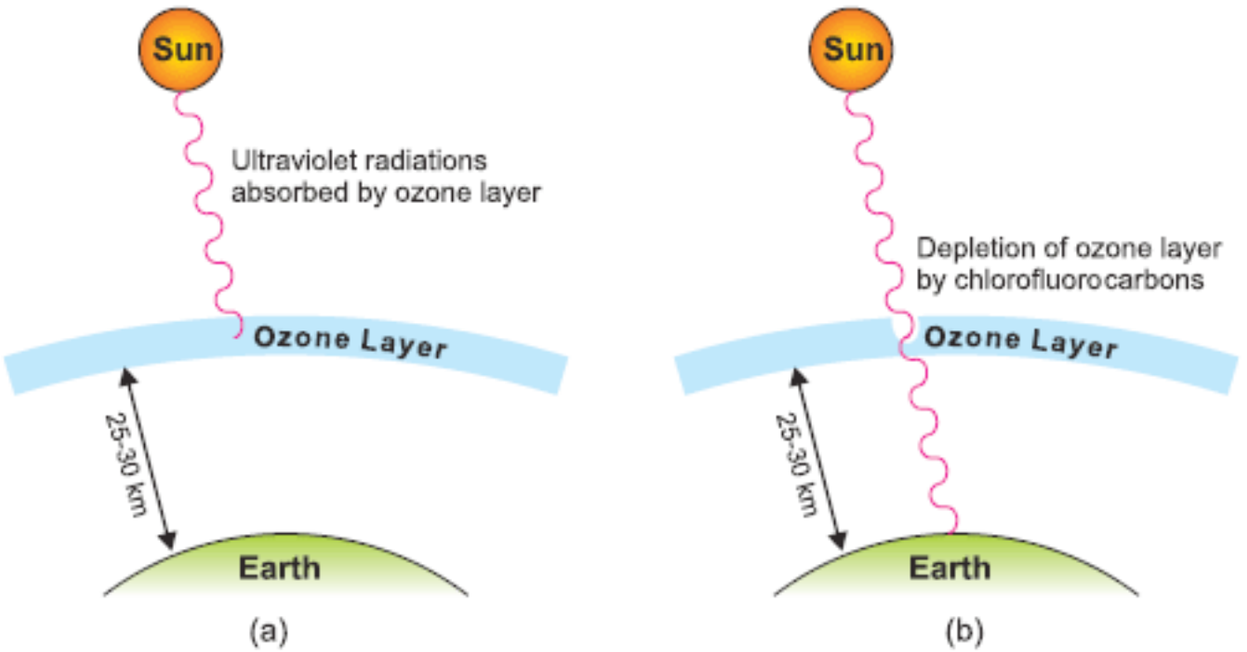


Fig 14.10:(a) Ozone layer (b) Depletion of ozone layer

Under normal conditions ozone concentration in stratosphere remains nearly constant through a series of complex atmospheric reactions. Two reactions that maintain a balance in ozone concentrations are as follows:

$$O_{2(g)} + O_{(g)} \longrightarrow O_{3(g)} \quad \text{(formation)}$$

$$O_{3(g)} + O_{(g)} \longrightarrow 2O_{2(g)} \quad \text{(decomposition)}$$

But this ozone layer is being depleted through various chemical reactions.

However, chlorofluorocarbons (CFCs) (used as refrigerants in air conditioners and refrigerators) are major cause of depletion of ozone layer. These compounds leak in one way or other escape and diffuse to stratosphere. Ultraviolet radiations break the C-Cl bond in $CFCl_3$ and generates chlorine free radicals as:

$$CFCl_3 \xrightarrow{UV} CFCl_2 + Cl^{\bullet}$$

These free radicals are very reactive. They react with ozone to form oxygen as:

$$O_{3(g)} + Cl^{\bullet} \longrightarrow O_{2(g)} + OCl^{\bullet}$$

$$OCl^{\bullet} \longrightarrow O^{\bullet} + Cl^{\bullet}$$

$$O^{\bullet} + O^{\bullet} \longrightarrow O_{2(g)}$$

A single chlorine free radical released by the decomposition of CFCs is capable of destroying upto many lacs of ozone molecules. *The region in which ozone layer depletes is called* ***ozone hole***.

