Revision Notes for Class 8 Science

Chapter 4 – Combustion and Flame

1. Combustion:

The process in which a substance undergoes a chemical reaction in the presence of air (oxygen) to produce heat and light is called combustion.

The substance which undergoes combustion is called combustible. Combustion cannot take place in absence of oxygen.

Combustible Substances

Combustible substances are defined as those that can easily catch fire.

E.g., paper, wood, etc.

For combustion to take place, the presence of oxygen is essential.

Non-Combustible Substances

Non-combustible substances are defined as those that do not readily catch fire.

E.g., water, sand, etc.

Ignition Temperature:

The lowest temperature at which a combustible substance catches fire under given pressure conditions is called ignition temperature.

The substances which have very low ignition temperature and can easily catch fire with a flame are called inflammable substances.

Controlling Fire:

Fire can be controlled by removing one or more requirements essential for producing fire.

Water is commonly used to control fires caused by substances other than oils and electrical equipment as it can worsen the conditions.

As water cannot be used to control fires involving electrical equipment or oils, a fire extinguisher or sand is used to put out the fire.

Types of Combustion

The type of combustion depends upon the type of fuel used. Combustions are classified on the basis of nature and intensity, which are of three types. They are:

I. Rapid Combustion:

When a substance burns rapidly and produces heat and light, such combustion is called rapid combustion. For example, the burning of a matchstick, gas stove.

II. Spontaneous Combustion:

The type of combustion in which a material suddenly bursts into flames, without the application of any apparent cause is called spontaneous combustion. For example, burning of phosphorus, burning of camphor.

III. Explosion:

A large amount of gas formed in the reaction is liberated. Such a reaction is called an explosion. For example, a firecracker, missiles.

2. Flame:

It is a zone or burning vapour caused by substances during combustion. For example Kerosene oil and LPG gas, coal etc.

Zones of a Flame:

There are Three Different Zones of a Flame –

- **Dark Zone:** Near the surface of a combustible substance which is the least hot due to incomplete combustion.
- **Luminous Zone:** Brightest zone due to partial combustion.
- **Non-luminous Zone:** The outermost part of the flame which is the hottest zone due to complete combustion.

Candle Flame

The visible part of the fire, which contains gases, is called flame.

Zones of Candle Flame

The outer zone of flame undergoes complete combustion and is the hottest part of the flame. It is blue. It is non-luminous.

The middle zone of flame undergoes partial combustion and is moderately hot. It is the brightest part.

The innermost zone contains unburnt wax vapors and is black in color.

Smoke

It is the unburnt particles present in solid form dispersed in the air.

The black color appears due to the unburnt carbon particles in the smoke.

3. Fuel:

Fuel is any substance that undergoes combustion to obtain energy that can be used to heat or move another object.

Property of a Good Fuel:

A good fuel must:

- Be readily available.
- Be cheap.
- Burn easily at a moderate rate.
- Should have high calorific value.
- Not leave behind any undesirable substances after combustion.

Fuel efficiency is expressed in terms of its calorific value which is the amount of heat energy produced on complete combustion of 1 kg of fuel and is expressed in units of kilojoule per kg(kJ/kg).

Calorific Value of Fuel

Calorific value is the amount of heat energy production when complete combustion of 1kg of fuel occurs. The expression for calorific value is kilojoule/kg (kJ/kg).

Types of Fuels:

I. Solid Fuels: solid fuels are combustible substances that are solid at room temperature. For example: coal, camphor, wood, charcoal etc.

II. Liquid Fuels: Volatile liquids which produce combustible vapour are called liquid fuels. These are widely used fuels in our vehicles. For example Petrol, kerosene, diesel etc.

III. Gaseous Fuels: Combustible gases or a mixture of combustible gases are called gaseous fuels. For example: CNG, LPG, propane, biogas etc.

Harmful Effects of Burning of Fuels:

I. Fuels containing carbon like wood, coal or any fossil fuel release unburnt carbon particles (called suits). These are dangerous pollutants that cause respiratory diseases, such as asthma or even cancer.

II. Incomplete combustion of carbon fuels gives carbon monoxide which is a poisonous gas and prolonged exposure can be fatal.

III. Increased concentration of carbon dioxide in the air which is called greenhouse gas is causing global warming.

IV. Oxides of Sulphur and nitrogen dissolve in rainwater and form acids. Such rain is called acid rain. It is very harmful to crops, buildings and soil as it increases the acidity of the soil and corrodes the metal surface faster.

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Global Warming: Global warming refers to the gradual increase in Earth's average temperature due to human activities, especially the burning of fossil fuels.

Acid Rain: Acid rain is rain that has a lower pH than normal, making it more acidic. This occurs when pollutants in the air mix with rainwater.

Causes of Acid Rain: The main cause of acid rain is the burning of fossil fuels like coal, oil, and gas. This combustion releases sulphur dioxide (SO_2) and nitrogen oxides (NO_x) into the atmosphere.

Formation of Acid Rain: Sulphur dioxide and nitrogen oxides react with water vapour in the atmosphere to form sulfuric acid (H_2SO_4) and nitric acid (HNO_3). These acids then fall to the ground with the rain.

Effects on the Environment: Acid rain can harm plants, soil, and water bodies. It can damage leaves, reduce soil fertility, and lead to the acidification of rivers and lakes, affecting aquatic life.