

Combustion and Flame

- **Combustion**
- **Conditions required for combustion**

INTRODUCTION

**What are the two things? that are produced
when a substance burns?**

Burning of a substance
produces :

**Heat
Light**



COMBUSTION

The process of burning of a substance in the presence of **Air** or **Oxygen** with the liberation of **heat** and **light** is called **combustion**.

What is Combustion ???

COMBUSTION

Substances are classified as :

Combustible

Non-combustible

COMBUSTION

Substances that burn in air or oxygen to produce heat and light are called combustible substances.



COMBUSTION

Substances that do not burn in air or oxygen to produce heat and light are called

Non-combustible substances

COMBUSTION

**Let us classify some of the
materials**

into

combustible

and

non - combustible

MATERIALS

COMBUSTION

Matchstick

Combustible



MATERIALS

COMBUSTION

Water

Non - Combustible



MATERIALS

COMBUSTION

Paper

Combustible



MATERIALS

COMBUSTION

Cloth

Combustible



MATERIALS

COMBUSTION

Sand

Non - Combustible

FIRE



CONDITIONS REQUIRED FOR COMBUSTION

1. Presence of a supporter of combustion

Adequate supply of a supporter of combustion (e.g. oxygen) is essential for combustion.

2. Attainment of ignition temperature

A substance starts to burn only after it has

a particular temperature.

A substance cannot catch fire if its temperature is lower than its ignition temperature.

PRESENCE OF A SUPPORTER OF COMBUSTION

CONCLUSION

5

- We can see that the candle flame
is completely extinguished.
- Observe the flame.

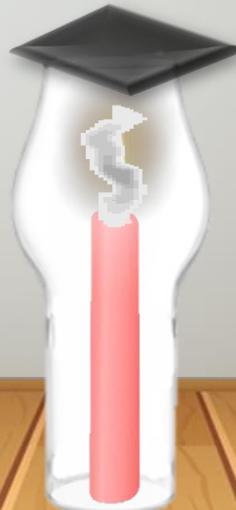
The candle flame is completely
extinguished because it has
completely exhausted the
available oxygen.

Activity



To prove that air is necessary for combustion.

Air is necessary for combustion.



Activity 2 COMBUSTION

In this experiment we will water that improves that ignition temperature. If the temperature reaches fire, a substance does not catch fire.

Take a piece of paper and keep the other half filled above the flame carefully.

A substance cannot catch fire if its temperature is lower than its ignition observe?



1. Define combustible and non combustible substances.
2. What are the conditions required for combustion?
3. What do you mean by ignition temperature?

Questions



Combustion and Flame

- **Types of combustion**
- **Fire control**
- **Extinguishing a fire**

TYPES OF COMBUSTION

RAPID COMBUSTION

When a combustible substance burns fast to produce heat it is called rapid combustion.



For example:

COMBUSTION OF LPG



TYPES OF COMBUSTION

EXPLOSIVE COMBUSTION

When a mixture of combustible materials is burnt completely in the air at a very short span of time, explosive combustion takes place.

RAPID COMBUSTION

For example:

EXPLOSIVE COMBUSTION

**WHEN CRACKERS
ARE IGNITED**



SPONTANEOUS COMBUSTION

TYPES OF COMBUSTION

SPONTANEOUS COMBUSTION

When a combustible substance catches fire even at room temperature, spontaneous combustion takes place.

RAPID COMBUSTION



SPONTANEOUS COMBUSTION

For example:

EXPLOSIVE COMBUSTION

BURNING OF WHITE PHOSPHOROUS



FIRE CONTROL

The 3rdings masterseapdient firetheextingushers
timerin onefirsto pruduce kinow about fire.



Enough oxygen to sustain combustion.



Enough heat to raise the material to
its ignition temperature



Fuel or combustible material.



