

ANSWERS TO TEXTBOOK QUESTIONS

Objective Questions

A. Multiple choice questions.

1. d 2. d 3. d 4. c 5. d
6. d

B. Fill in the blanks.

1. complete 2. incomplete 3. outer most 4. fossil 5. Hydrogen

C. State whether 'true' or 'false':

1. False 2. True 3. False 4. True 5. False
6. False 7. True 8. True 9. True 10. True

D. Give one word answers.

1. Combustion 2. Combustible 3. Non-combustible
4. Rapid combustion 5. Extinguisher

Theoretical Questions

A. Short answer type questions.

- The substances that get ignited when brought near the flame are called combustible substances.
 - Fuel is a material burnt to produce heat and as a source of power.
 - A region of burning gases (vaporised fuel) is called a flame.
- Calorific value of a fuel is the amount of heat energy produced on burning one unit fuel.
- Ignition temperature is the lowest temperature at which fuel catches fire.
- Combustion is a chemical process in which a substance reacts with air and burns releasing heat and may be light.
- No combustion is not possible without oxygen.
- Air, ignition temperature and combustible substances are requisites of combustion.
- Combustion is of four types:

Explosive Combustion: Bursting of crackers

Spontaneous Combustion: Strike the head of a matchstick over the side of a matchbox. It catches flame instantaneously.

Rapid Combustion: Cooking gas (in our homes), spirit, petrol and camphor go to flames even with a spark from a gas lighter.

Slow Combustion: Burning of wood, coal

- Spray of water lowers the temperature of the material on fire to below 'ignition temperature' and cuts off the supply of air (oxygen) to the burning material.
 - Carbon dioxide around a burning material replaces oxygen and acts as a fire extinguisher.

9. Solid Fuels:

Dung cakes, wood, saw dust, straw and other agricultural wastes, charcoal, coal, coke, paraffin wax and camphor.

Liquid Fuels:

Petrol, kerosene, diesel and vegetable oils are liquid fuels.

Gaseous Fuels:

LPG (Liquefied petroleum gas) and CNG (Compressed natural gas) are gaseous fuels.

- Luminous zone
 - Non-Luminous zone
 - Dark zone

B. Long answer type questions.

1. Following three conditions are necessary for combustion to take place:

Combustible Material

Try to set sand on fire. It will not catch fire. Sand is not combustible. Fire can easily be ignited with petrol, spirit, kerosene, wax, wood, coal, paper, straw and gaseous fuel. All these are combustible materials or these are fuels. Combustible material is necessary for combustion.

Air: Oxygen is necessary for combustion to take place. Covering burning material with sand, water or carbon dioxide gas will not get ignited.

Ignition Temperature: The lowest temperature at which a substance catches fire is called its ignition temperature. A fuel catches fire immediately if it is in the form of vapour (gas). Cooking gas catches fire immediately. Spirit and petrol vaporise at room temperature, hence they catch fire immediately. Similarly, camphor sublimates and gets ignited fast. Cloth and paper get ignited at room temperature.

2. **Kinds of Fuels:** We may group fuels on the basis of their physical state at room temperature as solid, liquid or gaseous fuels as follows:-

Solid Fuels:

Dung cakes, firewood, saw dust, straw and other agricultural wastes, charcoal, coal (mined fossil fuel), coke, paraffin wax and camphor are the examples.

Liquid Fuels:

Fossil fuel (petroleum) or crude from which petrol, kerosene, diesel, benzene and toluene are liquid fuels. Vegetables oils, ghee and tallow (animal fat in liquid form), alcohol (spirit), and liquefied hydrogen (being used in rockets) are liquid fuels.

Gaseous Fuels:

LPG (Liquefied petroleum gas) and CNG (Compressed natural gas) obtained from natural oil wells and piped to houses and industrial houses. Natural gas (methane) fuel is also available from putrefying (decaying) organic matter from biogas plants and from sewage treatment plants.

3. Calorific value of hydrogen is 35.0 to 40.0 cal/g, which is the highest of all the combustible substances. Ideal fuel is a fuel which on burning: (i) doesn't emit harmful gases, (ii) is easy to transport, (iii) can be safely stored, (iv) low in cost, (v) has a high calorific value and (vi) with a low ignition temperature. A fuel which meets most of these parameters can be said to be a good fuel.
4. On lighting a wax candle, wax melts and rises into the wick. Liquid wax in the wick vaporises and catches fire to give out a flame. The vaporised wax includes hydrogen and carbon since wax is a hydrocarbon. Light a wax candle and watch its flame. Carefully note the different coloured zones in the flame. Starting from the base of the flame, a flame has three zones.

Dark or black inner zone of the flame

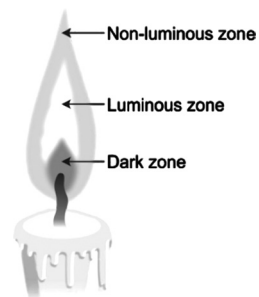
Surrounding the wick is the dark zone. There is no burning in this zone. If we pass a wooden splinter through the dark zone of the flame, it comes out unburnt, showing that there is no 'burning' in this zone. This dark zone is least hot part of the flame.

Luminous Zone

In this region of the flame, hydrogen burns with a brilliant yellow luminous flame. Burning hydrogen combines with oxygen to form water vapour. Carbon also burns in this zone giving some luminosity to the flame and producing carbon dioxide. Some unburnt carbon particles are left which give rise to soot. Luminous yellow zone of a flame is mainly due to incomplete burning of carbon. In case of fuel gas (LPG or CNG) there is no soot formation. The fuel gas burns completely with a blue flame. If we introduce a clean glass slide in the luminous zone of the flame from a wax candle with the help of a pair of tongs for few seconds a blackish ring is formed on the slide which shows deposition of unburnt carbon particles present in luminous zone of the flame.

Outermost Non-Luminous Zone

This zone is poorly visible and is slightly blue. It is the hottest part of the flame where complete oxidation (burning) of the fuel takes place. If we introduce a thin long copper wire inside the outermost region of flame, the wire becomes red hot. This shows that this region is the hottest region of the flame.



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