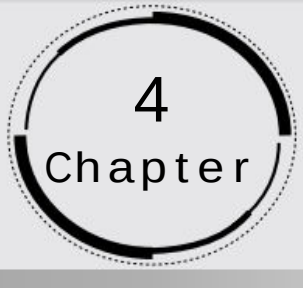
Combustion and Flame



1. List conditions under which combustion can take place.

Ans: Combustion takes place under following three conditions:

i. In the presence of fuel.
ii. In the presence of oxygen (air).
iii. In the presence of heat - the minimum temperature at which a substance catches fire, known as ignition temperature.

2. Fill in the blanks:

(a) Burning of wood and coal causes_____of air.

Ans: Burning of wood and coal causes pollution of air.

(b) A liquid fuel used in homes is_____.

Ans: A liquid fuel used in homes is Liquified Petroleum Gas (LPG).

(c) Fuel must be heated to its_____before it starts burning.

Ans: Fuel must be heated to its ignition temperature before it starts burning.

(d) Fire produced by oil cannot be controlled by_____.

Ans: Fire produced by oil cannot be controlled by water.

3. Explain how the use of CNG in automobiles has reduced pollution in our cities.

Ans: The use of CNG in automobiles has reduced pollution in our cities because it is a clean fuel and the amount of unburnt fuel in CNG is very less compared to petroleum. It does not produce smoke and harmful substances that are produced in petroleum.

4. Compare LPG and wood as fuels.

Ans:

LPG	WOOD
LPG is a by-product of natural gas and crude oil refining.	Wood is a fuel which is obtained from trees.
Its efficiency is 55,000 kJ / kg.	Its efficiency is 17,000 – 22,000 kJ / kg.
It is a gaseous fuel.	It is a solid fuel.
It produces less pollution on combustion.	It produces a lot of smoke on combustion and causes respiratory problems.

5. Give reasons.

(a) Water is not used to control fires involving electrical equipment.

Ans: Water is not used to control fires involving electrical equipment because water is a good conductor of electricity due to which the person may be electro-conducted and it may damage the equipment.

(b) LPG is a better domestic fuel than wood.

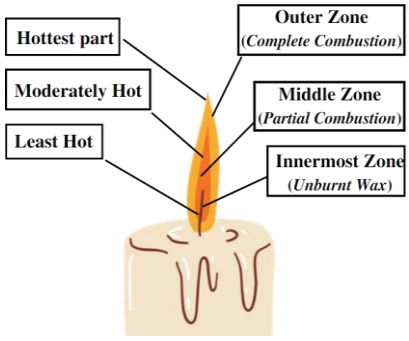
Ans: LPG is a better domestic fuel than wood because wood produces a lot of smoke on combustion and causes respiratory problems. Also, its efficiency is lower than LPG.

(c) Paper by itself catches fire easily whereas a piece of paper wrapped around an aluminum pipe does not.

Ans: Paper by itself catches fire easily whereas a piece of paper wrapped around an aluminum pipe does not because aluminum is a good conductor of heat which absorbs the heat from the paper and the paper does not catch fire. Whereas, paper by itself catches fire.

6. Make a labelled diagram of a candle flame.

Ans: A labelled diagram of candle flame is:



7. Name the unit in which the calorific value of a fuel is expressed.

Ans: "Kilo Joule per Kilogram (kJ/kg)" is used to express the calorific value of a fuel.

8. Explain how CO_2 is able to control fires.

Ans: We know that combustion takes place under following three conditions:

i. In the presence of oxygen (air).
ii. In the presence of fuel.
iii. In the presence of heat - the minimum temperature at which a substance catches fire, known as ignition temperature.

We can control fire if any one of the three conditions are not met.

i. CO_2 is heavier than oxygen and hence it acts as a protective blanket and prevents oxygen from reaching the fire.
ii. Since CO_2 is stored in liquid state therefore, when it is used on fire, it expands and cools which lower down the temperature. This prevents heat from reaching the fire.

9. It is difficult to burn a heap of green leaves, but dry leaves catch fire easily. Explain

Ans: It is difficult to burn a heap of green leaves, but dry leaves catch fire easily because combustion takes place in the presence of heat - the minimum temperature at which a substance catches fire, known as ignition temperature. Green leaves have higher moisture than dry leaves and hence, it takes more time for green leaves to reach ignition temperature than dry leaves.

10. Which zone of a flame does a goldsmith use for melting gold and silver and why?

Ans: Goldsmiths use the outermost zone of the flame to melt gold and silver because gold and silver has a high melting point and the outermost part undergoes complete combustion and it is the hottest part of the flame which supplies the adequate amount of heat required for melting.