FIRE CONTROL

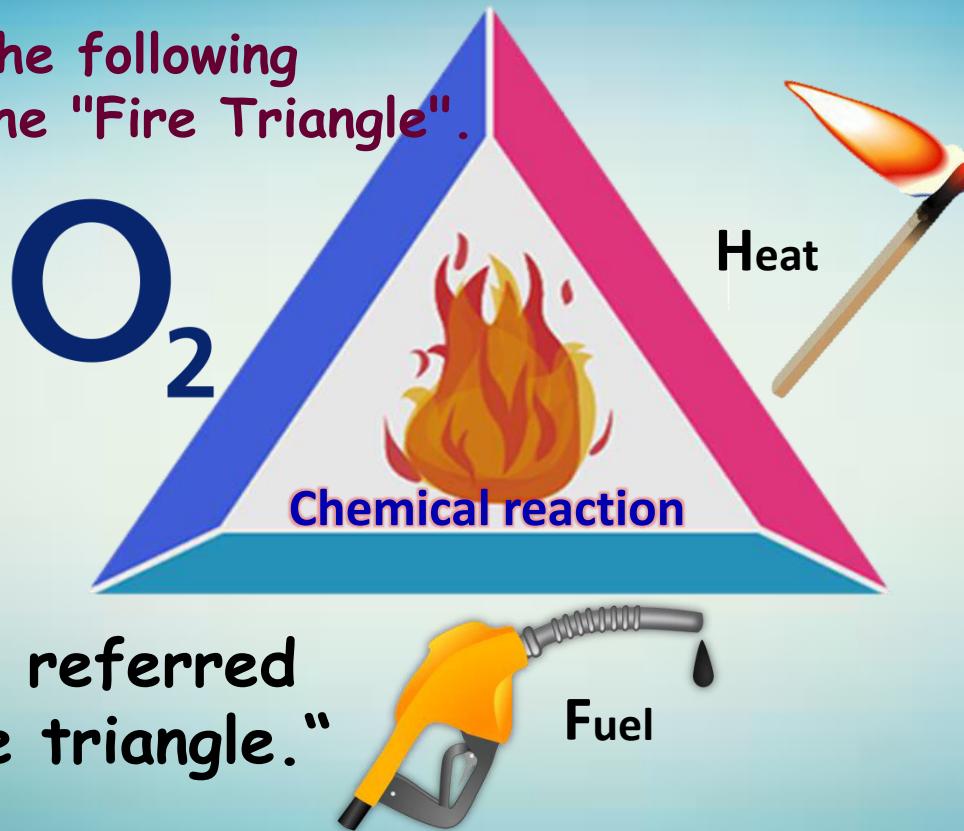
Take a look at the following diagram, called the "Fire Triangle".

Oxygen

Heat

Fuel

are frequently referred to as the "fire triangle."



EXTINGUISHING A FIRE

A fire can be extinguished using substances where water. Water can be dangerous. As a result, water forms a layer beneath them and the substance continues burning. Substances are lighter than water and do not mix with it.



EXTINGUISHING A FIRE

Water should not be poured over
electrical fires, kerosene or diesel.



- 
1. What do you mean by slow, rapid, spontaneous and explosive combustion? Give one example of each.
 2. What is fire triangle?
 3. What are the conditions necessary for fire?

Questions

Combustion and Flame

- Fire extinguishers
- Fire precautions
- Fire safety
- Flame

FIRE EXTINGUISHERS

Two common types of fire extinguishers are :