Animation 14.15: Ozone layer
Source & Credit:ucar

Signs of ozone depletion were first noticed over **Antarctica** in 1980s. Since 1990s depletion has also been recorded over the **Arctic**, as well.

Effects of Ozone Depletion

Even minor problems of ozone depletion can have major effects.

i. Depletion of ozone enables ultraviolet radiations of Sun to reach to the Earth, that can cause skin cancer to human beings and other animals.
ii. Decreased ozone layer will increase infectious diseases like malaria.
iii. It can change the life cycle of plants disrupting the food chain.
iv. It can change the wind patterns, resulting in climatic changes all over the world. Especially, Asia and Pacific will be the most affected regions,facing climate induced migration of people crisis.

Test yourself 14.4

i. Justify, ozone is beneficial for human kind.
ii. Why is ozone depleting in atmosphere?
iii. What do you mean by ozone hole?
iv. Where is the ozone layer found?

Incineration of waste material causes air pollution

Incineration is a waste treatment process that involves the burning of solid waste at high temperatures between 650° C to 1100° C in incinerators. Incinerators reduce the solid mass of the original waste by 80-85% and convert the waste materials into ash, flue gases and heat. Although, the volume of solid waste is reduced effectively by incineration, it produces highly poisonous gases and toxic ash. The flue gases include, dioxins, furans, sulphur dioxide, carbon dioxide, carbon monoxide, hydrochloric acid and a large amount of particulate matter.

Key Points

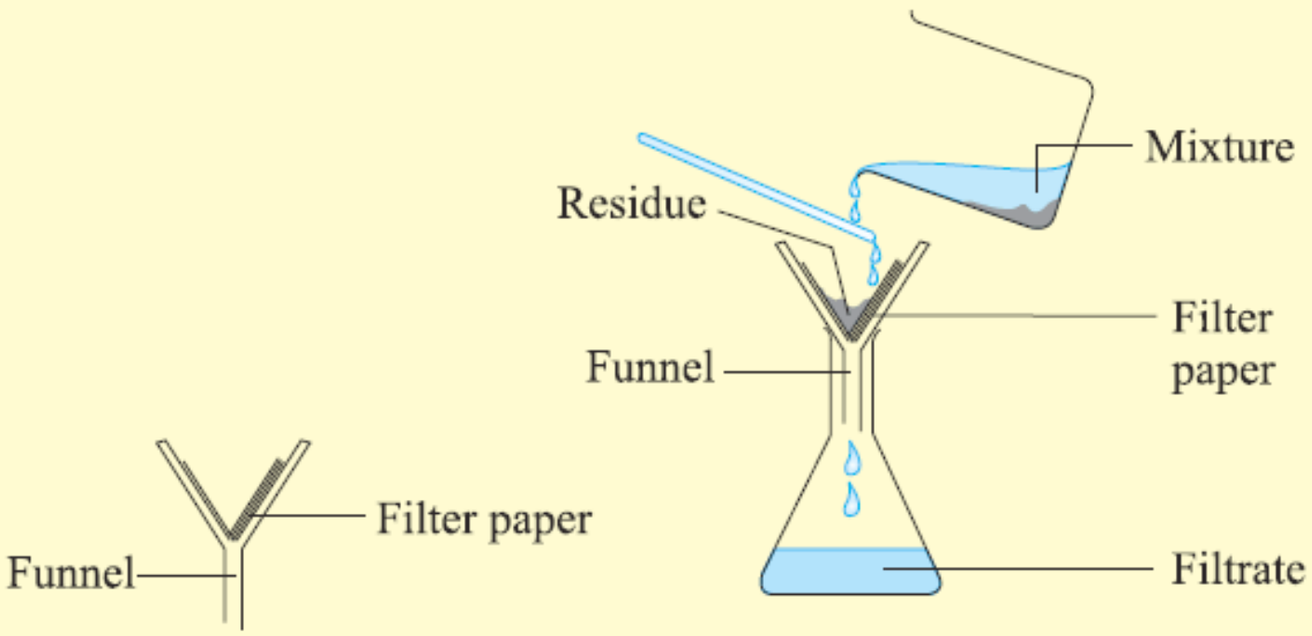
- Atmosphere is the envelope of different gases around the Earth.
- Atmosphere is divided into four regions; troposphere, stratosphere, mesosphere and thermosphere.
- Troposphere is just above Earth's surface and extends upto 12 kilometre.
- Stratosphere is next to troposphere and extends upto 50 km. In this region, temperature rises upwards because of presence of ozone layer.
- Mesosphere is next to stratosphere and extends up to 85 km.
- Thermosphere lies beyond mesosphere.
- Natural sources of air pollutants are volcanic eruption and decomposition of organic matter.

