PHYSICAL AND CHEMICAL PROPERTIES OF CARBON DIOXIDE

INTRODUCTION

Carbon dioxide is a chemical compound in which one carbon and two oxygen atoms are bonded together. It is a gas at room temperature. It is represented by the formula CO_2. It is found in the earth's atmosphere and it send back the solar energy which is reflected by the surface of the earth, to make it possible for living organisms to survive. When carbon dioxide accumulates more in the atmosphere it produces harmful effects.

OCCURRENCE OF CARBON DIOXIDE

- Carbon dioxide is present in air to the extent of about 0.03% by volume.
- It is evolved by the plants and animals during respiration and is produced during fermentation reactions.
- Much of the naturally occurring CO_2 is emitted from the magma through volcanoes.
- CO_2 may also originate from the bio degradation of oil and gases. Carbon dioxide emitted by human upset the natural balance of the carbon cycle.
- Man-made CO_2 in the atmosphere has increased global temperatures which is warming the planet.
- While CO_2 derived from fossil-fuel is a very small component of the global carbon cycle, the extra CO_2 is cumulative because the natural carbon exchange cannot absorb all the additional CO_2.

PHYSICAL PROPERTIES OF CARBON DIOXIDE

- Carbon dioxide is a colourless and odourless gas.
- It is heavier than air.
- It does not support combustion.
- It is fairly soluble in water and turns blue litmus slightly red. So it is acidic in nature.
- It can easily be liquified under high pressure and can be solidified.
- This solid form of CO_2 is called dry ice which undergoes sublimation.

CHEMICAL PROPERTIES OF CARBON DIOXIDE

1. Combustibility

It is non-combustible gas and not a supporter of combustion.

2. Reaction with metals

Lighter metals like sodium, potassium and calcium, combine with CO2 to form corresponding carbonates whereas magnesium gives its oxide and carbon.

Example

$$4Na + 3CO_2 \rightarrow 2Na_2CO_3 + C$$

Sodium Sodium carbonate

$2Mg + CO_2 \rightarrow 2MgO + C$

Magnesium Magnesium oxide

3. Reaction with sodium hydroxide (Alkali)

Sodium hydroxide (base) is neutralized by carbon dioxide (acidic) to form sodium bicarbonate (salt) and water.

$NaOH + CO_2 \rightarrow NaHCO_3 + H_2O$

Sodium bicarbonate

4. Reaction with Lime water (Calcium hydroxide)

When a limited amount of CO2 is passed through lime water, it turns milky due to the formation of insoluble calcium carbonate.

$Ca(OH)2 + CO2 \rightarrow CaCO3 + H2O$

Calcium carbonate

When an excess amount of CO2 is passed through lime water, it first turns milky and the milkyness disappears due to the formation of soluble calcium hydrogen carbonate,Ca(HCO3)2.

USES OF CARBON DIOXIDE

- ✓ CO2 is used to prepare soft drinks or aerated drinks.
- ✓ It is used in fire extinguishers
- ✓ It is used in the manufacturing of sodium carbonate by Solvay process.
- ✓ Solid carbon dioxide, called as dry ice is used as a refrigerant. The gas is so cold that moisture in the air condenses on it, creating a dense fog which is used in stage shows and movie effects.
- ✓ It is used along with ammonia in the manufacture of fertilizers like urea.
- ✓ CO2 can be used in the preservation of food grains, fruits etc.

GLOBAL WARMING

- ❖ The solar radiation is absorbed by the surface of land and ocean.
- ❖ In turn, they release infra red radiation or heat into the atmosphere.
- ❖ Certain gaseous molecules present in the atmosphere absorb the infra red rays and reradiate the heat in all directions.
- ❖ Hence, these gases maintain the temperature of earth's surface.
- ❖ The gases which absorb these radiations are called **green house gases** and this effect is called **green house effect**.
- ❖ The green house gases are **CO2, N2O, CH4, CFC** (Chlorofluoro carbon) etc.
- ❖ The increase in the levels of these gases results in the gradual increase of temperature of the earth's surface.
- ❖ This green house effect is caused due to increase in the air pollutants and it results in the

average increase of temperature of the atmosphere.

- This is called as **Global warming**.

EFFECTS OF GLOBAL WARMING

- The following are the effects of global warming.
- Melting of ice cap and glaciers.
- Increase in frequency of floods, soil erosion and unseasonal rains.
- Loss of biodiversity due to the extinction of coral reefs and other key species.
- Spreading of water borne and insect borne diseases.

PREVENTIVE MEASURES

In order to save the earth and its resources we need to take certain measures. Some of the measures are given below.

- Reducing in the use of fossil fuels.
- Controlling deforestation.
- Restricting the use of CFCs.
- Planting more trees.
- Reducing, reusing and recycling resources.
- Using renewable energy resources.

ACID RAIN

- Rain water is actually the purest form of water.
- However, pollutants such as oxides of nitrogen (N2O, NO2) and sulphur (SO2, SO3) in the air released by factories, burning fossil fuels, eruption of volcanoes etc., dissolve in rain water and form nitric acid and sulphuric acid which adds up to the acidity of rain water.
- Hence, it results in **acid rain.**

EFFECTS OF ACID RAIN

- Acid rain affects us in many ways. Some of the consequences are given below.
- It irritates eyes and skin of human beings.
- It inhibits germination and growth of seedlings.
- It changes the fertility of the soil, destroys plants and aquatic life.
- It causes corrosion of many buildings, bridges etc.

PREVENTIVE MEASURES

- Acid rain and its effects can be controlled by the following ways.
- Minimizing the usage of fossil fuel such as petrol, diesel etc.,
- Using CNG (**Compressed Natural Gas**).
- Using non- conventional source of energy.
- Proper disposal of the industrial wastes.