Fire Extinguisher Chemistry Questions with Solutions

Q1: Which gas helps in the process of combustion?
(a) Cooking gas
(b) Nitrogen gas
(c) Producer gas
(d) Oxygen gas

Answer: (d) Oxygen gas

Q2: The amount of heat energy produced on complete combustion of 1 kg of a fuel is called
(a) significant value
(b) calorific value
(c) heat value
(d) internal energy

Answer: (b) calorific value

Q3: Calorific value of a fuel is expressed in
(a) kilojoule per kilogram
(b) kilojoule per gram
(c) joule per milligram
(d) kilojoule per milligram

Answer: (a) kilojoule per kilogram

Q4: Magnesium burns to form
(a) calcium carbonate
(b) calcium oxide
(c) magnesium oxide
(d) magnesium sulphate

Answer: (c) magnesium oxide

Q5: Out of these, which is able to control fires?
(a) NH_3
(b) H_2
(c) CO_2
(d) F_2

Answer: (c) CO_2

Q6: When a hydrocarbon fuel is burnt, it always gives out carbon dioxide and water vapour. Do you agree?

Answer:

Yes, when a hydrocarbon fuel is burned, carbon dioxide and water vapour are released. Carbon and hydrogen combine to form hydrocarbons. Carbon combines with oxygen to generate carbon dioxide, while hydrogen reacts with oxygen to form water vapours when they are burned in the presence of oxygen.

For example: When methane gas is burned in the presence of enough oxygen, carbon dioxide gas and water vapours are produced.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Q7: A scientist created a low-cost, non-polluting fuel with a high calorific value. It had a 20°C ignition temperature. Is it a good source of energy? Justify your actions.

Answer:

Yes, it's a good source of energy.
The following are some of the benefits of good fuel:

1. It has a high calorific value.
2. It is environmentally friendly.
3. The ignition temperature is mild.

Q8: Mention the types of Fire Extinguishers.

Answer:

Fire extinguishers come in a wide range of types, depending on how the fire extinguisher affects any of the fire triangle's controlling aspects, such as:

- Water and foam: Removes heat and oxygen from the environment.
- Carbon Dioxide: Removes heat and oxygen from the atmosphere.
- Dry Chemical: Interfere the chemical reaction responsible for the fire.
- Wet Chemical: Removes the heating element and blocks oxygen and fuel from re-ignition.
- Clean Agent: Interrupts the fire's chemical reaction.
- Dry Powder: Removes heat and separates fuel from oxygen.
- Water mist: Removes the heating element.
- Cartridge Operated Dry Chemical: Interrupts the fire's chemical reaction.

Q9: To extinguish a fire, you can remove the combustible substance. What other methods can you use?

Answer:

We must cut off the flammable substance's oxygen supply to extinguish the flames. We can put out the fire using the following procedures in addition to removing the combustible substance:

(i) We can put out minor and short-range fires with water.

(ii) A CO_2 extinguisher can be used to put out a strong fire or a fire caused by oils. CO_2 extinguishers use carbon dioxide gas to restrict the combustible substance's oxygen supply.

Q10: What is combustion? Mention the types of combustion.

Answer:

Combustion is a chemical reaction in which a substance reacts with oxygen to produce heat, light, or both forms of energy. Because it involves the total or partial combustion of a fuel in the presence of air, it is classified as an oxidation process. The presence of oxygen is not required for oxidation to occur. Magnesium, for example, can be converted to magnesium nitride or magnesium chloride in the presence of nitrogen or chlorine.

Complete combustion: Complete combustion: When a reaction occurs in the presence of a large amount of oxygen, the components combine to their maximum extent with the oxygen. A visible by-product of such reactions is heat and light.

Incomplete combustion: Incomplete combustion is defined as reactions that occur in the absence of sufficient oxygen, preventing things from entirely burning. As a result of this process, soot is left in the container, as well as carbon monoxide, which is an air pollutant.

Q11: State the conditions under which combustion occurs. Why is it more difficult to burn some combustible substances than others?

Answer:

Combustion of a fuel requires:

- The presence of a flammable substance, such as coal, natural gas, or wood.
- The presence of air to provide oxygen.
- Heat is available to raise the fuel temperature above its ignition point.

Because different substances catch fire at different temperatures, certain flammable substances are more difficult to burn than others. Because some compounds have a lower ignition temperature than

others, they catch fire more easily. The temperature at which a substance ignites is critical in assessing its combustibility.

Q12: Name and give chemical equations to show the products of the combustion reaction in
(a) limited supply of air.
(b) sufficient supply of air.

Answer:

(a) Limited supply of air
If the amount of air available is limited, incomplete combustion can occur, resulting in carbon monoxide gas instead of carbon dioxide gas.

$$2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$$

(b) Sufficient supply of air
Complete combustion can occur if the supply of air is sufficient. The reactants yield a restricted number of products when exposed to oxygen. When hydrocarbons are burned in the presence of oxygen, the result is mostly carbon dioxide and water.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Q13: What is calorific value of a fuel? Why is hydrogen not used as a fuel though it has the highest calorific value?

