

# NCERT solution for Combustion and Flame Science

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## Question 1

List conditions under which combustion can take place.

## Answer

The conditions required for combustion to take place are:

- a) Presence of a fuel
- b) Air (or oxygen)
- c) Ignition temperature (minimum temperature at which a substance catches fire).

## Question 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 \_\_\_\_\_.

## Answer

- (a) pollution
- (b) LPG.
- (c) ignition temperature.
- (d) water.

## Question 3

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

## Answer

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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 like asthma etc. 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. It is much cleaner fuel for the vehicles

#### Question 4

Compare LPG and wood as fuels.

#### Answer

LPG	Wood
It has more calorific value about 55000 kJ/kg	It has less calorific value about 17000 to 22000 kJ/kg
It is smokeless fuel.	It gives out lot of smoke
It is easy to store and can be easily transported in cylinders and pipelines.	It needs a lot of space to store also difficult to transport.
It has Low Ignition temperature	It has High Ignition temperature
It does not cause any environmental problem and does not cause any health issues	It causes diseases such as asthma on burning wood as it releases unburnt carbon particles

#### Question 5

##### Give reasons.

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

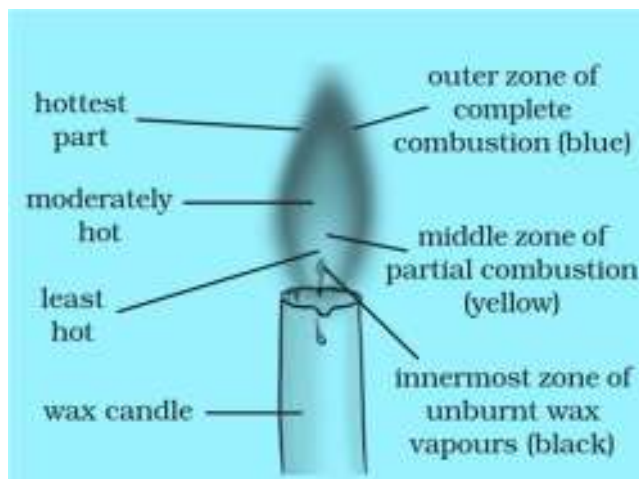
#### Answer

a)	Water is a conductor of electricity, so it can easily conduct electric current and cause danger of electric shocks or short-circuits. Therefore, water cannot be used to control the fire involving electrical equipment.
b)	LPG is a better domestic fuel as it does not produce smoke and un-burnt carbon particles, which cause respiratory problems.
c)	Paper by itself catches fire easily because it has low ignition temperature but when wrapped around an aluminum pipe its temperature is lowered due to aluminum metal absorbing the heat supplied to paper. So it does not catch fire.

**Question 6**

Make a labelled diagram of a candle flame.

**Answer**



**Question 7**

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

**Answer**

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

**Question 8**

Explain how  $\text{CO}_2$  is able to control fires.

**Answer**

Being heavier than oxygen,  $\text{CO}_2$  covers the fire like a blanket. Since the contact between the fuel and oxygen is cut off, the fire is controlled.

**Question 9**

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

**Answer**

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?

**Answer**

A goldsmith uses the outer part of the candle flame for melting gold and silver because in this zone the temperature is the highest which helps to melt these metals easily.

**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.

**Answer****What is calorific value of fuel**

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 So, heat produced by 1Kg of fuel =  $180000/4.5 = 40,000$  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.

### Answer

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?

### Answer

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.