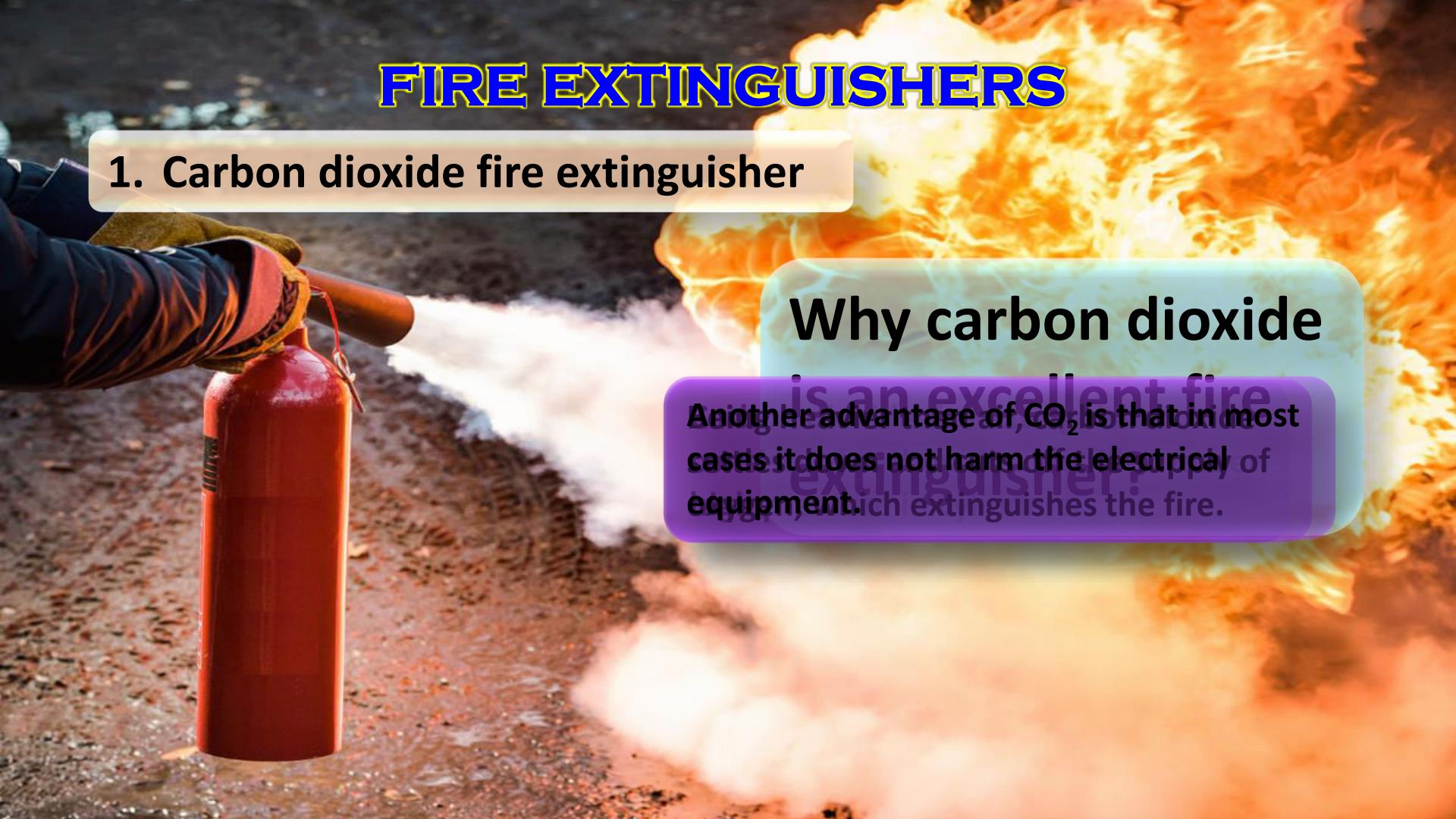
- 1. Carbon dioxide fire extinguisher**
- 2. Soda-acid fire extinguisher.**

FIRE EXTINGUISHERS

1. Carbon dioxide fire extinguisher

Why carbon dioxide

Another advantage of CO₂ is that in most cases it does not harm the electrical equipment, which extinguishes the fire.



FIRE EXTINGUISHERS

Two common types of fire extinguishers are :

- 1. Carbon dioxide fire extinguisher**
- 2. Soda-acid fire extinguisher.**

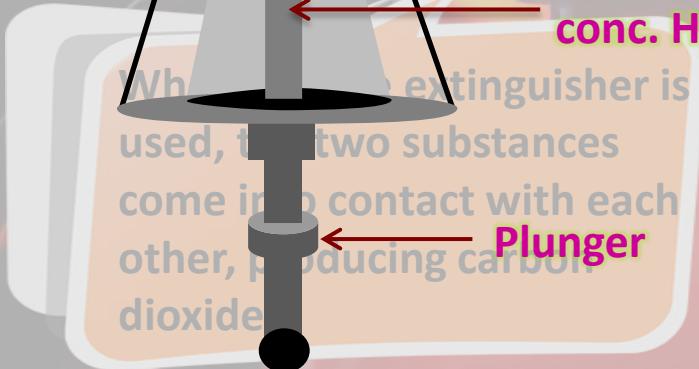
FIRE EXTINGUISHERS

2. Soda-acid fire extinguisher.

This type of fire extinguisher has a concentrated solution of sodium bicarbonate and sulphuric acid in separate compartments.



