

Combustion and Flame (Science)

Question 1:

List conditions under which combustion can take place.

Ans: Combustion is a process of reaction of a substance with oxygen. There are certain conditions required for combustion to take place. They are:

- (i) Presence of a fuel
- (ii) Air (or oxygen)
- (iii) Ignition temperature (minimum temperature at which a substance catches fire).

Question 2:

Fill in the blanks:

- (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.

Question 3:

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

Ans: Combustion of fuels like petroleum causes formation of un-burnt carbon particles along with carbon monoxide gas. These harmful pollutants enter the air and cause respiratory diseases. Compressed Natural Gas (CNG) produces these harmful products in very less quantity. It is a comparatively cleaner fuel. Therefore, the use of CNG has reduced pollution in our cities.

Question 4:

Compare LPG and wood as fuels.

Ans: Wood has been a traditional fuel for both domestic and industrial use. However, it produces a lot of smoke that can cause respiratory problems. Also, wood is obtained from trees. Thus, using wood as a fuel causes deforestation. Therefore, slowly wood is replaced by LPG, which is a liquefied form of petroleum gas. It does not give out smoke and other pollutants and is a cleaner fuel. Again, fuel efficiency of LPG is more than that of wood. The calorific value of LPG

is 55000 kJ / kg, while that of wood is between 17000 to 22000 kJ / kg. Hence, LPG is favoured over wood.

Question 5:

Give reasons.

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

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

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

Ans: (a) Water is a good conductor of electricity. If it is used for controlling a fire involving electrical equipments, then the person dousing the fire might get an electric shock. Also, water can damage electrical equipments.

(b) LPG is a better domestic fuel as it does not produce smoke and un-burnt carbon particles, which cause respiratory problems.

(c) A piece of paper wrapped around aluminium pipe does not catch fire easily. This is because aluminium, being a metal, is a good conductor of heat. Therefore, heat is transferred from the paper to the metal and the paper does not attain its ignition temperature.

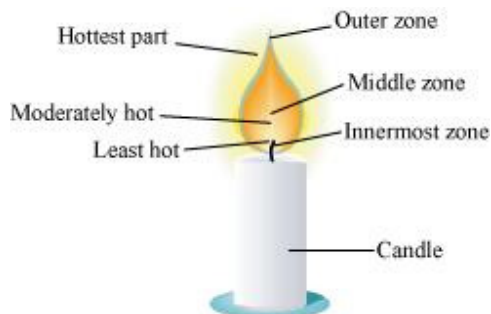
Question 6:

Make a labelled diagram of a candle flame.

Question 7:

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

Ans: The calorific value of a fuel is expressed in kilojoules per kilogram (kJ/kg).



Question 8:

Explain how CO₂ is able to control fires.

Ans: CO₂ is a non-combustible gas and extinguishes fire in two ways:

(i) Since it is heavier than oxygen, it covers the fire like a blanket and cuts off the contact between oxygen and fuel.

(ii) In cylinders, CO₂ is kept in the liquid form. When released, it expands enormously and cools down. This brings down the temperature of the fuel, which helps in controlling the fire.

Question 9:

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

Ans: Green leaves have a lot of moisture in them. This moisture does not allow them to catch fire easily. However, dry leaves have no moisture in them. Therefore, they catch fire easily.

Question 10:

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

Ans: Goldsmiths use the outermost part/zone of the flame to melt gold and silver. This is because the outermost zone of the flame undergoes complete combustion and is the hottest part of the flame.

Question 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 calorific value of fuel is the amount of heat produced by the complete combustion of 1 kg of fuel.

Now,

Heat produced by 4.5 kg of fuel = 180000 kJ

Therefore, heat produced by $1\text{ kg of fuel} = \frac{180000}{4.5} \times 1$ kJ/kg

= 40,000 kJ/kg

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

Question 12:

Can the process of rusting be called combustion? Discuss.

Combustion is a chemical process in which a substance reacts with oxygen and gives out energy during the process in the form of either heat or light or both. Rusting of iron is an exothermic process as heat is released during rusting. Hence, it is a kind of slow combustion.

Question 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: The water in the Ramesh's beaker will heat up in a shorter time. This is because the outermost zone of a flame is the hottest zone, while the yellow zone (in which Abida had kept the beaker) is less hot.