Answer:

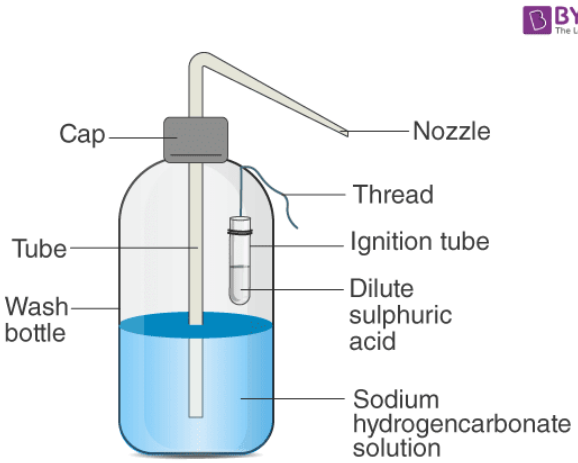
The calorific value of a fuel is the amount of heat released when one kilogram of the fuel is completely burned in an adequate supply of oxygen.

Despite having the highest calorific value, hydrogen is not used as a fuel because:

- Because it is lighter than air, it is difficult to procure.
- Because of its melting point of −2530°C, it cannot be used in liquid form.
- External hydrogen gas may spontaneously ignite.
- While hydrogen fire is extremely hot, it is nearly invisible, which can result in accidental burns.
- Because of its ease of leaking, low energy ignition, and wide range of combustible fuel-air combinations, hydrogen provides different concerns.

Q14: Explain, with the help of a labelled diagram, how a soda-acid type fire extinguisher works.

Answer:



Making a soda-acid fire extinguisher

In a small cylinder connected with a glass bottle filled with sulphuric acid, a soda-acid fire extinguisher carries a concentrated solution of sodium hydrogen carbonate ($NaHCO_3$).

When a fire breaks out, the cylinder is pushed against a hard surface, breaking the bottle. When the acid combines with sodium hydrogen carbonate in the bottle, it produces carbon dioxide and water vapours. Because carbon dioxide does not sustain combustion, it forms a blanket over the fire and puts it out. Water's cooling impact lowers the temperature below the ignition temperature, preventing burning.

Q15: What are the characteristics of a good fuel?

Answer:

The following are the characteristics of a good fuel:

1. High calorific value: A good fuel must have a high calorific value in order to have high fuel efficiency.
2. Reasonable ignition temperature: The ignition temperature of a suitable fuel should be moderate.
3. Burns easily and at a moderate rate: A suitable fuel should burn easily and at a moderate rate in sufficient air.
4. Low non-combustible material content: A good fuel should have a low non-combustible material content.
5. Easy to store and handle: A good fuel should be inexpensive to transport and store and cause no harm.
6. Low moisture content: The moisture level of a good fuel should be low.
7. When fuels are burned, no hazardous products such as CO or SO_2 should be produced.
8. A good gasoline should include little volatile stuff.

Practise Questions on Fire Extinguisher

Q1: Carbon dioxide is the most commonly used gas for extinguishing a fire. Which properties of carbon dioxide are used here?

Answer:

Because carbon dioxide is heavier than air, it settles and reduces the availability of oxygen, thus extinguishing the atmosphere.

Q2: Which gas released during combustion is thought to cause global warming?

Answer:

Carbon dioxide gas is produced during the combustion of hydrocarbons, and it is one of the key contributors to global warming. Carbon dioxide concentrations rise, trapping the sun's heat inside the earth's atmosphere and raising global temperatures.

Q3: Which gas is produced when a fuel burns in
(a) sufficient supply of air
(b) insufficient supply of air.

Answer:

(a) When a fuel burns in a sufficient supply of air, carbon dioxide gas is produced.
(b) When fuel burns with insufficient air, carbon monoxide gas is produced.

Q4: List the different methods by which a fire can be extinguished.

Answer:

Various methods can be used to extinguish fires. They are:

- The substance is being cooled down.
- Excluding oxygen from fire
- Removing fuel from fire
- Using a flame suppressor

Q5: What kind of fires can effectively be put out by water? What kind of fires is it not suitable for? Give reasons for both cases.

Answer:

Water cools the flammable material, lowering the temperature below the combustible substance's ignition temperature. This stops the spread of the fire. The flammable substance is also surrounded by water vapours, which aid in cutting off the air supply.

When solid items such as paper, wood, and other materials are on fire, water can be employed. It is not, however, ideal for putting out fires in electrical appliances. Water can conduct electricity and produce electric shocks to someone attempting to put out an electrical fire. Water should also not be used to put out flames involving hot cooking oil or fat since it can spread the fire.