Thin glass tube containing conc. H_2SO_4



3



FIRE PRECAUTIONS

Do not throw burning matchstick
within the premises of :



4

FIRE PRECAUTIONS

Do not throw burning matchstick
within the premises of :



FIRE PRECAUTIONS

Do not throw burning matchstick
within the premises of :



FIRE PRECAUTIONS

Do not throw burning matchstick
within the premises of :



ammunition depots



FIRE PRECAUTIONS

**Do not throw burning cigarette near
the forest area. in the house at the
time of power failure.**



FIRE PRECAUTIONS

Do not over load power sockets.



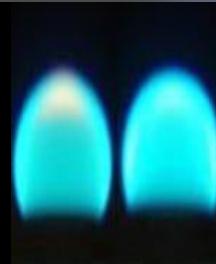
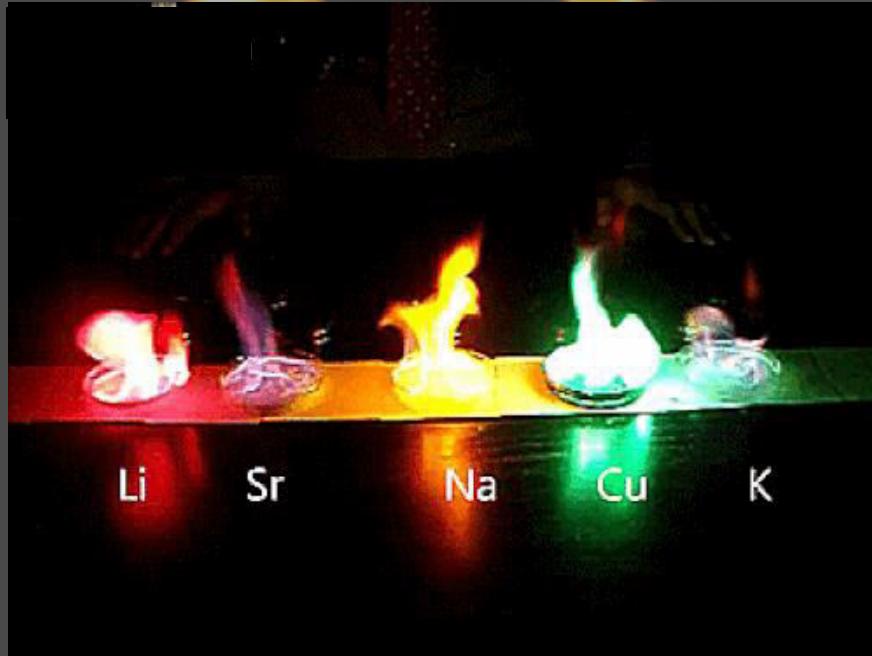
FIRE SAFETY

Running makes fire
burn faster.
If your clothes
STOP
are on fire.
DROP
ROLL



FLAME

The colour of the flame depends on :
combustion of fuel takes place.
Nature of the substance burning



FLAME

The colour of the flame depends on :

Amount of air available

Yellow flame is observed because of
incomplete combustion.

This type of combustion
takes place in inadequate
amount of air or oxygen.

What is

FLAME

The colour of the flame depends on :

Amount of air available

What is ?

It results in the formation of cause carbon dioxide, water, heat and light.

Soot is a mass of impure carbon particles resulting from the incomplete combustion of hydrocarbons.

ZONES OF CANDLE FLAME

A candle flame can be divided into three zones, depending on the amount of oxygen available.



