# CHAPTER -4

# COMBUSTION AND FLAME

## EXERCISES

## 1 Mark Questions

**Q1: What is the main constituent of biogas and kitchen gas (L.P.G.)?**

Answer: The main constituent of biogas is methane and of kitchen gas (L.P.G.) is butane.

**.Q2: What is biogas?**

Answer: Biogas is formed by the decomposition of plant and animal wastes.

**Q3: Fuel must be heated to it's …….. Temperature before it starts burning.**

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

**Q4: List conditions under which combustion can take place**

Answer:
The conditions under which combustion can take place:

- Presence of combustible substance.
- Presence of supporter of combustion i.e., oxygen.
- Attainment of ignition temperature

**Q5: Define combustion.**

Answer:
Combustion is the process of burning of substances to give heat and light.

**Q6: What name is given to the substances which can bum easily?**

Answer: Combustible substances.

**Q7: List conditions under which combustion can take place**.

.Answer: Combustion can take place in the presence of:
(a) a combustible substance.
(b) Oxygen, that is, the supporter of combustion.
(c) Attainment of ignition temperature of the substance.

**Q8: Name the unit in which the calorific value of a fuel is expressed.**

Answer: The unit in which the calorific value of a fuel is expressed is kilojoules per kilogram (kJ/kg).

**Q9: Can the process of rusting be called combustion? Discuss**.

Answer: The process of rusting emits heat during the formation of its oxide. So we can call the process of rusting as slow combustion.

## 2 Mark Questions

**Q1: Explain how the use of CNG in automobiles has reduced pollution in our cities.**

Answer: The use of CNG in automobiles has reduced pollution in our cities as it is a quality fuel and has some benefits:
(a) It gives out less carbon dioxide gas, carbon monoxide gas, sculpture dioxide and nitrogen dioxide, which is beneficial as they play crucial role in global warming and acid rain.
(b) It leaves behind no residue after its combustion.

**Q2: Explain how $CO_2$ is able to control fires.**

Answer: As $CO_2$ is heavier than oxygen, it forms a blanket around fire, because of which the supply of air is stopped. Men over, it brings down the temperature of the burning substance. In these ways, it plays a significant role in controlling fire.

**Q3: It is difficult to burn a heap of green leaves but dry leaves catch fire easily. Explain.**

Answer: The green leaves hold some amount of water, so its ignition temperature gets increased and it does not burn easily. On the other hand, dry leaves are waterless, so they catch fire easily (having low ignition temperature).

**Q4: Which zone of a flame does a goldsmith use for melting gold and silver and why?**

Answer: A goldsmith uses the outermost zone of a flame, which is non-luminous, to melt gold and silver as it is the hottest zone of the flame, having more temperature.

**Q5: 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: Calorific value of a fuel = HeatProducedAmountoffuel
= 1800004.5 kJ/kg
= 40,000 kJ/kg.

**Q6: Can the process of rusting be called combustion? Discuss.**

Answer: The process of rusting emits heat during the formation of its oxide. So we can call the process of rusting as slow combustion.

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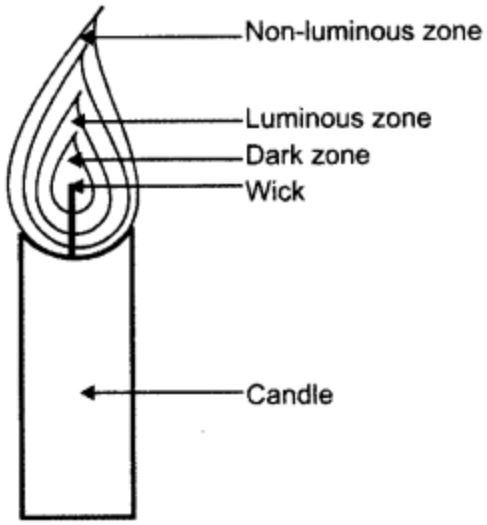
**Q7: Abida and Ramesh were doing an experiment in which water was to be heated in a beaker. Abida kept the beaker near the wick in the yellow part of the candle flame. Ramesh kept the beaker in the outermost part of the flame. Whose water will get heated in a shorter time?**

Answer: The water which was put by Ramesh will get heated in a shorter time; because he had put it nearer to the hottest zone of the flame.