- Source of air pollutants because of human activities are burning of fossil fuel in combustion engines of automobiles, kilns of industries, open air fires and forest fires.
- CO_2 forms a layer around Earth, that absorbs the infrared radiations emitted by Earth surface. Thus, heating up the atmosphere is called greenhouse effect.
- CO is highly poisonous gas so it is health hazard.
- SO_2 is also health hazard and forms sulphuric acid by combining with water vapours in air. It is also a component of acid rain.
- Acid rain consists of $H_2SO_4$and HNO_3 that reduces the pH of rain water to 4.
- Ozone layer lies in stratosphere about 25 to 30 km away from Earth's surface.
- Ozone layer protects Earth like a shield from harmful ultraviolet radiations of sunlight.
- Chlorofluorocarbons destroy ozone molecules, depleting the ozone called ozone hole.
- Depletion of ozone enables ultraviolet radiations of the Sun to reach the Earth; causing infectious diseases; changing the life cycle of plants, wind patterns.

SKILLS:

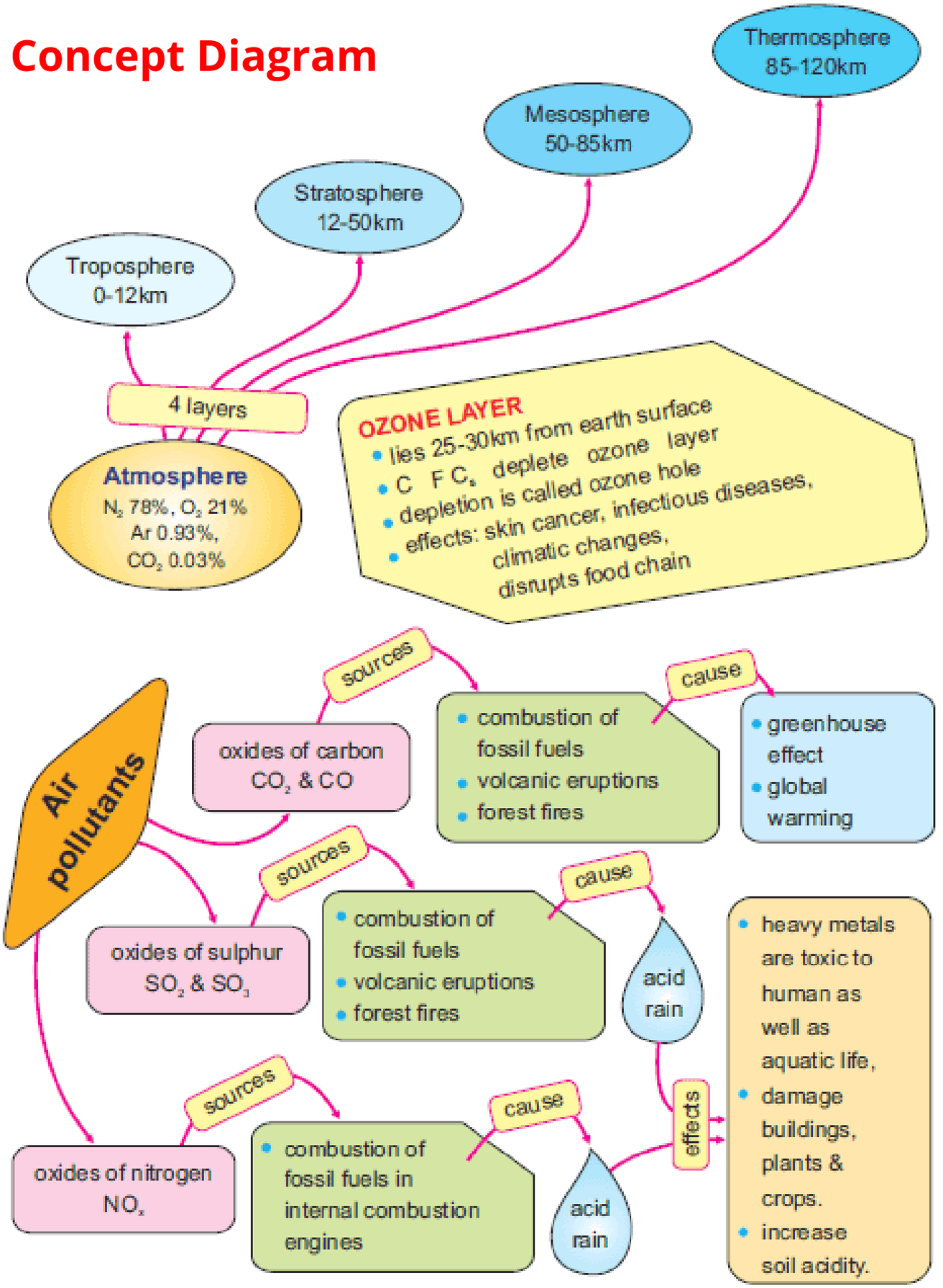
Filtration of suspended impurities

Filtration is separation of insoluble solid particles (sand, clay, dust or precipitates) from a liquid. It is carried out by filtering a mixture. A filter paper is first folded half way, then another fold is made, so that a filter paper gets four folds. This folded filter paper is placed in a filter funnel in such a way that on one side there are three layers and on the other side there is one layer as shown in the figure.The mixture (sand in water or chalk in water) is poured into the filter paper as shown in the figure.