ZONES OF CANDLE FLAME

OUTER ZONE

In this zone, the wax vapours have enough oxygen to burn completely.

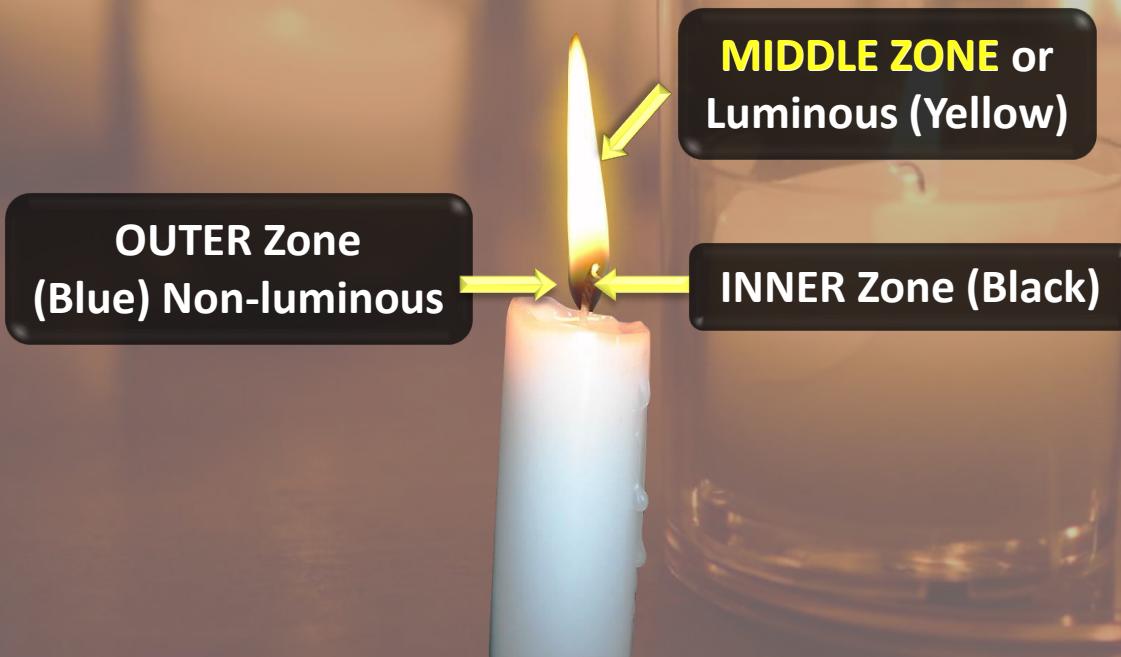
This zone emits very little light.

It is the hottest part of the flame.



ZONES OF CANDLE FLAME

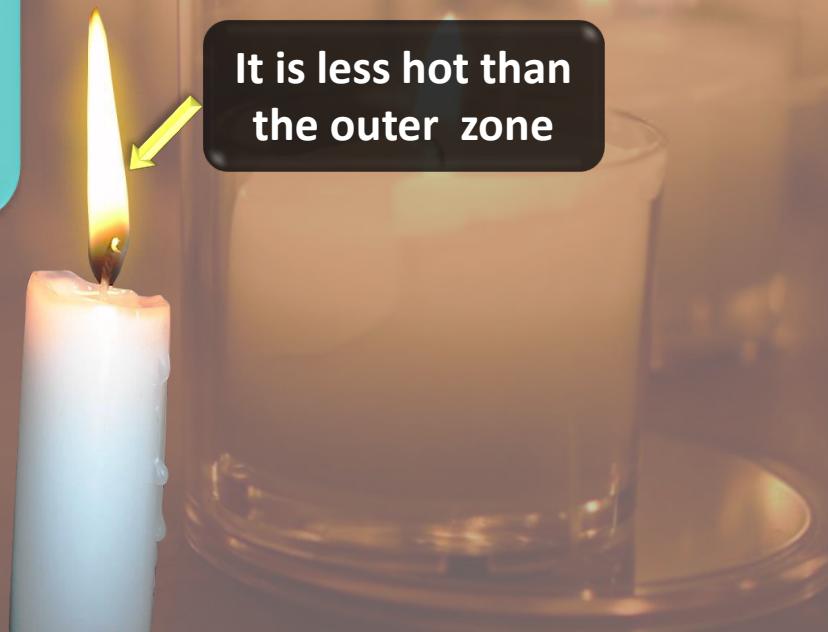
A candle flame can be divided into three zones, depending on the amount of oxygen available.