**Q8: Explain the different zones of a flame with the help of a neat and well labeled diagram.**

Answer: The innermost zone is the dark zone. It contains unbumt vapours of wax.

- The second zone is the yellow zone where incomplete combustion takes place. It is known as luminous zone.
- The thin outermost zone of the flame is blue in colour and complete combustion takes place. This is the non-luminous zone.



**Q9: Distinguish between combustible and non-combustible substances**.

Answer:

Combustible substances: The substances which bum easily are called combustible substances, e.g., paper, cloth.
Non-combustible substances: The substances which do not bum easily are called Non-combustible substances, e.g., iron, and glass.

## 5 Mark Questions

**Q1: 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 aluminum pipe does not.**

Answer:

(a) Since water is a good conductor of electricity, it may result in electric shocks to the person trying to extinguish fire.
(b) LPG is better domestic fuel than wood because it does not produce gases, nor does it leave any residue behind. Moreover, it has more calorific value than wood.
(c) As its ignition temperature is low, the paper by itself catches fire easily. But a piece of paper wrapped around an aluminum pipe does not catch fire easily, as the heat being given gets absorbed by the aluminum pipe and the piece of paper does not get its ignition temperature.

**Q2: Why is wood used as a fuel in villages? What are the disadvantages of using wood as a fuel?**

Answer:

In villages wood is used because it is easily available and cheap.
Its disadvantages are:

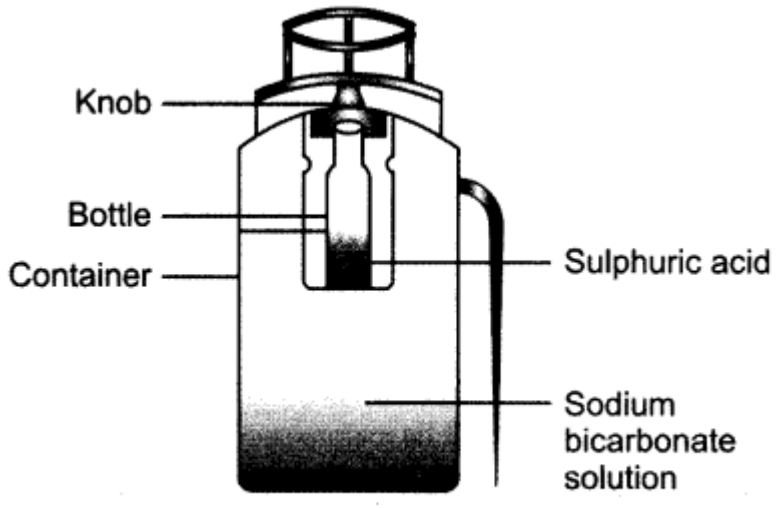
- It produces lot of smoke which causes respiratory problems.
- Wood contains several important substances which are lost when it is burnt,
- Cutting of trees leads to deforestation.

**Q3: In an experiment 4.5 kg of a fuel was completely burnt. The heat produced was measured to be 1, 80,000 kJ. Calculate the calorific value of the fuel.**

Answer: Heat produced = 180,000kJ
Mass of fuel = 4.5 kg
Calorific value = 180,000 kJ/4.5 kg = 40,000 kJ/kg.

**Q4: Draw a labeled diagram to show the construction of soda-acid fire extinguisher and explain its working**.

Answer:




**A soda-acid fire extinguisher**

In the soda-acid fire extinguisher, carbon dioxide is produced by the reaction of sulphuric acid and sodium bicarbonate. The bottle containing sulphuric acid is struck with a knob and the reaction starts.

$$\underset{\text{Sodium bicarbonate}}{2NaHCO_3} + \underset{\text{Sulphuric acid}}{H_2SO_4} \longrightarrow \underset{\text{Sodium sulphate}}{Na_2SO_4} + \underset{\text{Water}}{H_2O} + \underset{\text{Carbon dioxide}}{2CO_2}$$

Carbon dioxide produce is neither combustible nor supporter of combustible. Being heavier than air it forms a blanket over the fire and cuts off the supply of air. The water formed cools the substance below its ignition temperature.

