

**ATOMIC ENERGY EDUCATION SOCIETY**  
**E-Learning Material**

**Class VIII**

**6.Combustion & Flame**

**Subject :Science**

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**Gist of the lesson**

- ✓ **Combustion:** It is a chemical reaction in which heat is released by a material when it reacts with oxygen.
- ✓ **Fuel or Combustible Substance:** Any material that undergoes combustion is called a combustible substance. It is also called as fuel. Some examples of fuels are petrol, diesel, etc. The fuel may be in solid, liquid or gas state. Sometimes, light is also given off during combustion, either as a flame or as a glow.
- ✓ Types of fuels- a) Solid Fuels –wood ,charcoal    b) Liquid Fuels –Kerosene ,petrol    c) Gaseous Fuels-LPG,CNG
- ✓ **Requirements for combustion :** (i) Fuel or Combustible substance.        (ii) Air (With presence of Oxygen in it).
- ✓ (iii) Temperature above the Ignition temperature.

**Methods to extinguish the fire**

a) Using Water (Role of water to extinguish the flame )

1. The water will bring down the temperature below its ignition temperature.
2. Water vapours also surround the combustible material, helping in cutting off the supply of air.

b) **Using Fire Extinguisher:** In case fire is caught on electrical things then, water being good conductor of electricity will destroy those equipment. Even water is not good in case of fires due to oil, petrol, etc For such cases, Carbon dioxide (CO<sub>2</sub>) is best extinguisher. This extinguisher cut off the air supply and thus brings down the temperature below the ignition temperature as a result fire gets extinguished. Moreover it usually does not damage electrical equipment.

### **C) Use of Blankets:**

If a person catches the fire, then blankets can be used to extinguish the fire. The blanket cuts off the supply of air.

### **Ignition Temperature:**

- (i) It is the minimum temperature at which any material catches fire.
- (ii) If the temperature of combustible substance is lower than the ignition temperature then the substance will not burn.

*Example:* (i) Cooking oil catching fire when a frying pan is kept for long on a burning stove.

(ii) Kerosene oil and wood do not catch fire on their own at room temperature. But, if kerosene oil is heated a little, it will catch fire. But if wood is heated a little, it would still not catch fire.

### **Inflammable Substances:**

Those materials which have low ignition temperature and catch fire easily are termed as inflammable substances. Example includes petrol, LPG, etc.

### **Different Types of Combustion:**

#### **1. Rapid Combustion**

In this type of combustion, the substances burn rapidly and yield light and heat.

*Example:* Bring a burning matchstick or a gas lighter near a gas stove in the kitchen. Turn on the knob of the gas stove. We find that the gas burns rapidly and produces heat and light.

#### **2. Spontaneous Combustion:**

In this type of combustion, substances burst out into flames suddenly without any known reason.

*Examples:* Many disastrous fires in coal mines result due to this kind of combustion. The heat rays coming from the sun or a lightning strike might be responsible for this kind of combustion

#### **3. Explosion:**

In this type of combustion, all of a sudden reaction results into heat, light and sound. Moreover, large quantity of gas also gets released

*Example:* When a fire cracker is ignited, a sudden reaction takes place with the evolution of heat, light and sound with the large amount of gas.

## Difference between Rapid combustion and spontaneous combustion

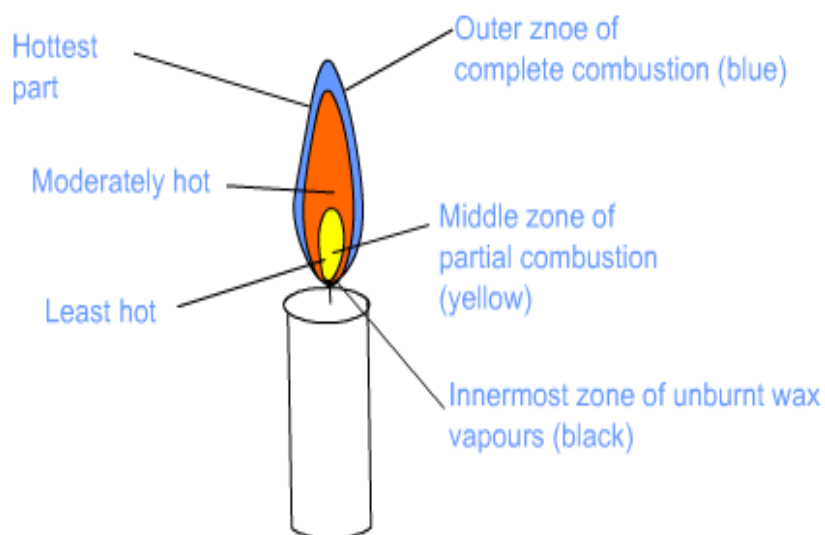
<b>Rapid combustion</b>	<b>Spontaneous combustion</b>
1. It is to be initiated once.	1. It take place by itself.
2. External heat is required to start it once.	2. No external heat is required to start it.
3. Large amoutn of heat and light is evolved in a short time.	3. Small amount of heat and light is evolved.
4. Example: Burning of domestic cooking gas in a gas burner.	4. Burning of white phosphorous on its own when kept exposed in air for some time.

### **Flame:**

When something is burnt, a hot luminous gas emerges out of the substance. This gas is called as flame.

Flames are result of the substances which vaporizes on burning. Example includes kerosene oil, wax, etc. which form flames on burning.

### **Flame structure:**



## Fuel Efficiency

- (i) The quantity of heat generated on combustion of 1 kg of a fuel is called its calorific value.
- (ii) Its unit is kilojoule per kg (KJ /kg).

### Characteristics of good fuel:

- (i) It should easily be available.
- (ii) It should be cheap.
- (iii) It should generate large amount of heat.
- (iv) It should not leave any unwanted matter after combustion.

**Harmful Effects of Burning Fuels:** The increasing fuel consumption has harmful effects on the environment.

1. Various air pollutants like unburnt carbon particles released due to partial burning of carbon fuels causes many respiratory diseases.

2. The partial burning of some fuels releases carbon monoxide, which is a poisonous gas. And this gas can kill a person if left in a room filled with this gas.

3. **Global Warming:** Combustion of most fuels the increase the amount of carbon dioxide in the atmosphere that has lead to increase in the average temperature on the earth.

**Acid Rain:** Due to burning of coal and diesel, Chemicals like sulphur dioxide and nitrogen dioxide are released into the air. The pollutants reacts with the water vapour present in the air and forms sulphuric and nitric acid. When it rains, these acids are also present. Such kind of rain is called Acid Rain. It is very harmful for crops, buildings and soil.

### Prevention from Acid rain:

The use of diesel and petrol as fuels in automobiles is being replaced by CNG (Compressed Natural Gas), because CNG produces the harmful products in very small amounts. CNG is a clean

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