ZONES OF CANDLE FLAME

MIDDLE ZONE

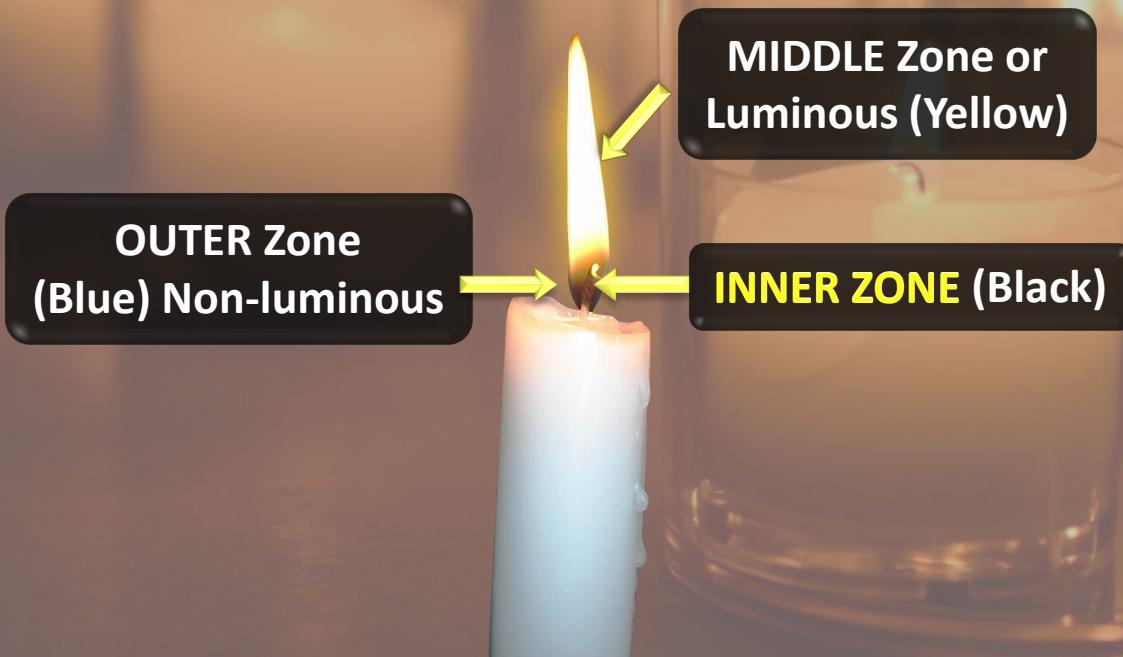
This zone emits the most light.
incomplete combustion of
wax vapours occurs producing
carbon particles and carbon
monoxide.



**It is less hot than
the outer zone**

ZONES OF CANDLE FLAME

A candle flame can be divided into three zones, depending on the amount of oxygen available.



ZONES OF CANDLE FLAME

INNER ZONE

This zone is completely dark and in emits no light. No oxygen is available.

**It is the coolest
part of the flame.**



- 
1. Why water should not be poured over burning petrol, diesel or kerosene?
 2. On what factors the colour of the flame depends?
 3. Name the zones of the candle flame.
 4. What are the fire precautions to be taken?



Combustion and Flame

- **Combustion of a wax candle**
- **Activity**



If you observe a candle flame closely, you will notice the following.



The liquid or solid waxed in never catches fire.x in the flame and the liquid wax.



Activity: To prove that when a candle burns, it is the wax vapours that burn and not the liquid wax

Conclusion
The candle
burns the wick
not the liquid wax.
The wick
ignites the wick
by giving off smoke.