**Q5: Compare LPG and wood as fuels.**

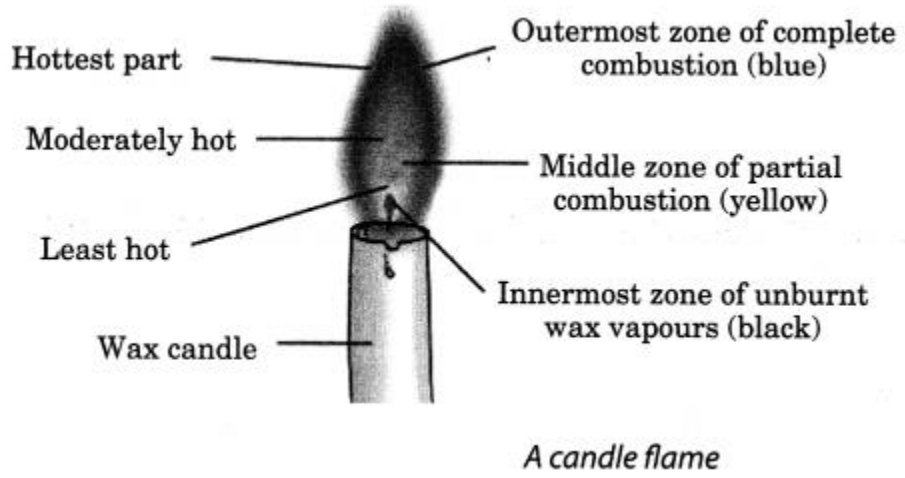
Answer:

| LPG | Wood |
|---|---|
| (i) It does not cause pollution on combustion. | (i) It pollutes air on its combustion. |

| | |
|---|---|
| (ii) No smoke is produced. | (ii) It produces smoke. |
| (iii) It is a liquid fuel. | (iii) It is a solid fuel. |
| (iv) It has more calorific value (55000 kJ/kg). | (iv) It has less calorific value (17000 kJ/kg). |
| (v) It can be easily transported, as it is stored in cylinders. | (v) It can't be transported easily like LPG fuels (v) It can't be transported easily like LPG fuels |

**Q6: Make a labeled diagram of a candle flame.**

Answer:




*A candle flame*

**Q7: Explain the combustion and its types**

Answer:

**Combustion:**
When a substance undergoes a chemical reaction in the presence of air (oxygen) to produce light and heat, the process is known as combustion.

Hence, the presence of oxygen is necessary for combustion and it cannot take place in its absence. The substance undergoing combustion is known as a combustible substance.

## Types of Combustion

There are many types of combustion and the type of combustion depends upon the type of fuel used. Based on nature and intensity, combustion is of three types:

1. Rapid Combustion: Combustion is said to be rapid combustion when a substance burns rapidly and produces light and heat. For example, the burning of a gas stove, matchstick, etc.
2. Spontaneous Combustion: When a material suddenly bursts into flames, even without any application of apparent cause, such type of combustion is called spontaneous combustion. For example, burning of camphor, burning of phosphorus, etc.
3. Explosion: When a large amount of gas formed in the reaction is liberated, such a reaction is known as an explosion. For example, missiles, firecrackers, etc.

## Fill in the blanks

1. Burning of wood and coal causes _____ of air.

Answer: pollution

2. A liquid fuel, used in homes is _____

Answer: LPG

3. Fuel must be heated to its _____ before it starts burning.

Answer: ignition temperature

4. Fire produced by oil cannot be controlled by _____

Answer: water

5. The burning of substance takes place when oxygen is present then it is called _____.

Answer: Combustion

6. Substances that don't catch fire in the presence of oxygen are called_____.

Answer: Non-combustible

7. The minimum temperature required by any substance to catch fire or burn is called_____.

Answer: Ignition temperature

8. The flame of Bunsen burner becomes blue due to the sufficient supply of_____.

Answer: Oxygen

9._____ And_____ substances are examples of the explosion.

