Combustion and Flame

Q.1 List conditions under which combustion can take place.

Sol: Below are the three conditions under which combustion can take place:

(a) Fuel (Combustible Substances)
(b) Air (oxygen O2)
(c) Attainment of Ignition temperature (minimum temperature at which substances catch fire)

Q.2 Fill in the blanks:

(a) Burning of wood and coal causes _____ of air.
(b) A liquid fuel used in homes is _____.
(c) Fuel must be heated to its _____ before it starts burning.
(d) Fire produced by oil cannot be controlled by _____.

Sol: (a) Burning of wood and coal causes **pollution** of air.
(b) A liquid fuel used in homes is **liquefied petroleum gas (LPG)**.
(c) Fuel must be heated to its **ignition temperature** before it starts burning.
(d) Fire produced by oil cannot be controlled by **water**.

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

Sol: CNG is a clean fuel. It does not produce smoke and harmful substances like-carbon monoxide (CO) and carbon do oxide (CO_2) etc. that are produced in petroleum. These substances are very harmful to the environment, and human beings. In this way, the use of CNG in automobiles has reduced pollution in our cities.

Q.4 Compare LPG and wood as fuels.

Sol: Comparison between LPG and wood as fuels:

LPG	Wood
1. It is a Liquid fuel.	1. It is solid fuel.
2. It does not produce smoke.	2. It produces smoke.
3. It does not create pollution on combustion.	3. It pollutes air on the combustion.
4. It has high fuel efficiency (55000 kJ/kg) compared to wood.	4. It has low fuel efficiency (17000 kJ/kg).
5. It can be easily transported.	5. It can't be transported easily.

Q.5 Give reasons.

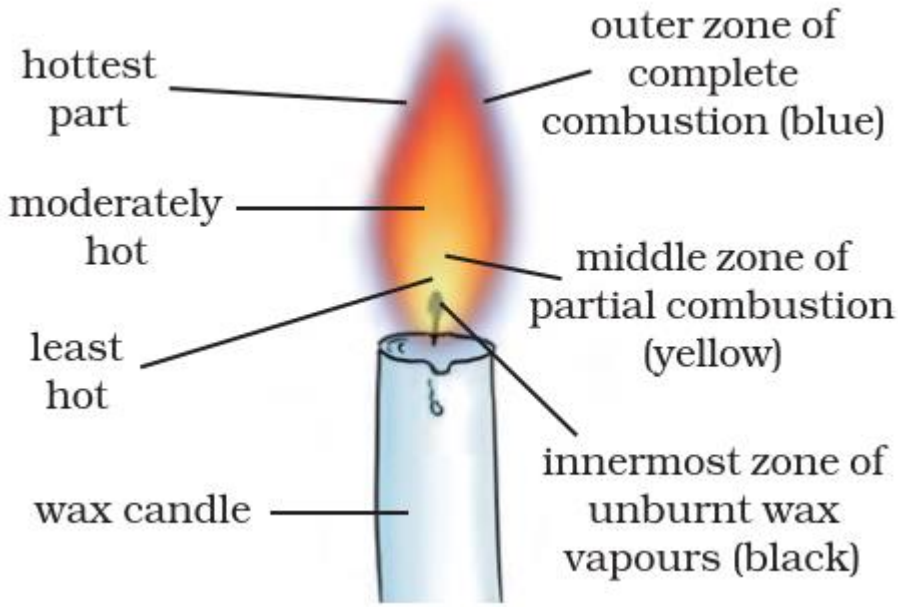
1) Water is not used to control fires involving electrical equipment.
2) LPG is a better domestic fuel than wood.
3) Paper by itself catches fire easily whereas a piece of paper wrapped around an aluminium pipe does not.

Sol: (1) Water is not used to control fires involving electrical equipment because it is a good conductor of electricity. If water is used to extinguish fire, the person may be got electric shock and water may damage the equipment.

(2) LPG is a better domestic fuel than wood. It is very clean fuel. It does not produce harmful gases with smoke and does not leave any residue. It has more calorific value than wood.

(3) A piece of paper wrapped around aluminium pipe does not catch fire easily because Ignition temperature of aluminium is higher than paper. So, aluminium pipe absorbs the heat and piece of paper does not get its ignition temperature.

Q.6 Make a labelled diagram of a candle flame.
Sol:



Q.6 Name the unit in which the calorific value of a fuel is expressed.
Sol: The calorific value of a fuel is expressed in kilojoule per kilogram (kJ/kg).

Q.8 Explain how CO_2 is able to control fires.
Sol: CO_2 does not support combustion. So, it is used as a fire extinguisher. CO_2 is heavier than oxygen, when it is released, it acts as a protective blanket around the fire and stops the supply of oxygen to the fuel. And the fire is controlled.

Q.9 It is difficult to burn a heap of green leaves, but dry leaves catch fire easily. Explain.
Sol: Green leaves contain higher moisture content than dry leaves. So its ignition temperature gets increased and it does not catch fire easily. But dry leaves do not have moisture. So, it catches the fire easily.

Q10. Which zone of a flame does a goldsmith use for melting gold and silver and why?
Sol: Goldsmiths use the outermost zone of the flame for melting gold and silver because the outermost zone is the hottest zone of flame. In this zone, complete combustion occurs.

Q.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.
Sol: Calorific value means that the amount of heat produced when 1 kg of fuel is completely burnt.

Now,
Heat produced by 4.5 kg of fuel = 180000 kJ Then, heat produced by 1kg of fuel is = 180000/4.5

= 40,000 kJ/kg

Therefore, the calorific value of the fuel is 40,000 kJ/kg.

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

Sol: Yes, the process of rusting can be called as combustion. Because in combustion process, the substances react with oxygen and liberate heat, light and energy. Whereas in process of rusting, the substance react with oxygen and emit heat during the formation of its oxide. Rusting is also known as slow combustion.

Q.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?

Sol: Ramesh's beaker is heated in shorter time because the outer most zone of flame is the hottest flame compared to the yellow part of the flame.