When a candle is lit, it is the wax vapours that burn, not the liquid wax.



4

Conclusion

There is no deposition in the middle of the ring because it does not have any carbon particles in the inner zone of unburnt carbon particles.

Middle zone of the candle flame contains (minous) of the ticles of carbon.



Activity :-

Conclusion :-

To prove that outer zone (non-luminous) flame and inner zone (luminous) flame are different in temperature.

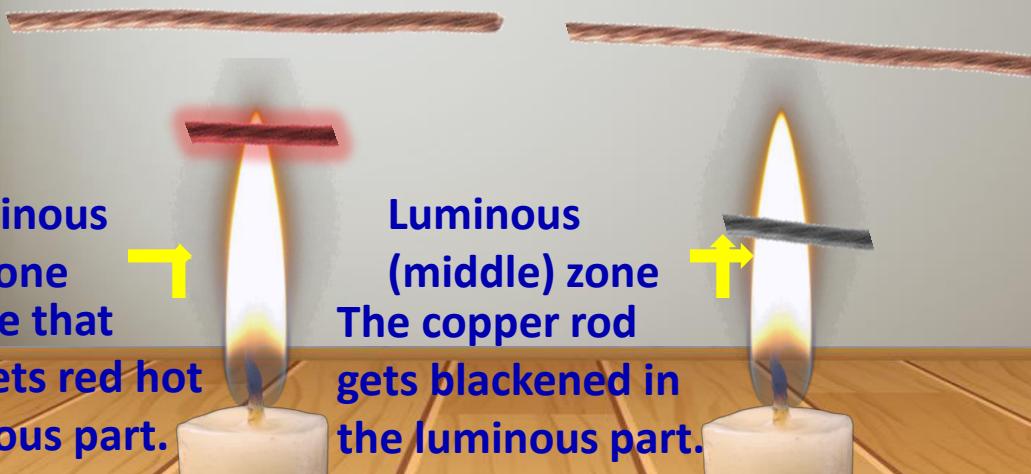
The inner zone is the hottest part of the flame.

Non-luminous
(outer) zone

We will notice that
copper rod gets red hot
in non-luminous part.

Luminous
(middle) zone

The copper rod
gets blackened in
the luminous part.

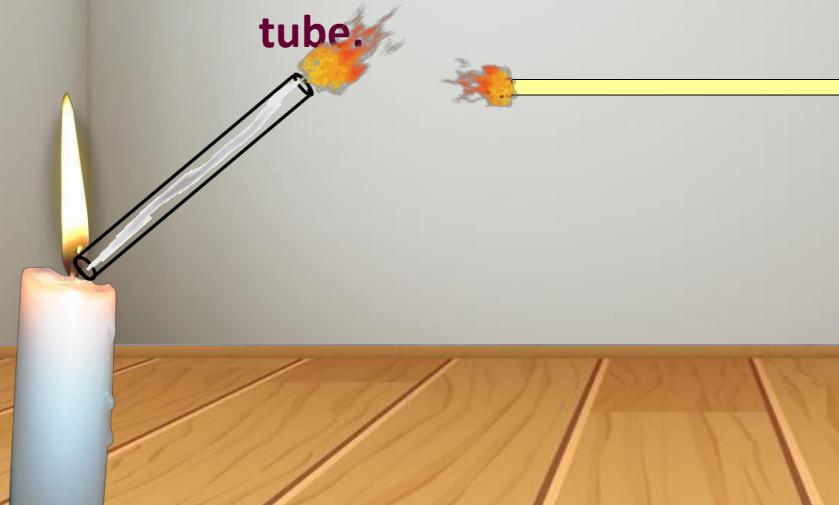


Conclusion

Conclusion

Wax vapours are present in the inner most zone of candle flame.

2. When you blow back over the glass tube, the daddy, in the mouth of the glass tube, will blow flame coming out from the other end of the glass tube.



- 
1. Why greyish black ring forms on the glass slide when it is introduced in the flame?
 2. Write the observations when the candle flame is observed closely.
 3. When a candle is lit, is the vapour of the liquid wax that burns?

Questions

Thank You