PARAGON CONVENT SCHOOL

SECTOR: 24B, CHANDIGARH

LESSON - 6

COMBUSTION AND FLAME

Summary:

- Combustion is a process in which a substance reacts with oxygen to produce heat, light and sound energy.
- There are three necessary conditions for combustion to take place:
  A) A combustible substance B) A supporter of combustion
  C) ignition temperature of substance
- A fuel is a substance that is burnt to produce energy.
- Ignition temperature is the minimum temperature at which a substance starts burning.
- In spontaneous combustion, a substance starts burning as soon as it comes into contact with air.
- In rapid combustion, a substance catches fire immediately and burns continuously.
- In an explosion, a substance burns suddenly in a very short time, producing lot of sound along with heat, light and gases.
- Fire can be extinguished by either bringing a substance below its ignition temperature or blocking its contact with the supporter of combustion.
- A flame is formed when the vapour of a combustible substance burns.
- The outer most zone of flame is the hottest and non-luminous.
- Middle zone of the flame is the luminous zone and contains unburnt carbon particles.

- The innermost zone is the dark zone and the coolest one.
- Most of the fuels we use are fossil fuels containing carbon and hydrogen. Burning of these fuels generate gases carbon dioxide, water vapour and other harmful like gases like carbon monoxide, oxides of nitrogen and sulphur.
- Calorific value of a fuel is defined as the energy released when lg of fuel burns completely in oxygen.
- A good fuel has high calorific value and low ignition temperature; it is easy to transport and store and causes minimum pollution. It should be cheap.
- Burning excessive fossil fuels causes environmental hazards like global warming and acid rains.

Multiple Choice Questions (Page No. 89, 90)

1. (c) 2. (a) 3. (c) 4. (c) 5. (c)

Multiple Choice Questions (Page No. 96)

1. (a) 2. (d) 3. (d) 4. (c) 5. (c)

SECTION A

Oral questions

Q1.- Name two fuels each used in a) homes b) vehicles and c) in industries.

Ans.- (a) LPG, kerosene, coal

(b) Petrol, CNG, Diesel

(c) Coal, coke, CNG

Q2.- It is said that oxygen is essential for burning. Where does this oxygen come from?

Ans.- From air

Q3.- What is meant by a ‘flame’?

Ans.- A flame is a region where combustion or burning of a fuel (in its gaseous form) takes place to produce heat and light.

Q4.- Expand ‘SPM’.

Ans.- Suspended Particulate Matter

Science quiz

Q1.- Which gas is evolved by the incomplete combustion of fuels?

Ans.- Carbon monoxide (CO)

Q2.- Give the name of the liquid fuel which is highly inflammable.

Ans.- Petrol

Q3.- Give the term used for the lowest temperature at which a substance reacts with oxygen to give heat and light.

Ans.- Ignition temperature

Q4.- Name the compound formed due to the reaction between carbon monoxide and haemoglobin.

Ans.- Carboxyhaemoglobin

WORKSHEET

Tick (√) the correct options

1. (d) 2. (c) 3. (b) 4. (d)

Circle the odd ones. Give reasons for your choice

1. Kerosene oil Mustard oil Petrol Coal

Ans.- Mustard oil - It is an edible oil, whereas others are fuels.

2. Oxygen Sulphur dioxide Oxides of nitrogen SPM

Ans.- Oxygen - It helps in combustion and respiration, whereas others are air pollutants.

3. Dry leaves Paper Glass Wood

Ans.- Glass - It is not a combustible substance, whereas others are combustible substances.

Fill in the blanks

1. Global warming 2. acid rain 3. outermost 4. Saponin

SECTION B

Multiple Choice Questions

1. (b) 2. (b) 3. (a)

Very Short Answer Questions

Q1.- Name the term which is used to express the efficiency of a fuel.

Ans.- Calorific value

Q2.- Name any two solid fuels.

Ans.- Wood and coal / coke / charcoal / paraffin wax

Q3.- What causes the greenhouse effect?

Ans.- The heating up of the earth's atmosphere due to the trapping up of Sun rays or infrared radiations by greenhouse gases, like carbon dioxide in the atmosphere, causes greenhouse effect.

Short Answer Type-I Questions

Q1.- What are combustible substances? Name two combustible substances.

Ans.- Substances which can burn easily in air to produce heat and light are called combustible substances. For example: wooden stick, paper, cloth, dry leaves.

Q2.- What is meant by combustion? Explain with examples.

Ans.- A chemical process in which a substance reacts with oxygen (of air) to give off heat and light is called combustion. Burning of magnesium and charcoal are examples of combustion, since, both give heat and light on burning.

Q3.- What is meant by 'spontaneous combustion'? Give any one example.