Filtrate passes through the filter paper and is collected in a conical flask. The solid particles (residue) deposit on the filter paper. It is then dried.

Concept Diagram



Short Answer Questions

1. Explain the phenomenon of decreasing temperature in troposphere.
2. Differentiate between primary and secondary air pollutants.
3. State the major sources of CO and CO_2 emission.
4. CO_2 is responsible for heating up atmosphere, how?
5. CO is a hidden enemy, explain its action.
6. What threats are there to human health due to SO_2 gas as air pollutant?
7. Which air pollutant is produced on anaerobic decomposition of organic matter?
8. How does acid rain increase the acidity of soil?
9. Point out two serious effects of ozone depletion.
10. How is ozone layer formed in stratosphere?
11. Why does 75% of the atmospheric mass lie within the troposphere?
12. How ozone layer is being depleted by chlorofluorocarbons?

Long Answer Questions

1. Write down the significance of atmospheric gases.
2. Give the characteristics of troposphere. Why temperature decreases upwards in this sphere?
3. What are the characteristics of stratosphere? Why does temperature increase upwards in this sphere?
4. CO_2 is necessary for plants but why is its increasing concentration alarming for us?
5. Why is CO considered a health hazard?
6. Define acid rain. How is it formed and what are its effects?
7. Compounds of sulphur are air pollutants. Describe the sources of these compounds along with their effects.
8. Where does ozone layer lie in atmosphere? How is it depleting and how can we prevent its depletion?
9. Oxides of nitrogen cause air pollution. Describe the sources of these compounds.