Answer: Firecrackers and bombs

## Multiple Choice Questions

**1. in non-luminous zone, the wax vapors burn in the presence of_____.**

(a)Soil
(b)Water
(c)Air
(d)Ice

Answer: (c) Air

**2. What do we call the innermost zone or zone of no combustion?**

(a)Combustion Zone
(b)Luminous Zone
(c)Dark Zone
(d)Inflammable Area

Answer: (c) Dark Zone

**3. Which of the following is the hottest zone?**

(a)Middle Zone
(b)Outermost Zone
(c)Innermost Zone
(d)All of these

Answer: (b) Outermost Zone

**4. Which type of fuels leaves residue or ash after combustion?**

(a)Solid fuels
(b)Liquid fuels
(c)Gaseous fuels
(d)None of these

Answer: (a) Solid fuels

**5. What do we call the fuels that are present in a finite amount?**

(a)Renewable fuels
(b)Non-renewable fuels
(c)Luminous fuels
(d)Non-luminous fuels

Answer: (b) Non-renewable fuel

**6. The gas required for combustion is**

(a) Oxygen
(b) nitrogen
(c) carbon dioxide
(d) hydrogen

Answer: (a) Oxygen

**7. burning of hydrogen is an example of**

(a)Slow combustion
(b) rapid combustion
(c) explosion
(d) spontaneous combustion

Answer: (c) explosion

**8. Which of the following can be used to extinguish fire at the petrol pump?**

(a)Water
(b) Carbon dioxide
(c) Blanket
(d) none of these

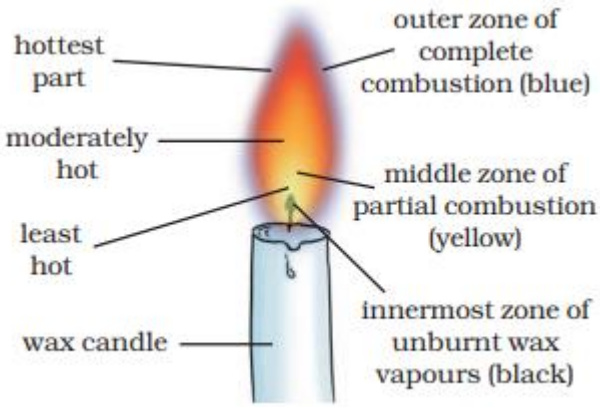
Answer: (b) Carbon dioxide

**9. Which fuel is the ideal fuel to be used at home?**

(a) LPG
(b) CNG
(c) Wood
(d) Coal

Answer: (a) LPG

## DIAGRAM:




**Different Zones of Candle Flame**

## SUMMARY

- The substances which burn in air are called combustible
- The process of rusting can be called combustion as rusting also takes place slowly in the air in presence of humidity in the atmosphere.
- We can prevent a substance from catching fire by not allowing its temperature to reach the ignition temperature or by cutting off the air supply or removing the fuel.
- Fire Extinguisher is made up of metal and is filled with highly compressed carbon dioxide. The function of a fire extinguisher is to cut off the supply of air. It is possible because carbon dioxide being heavier displaces oxygen and surrounds the burning fuel.
- Putting a blanket over a person whose clothes are on fire break the contact of air (oxygen).
- A water extinguisher can put out things like burning wood, paper or a ordinary fire but does not work well with electrical fire as water conducts electricity.
- A flame is the region where combustion of fuel takes place. The flame is produced by the substances that vaporizes easily on burning.There are three different zones of a flame - dark zone, luminous zone and non-luminous zone
- Burning of Petrol, Diesel produces sculpture dioxide and also vehicles produce nitrogen dioxide. These reach the atmosphere, mix with rain water in clouds and form acids.This rain is called acid rain which is harmful for crops, building and soil.