Ans.- When a combustible substance burns on its own without the help of any external heat, it is called spontaneous combustion. Examples : fire in coal mines, forest fires, burning of white phosphorus.

Q4.- How is it possible that water can be boiled in a paper cup without burning it?

Ans.- Water can be boiled in a paper cup without burning it because the heat supplied to the paper cup is transferred to water by conduction. The water takes away the heat and does not allow the paper cup to reach its ignition temperature. Hence, the paper cup does not burn.

Q5.- Why is incomplete combustion of fuels more harmful to human beings?

Ans.- Incomplete combustion produces carbon monoxide which is a very poisonous gas. Carbon monoxide forms carboxyhaemoglobin when it combines with haemoglobin of our blood. This decreases the oxygen- carrying capacity of the blood. This causes suffocation and in extreme conditions leads to death. Thus, incomplete combustion is harmful to human beings.

Short Answer Type-II Questions

Q1.- Write any four characteristics of an ideal fuel.

Ans.- Characteristics of an ideal fuel:

(i) It should be cheap and easily available.

(ii) It should burn smoothly.

(iii) It should not produce any harmful and irritating or toxic fumes during burning.

(iv) It should have a proper ignition temperature.

(iv) It should not leave any residue after burning.

(v) It should be easy to handle, safe to transport and convenient to store.

(vi) It should have high calorific value.

Q2.- What are the three conditions necessary for burning of a substance?

Ans.- The three conditions necessary for burning of a substance are-

(i) presence of a combustible substance

(ii) presence of oxygen

(iii) attainment of ignition temperature of the combustible substance

Q3.- Which zone of the candle flame is luminous and why?

Ans.- The middle zone of a candle flame is luminous because there is not enough air for complete combustion of wax vapour. The incomplete burning of wax vapour produces carbon particles and CO. The unburnt carbon particles become hot and emit yellow light and makes the middle zone luminous.

Q4.- Nitika is reading a book in her balcony. Suddenly, she observes fire at her neighbour's house in their kitchen. She immediately rushes and inform the old lady, who is the only one there. Finding the overturned kerosene can, that caused the fire, Nitika immediately opens the fire extinguisher and puts out the fire.

a) Why do you think Nitika used fire extinguisher and not water?

b) Which values are shown by Nitika in this act?

Ans.- a) Nitika used fire extinguisher and not water because water being heavier than oil settles down at the bottom and the oil floats over this water and continues to burn. Thus, we cannot extinguish fire caused by kerosene oil with water.

b) In this act, Nitika shows her presence of mind, awareness and that we should always help our neighbours.

Long Answer Questions

Q1.- Why is water not used for extinguishing fire by petrol and fire in electrical appliances? Explain in detail.

Ans.- Water is not used to put off fire caused by burning of petrol because water being heavier than petrol, settles down at the bottom. The petrol floats over this water and continues to burn.

Water is not used for extinguishing fire in electrical appliances because it is a good conductor of electricity. When water is poured over burning electrical appliances, it causes electric shocks to the people involved in firefighting.

Q2.- Distinguish between the three zones of a candle flame.

Ans.- Differences between the three zones of a candle flame

PARAMETERS	INNERMOST ZONE	MIDDLE ZONE	OUTERMOST ZONE
(i) Availability of oxygen (or air)	Not much air is available.	Not enough air is available.	Plenty of air is available.
(ii) Combustion	No combustion takes place.	Partial combustion takes place.	Complete combustion takes place.
(iii) Hotness	It is the least hot region of the candle flame.	It is moderately hot.	It is very hot, i.e, it is the hottest zone of the flame.
(iv) Luminous (light-giving)	It is dark.	It is luminous zone.	It is a non luminous zone.
(v) By-products formed	Nil	Unburnt carbon particles with carbon monoxide.	It produces carbon dioxide and water vapours.

Q3.- How are combustible substances different from non combustible substances?

Ans.- Combustible substances support combustion and burn easily in the presence of air or oxygen to produce heat and light, while non- combustible substances do not support combustion and do not burn in presence of oxygen.

Examples (a) Combustible substances are-cloth, wooden stick, dry leaves, paper, etc., (b) Non-combustible substances are iron nail, glass, stone piece, steel spoon, etc.

Q4.- a) How do we classify fuels?

b) How does the amount of carbon dioxide affect our environment?

Ans.- (a) Fuels are classified on the basis of physical state in which they occur. So, fuels are classified as follows:

(i) Solid fuels (ii) Liquid fuels (iii) Gaseous fuels

(b) The increase in the concentration of carbon dioxide in the atmosphere increases the rate of greenhouse effect. This leads to increase in the average temperature of the earth. This leads to a condition called global warming.