11. In an experiment 4.5 kg of a fuel was completely burnt. The heat produced was measured to be 180,000 kJ. Calculate the calorific value of the fuel.

Ans: The amount of heat released during combustion of 1 kg fuel is known as calorific value i.e.,

$$\text{Calorific Value} = \frac{\text{Heat produced during combustion}}{\text{Quantity of fuel}}$$

$$\Rightarrow \text{Calorific Value} = \frac{180{,}000}{4.5}\ \text{kJ / kg}$$

$$\therefore \text{Calorific Value} = 40{,}000\ \text{kJ / kg}$$

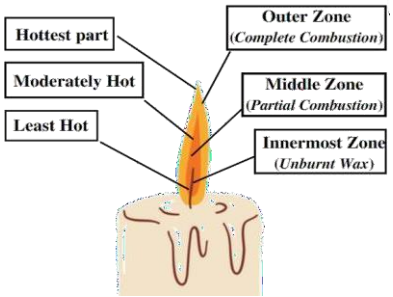
12. Can the process of rusting be called combustion? Discuss.

Ans: A chemical process in which a substance reacts with oxygen to give off heat is called combustion. When an iron metal combines with the oxygen in the presence of water to form a compound iron oxide is known as rusting.

Therefore, the process of rusting can be called as combustion because in both the processes, heat and light is produced. Rusting is known as slow combustion.

13. Abida and Ramesh were doing an experiment in which water was to be heated in a beaker. Abida kept the beaker near the wick in the yellow part of the candle flame. Ramesh kept the beaker in the outermost part of the flame. Whose water will get heated in a shorter time.

Ans: A labelled diagram of candle flame is:



Observe that the innermost zone of the candle which is near to the wick is least hot whereas the outer zone of the candle is the hottest part of the candle flame.

Since Ramesh kept the beaker in the outermost part of the flame therefore, his beaker will be heated in a shorter time as compared to Abida.

Extended Learning — Activities and Projects

1. **Survey the availability of various fuels in your locality.Find out their cost per kg andprepare a tabular chart showing how many** K**J of various fuels you can get for every rupee..**

Ans: The various fossil fuels available around us are coal, petrol and diesel. They can be easily purchased from shops and gas stations respectively.

Petrol today costs around Rs 78 per litre, Diesel costs around Rs 69 per litre and Coal costs around Rs 40 per kg.

The prices given above are inclusive of a

2. **Find out the number type and location of fire extinguishers avaible in your school nearby shops and factories write a brief report about the preparedness of these establishments to fight fire**

Ans: School : Total fire extinguishers 33 (20 Water, 13 Foam)

All fire extinguishers are serviced quarterly by the authorised dealer ABC company and found to be in good working condition. Located at easily accessible points throughout school.

Shop: Total fire extinguishers 3 (1 Water, 1 Foam, 1 Gas)

Fire

3. **Survey 100 houses in your area. Find the percentage of households using LPG, kerosene, wood and cattle dung as fuel.**

Ans: I had taked a survey 5 1/2 months ago for my homework and I find that:

Total number of families in my society=30

No. of families using LPG=24

No. of families using kerosene=1

No. of families using wood=2

No. of families using cattle dung=3

Percentages :- LPG=80%

Kerosene=3.4%

Wood=6.6%

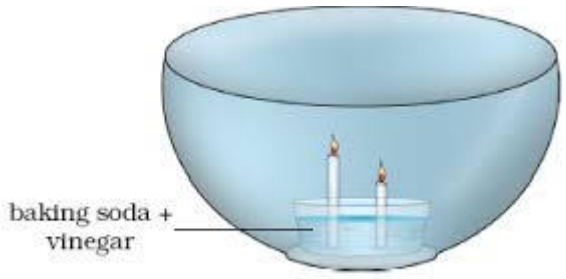
Cattle dung=1

4. Talk to people who using LPG at home find out what precautions they take in using LPG

Ans: The following precautions must be taken while using LPG cylinder:

1. Before igniting the gas, we should make sure that there is no foul smell of the leaking gas. If there is foul smell of gas, then the doors and windows should be opened at once to allow the gas to escape. The gas cylinder, rubber tub

5. Make a model of a fire extinguisher. Place a short candle and a slightly taller candlein a small dish filled with baking soda. Place the dish at the bottom of a large bowl. Light both the candles. Then pour vinegar into the dish of baking s oda. Take care. Donot pour vinegar on the candles. Observe the foaming reaction.What happens to the candles? Why? In what order?



Ans: Combine vinegar and baking soda to create a chemical reaction. Carbon dioxide (CO2)gas is formed during this chemical reaction. ... Pouring the heavy CO2 gas over the flame pushes away the oxygen from around the candle causing the fire to go out due to lack of oxygen.

Baking soda, (sodium bic