# 🔥 4.1 What is Combustion?

- **Combustion: A chemical process in which a substance reacts with oxygen to release heat (and often light).**
- **Combustible substances: Substances that burn in air (example: wood, coal, kerosene).**
- **Non-combustible substances: Substances that do not burn (example: iron nails, glass).**

## 🌟 Activity 4.1 — Combustible or Not?

## 🛠️ Materials Needed:

- **Straw, matchstick, kerosene oil, paper, iron nail, stone piece, glass.**

## 🧪 Steps:

1. **Try burning each material carefully.**
2. **Observe which material burns.**

## 🔍 Conclusion:

- **If it burns ➔ Combustible**
- **If not ➔ Non-combustible**
  **(Table 4.1 in book)**

## 🌟 Activity 4.2 — Air is Necessary for Burning

## 🛠️ Steps:

1. **Light a candle and cover it with a chimney.**
2. **Change air flow conditions:**
   - **Keep chimney raised (air enters)**
   - **Rest chimney on table (less air)**
   - **Cover with a plate (no air)**

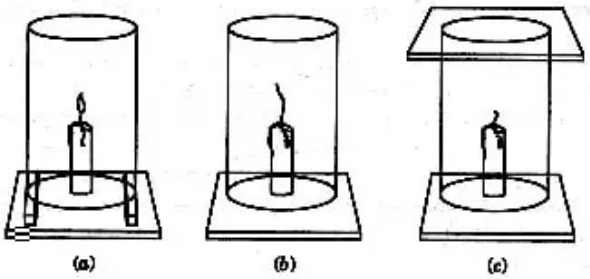



Fig. Showing that air is essential for burning

## 🔍 Observation:

- **More air ➔ Flame burns well.**
- **Less air ➔ Flame flickers and smokes.**
- **No air ➔ Flame goes out.**

✅ Air (oxygen) is necessary for combustion.

### 🌟 Activity 4.3 — Charcoal Burning in Closed Jar

### 🛠️ Steps:

1. Place burning charcoal on iron plate.
2. Cover it with a glass jar.

### 🔍 Observation:

- Charcoal stops burning after some time. ✅ Because oxygen finishes inside the jar.

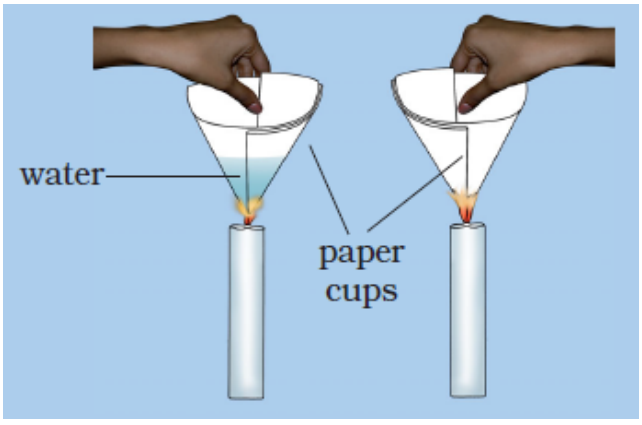
## ⚡ 4.2 What is Ignition Temperature?

- Ignition Temperature: The lowest temperature at which a substance catches fire.
- A substance must reach its ignition temperature to start burning.

### 🌟 Activity 4.4 — Heating Paper Cups

### 🛠️ Steps:

1. Make two paper cups — fill one with water.
2. Heat both over a candle.




### 🔍 Observation:

- Empty cup burns.
- Cup with water does not burn — water absorbs heat.

✅ Water prevents the paper from reaching ignition temperature.

### 🌟 Important Terms:

- Inflammable substances: Substances that catch fire easily at low temperatures (example: petrol, LPG, alcohol).

## 🚒 4.3 How Do We Control Fire?

- Fire needs three things:
  - Fuel
  - Air (oxygen)
  - Heat
- To extinguish fire, remove any one:
  - Use water: Removes heat and blocks air.
  - Use $CO_2$: Blocks air and cools fire.

✅ Water is not used for electrical fires or oil fires (dangerous).

✅ $CO_2$ extinguisher is best for:

- Electrical fires
- Oil fires

Fire extinguisher

## 🔥 4.4 Types of Combustion

| Type | Description | Example |
|---|---|---|
| Rapid Combustion | Burns quickly with heat and light | Gas stove |
| Spontaneous Combustion | Bursts into flames without external cause | Phosphorus |
| Explosion | Sudden reaction with sound, heat, light | Firecrackers |

# 🕯️ 4.5 Flame

- **Flame is produced by substances that vaporize during burning (example: kerosene, wax).**

## 🌟 Activity 4.5 — Observing Candle Flame

*Colours of a candle flame and the flame of a kitchen stove*

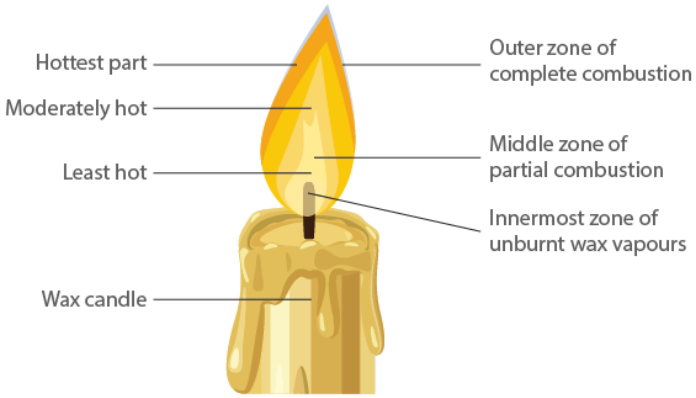
## 🛠️ Steps:

1. **Light a candle.**
2. **Place a glass tube into the flame.**
3. **Bring a matchstick near tube's end.**

## 🔍 Observation:

- **A flame appears ➔ shows wax vapours burning.**

## 🌟 Structure of Candle Flame



| Zone | Colour | Temperature |
|---|---|---|
| Outermost | Blue | Hottest |
| Middle | Yellow | Moderately hot |
| Innermost | Black | Least hot (unburnt wax vapours) |

✅ **Goldsmiths use the outermost zone for melting gold/silver because it is the hottest part.**

## ⛽ 4.6 What is a Fuel?

- **Fuel: A substance that gives heat and energy on burning.**
- **Examples: Wood, coal, petrol, kerosene, LPG.**

✅ **Good Fuel:**

- **Easily available**
- **Cheap**
- **Burns easily**
- **High heat output**
- **Leaves no harmful residue**

✅ **No fuel is perfectly ideal!**

### 🌟 Types of Fuels

| Solid Fuels | Liquid Fuels | Gaseous Fuels |
|---|---|---|
| Coal | Kerosene oil | LPG, CNG |

## 🔥 4.7 Fuel Efficiency

- **Calorific Value: Amount of heat energy produced by burning 1 kg of fuel.**

| Fuel | Calorific Value (kJ/kg) |
|---|---|
| Cow dung cake | 6000–8000 |
| Wood | 17000–22000 |
| Coal | 25000–33000 |
| LPG | 55000 |
| Hydrogen | 150000 |

✅ **Higher calorific value = More efficient fuel.**

## 🌍 Harmful Effects of Burning Fuels

- **Unburnt carbon particles: Cause breathing problems (asthma).**
- **Incomplete combustion: Produces carbon monoxide (poisonous gas).**
- **Burning fuels release $CO_2$ ➔ Leads to global warming.**
- **Coal and diesel release sulphur dioxide ➔ Causes acid rain.**

✅ **CNG is a cleaner alternative fuel.**