Chapter 15. Combustion and Flame

Very Short Q&A:

Q1: Give example of some of the fuel used in our day to day life.

Ans: Cow dung, coal, wood, petrol, charcoal, compressed natural gas (CNG)

Q2: Define combustion

Ans: The chemical process in which a substance reacts with oxygen to give off heat is called combustion.

Q3: Define combustible

Ans: The substance which undergoes combustion is called combustible or fuel.

Q4: The fuel may be solid , liquid or _____

Ans: Gas

Q5: Which of the following is not a combustible substance

a. **Wood**
b. **Petrol**
c. **Nail**
d. **All of them**

Ans: Nail

Q6: Sometimes light is also given out during _____

Ans: Combustion

Q7: Air is required for combustion or not?

Ans: Yes

Q8: Which fuels are used for running automobiles?

a. **Wood**
b. **Coal**
c. **Diesel**
d. **Charcoal**

Ans: Diesel

Q9: Combustion is a reaction in which a Substance reacts with

a. **Hydrogen**
b. **Nitrogen**
c. **Oxygen**
d. **Chlorine**

Ans: Oxygen

Q10: What is ignition temperature?

Ans: The lowest temperature at which a substance catches fire is called its ignition temperature.

Q11: Different substances catch fire at different _____

Ans: Temperature

Q12: Can a matchstick catch fire on its own on room temperature?

Ans: No

Q13: Name the substances by which head of the matchsticks are made of?

Ans: Antimony trisulphide and potassium chlorate

Q14: Name the substances by which the rubbing surface of matchsticks are made of?

Ans: Powdered glass and a little red phosphorous

Q15: A combustible substance cannot catch fire or burn as long as its temperature is lower than its _____.

Ans: Ignition temperature

Q16: What do you mean by inflammable substances?

Ans: Certain substances have very low ignition temperature and can easily catch fire with a flame are called inflammable substances like petrol, LPG etc.

Q17: Give examples of inflammable substances.

Ans: Alcohol, petrol, LPG etc.

Q18: List the three essential requirements for producing fire.

Ans: Fuel, air and heat

Q19: The job of fire extinguisher is to cut of the supply of_____.

Ans: Air

Q20: Which of the following are inflammable Substances?

a. **Petrol**
b. **Wood**
c. **Paper**
d. **Straw**

Ans: Petrol

Q21: Give example of rapid combustion.

Ans: Bring a burning matchstick or gas lighter near a gas stove and turn on the knob of gas stove, we will find the gas burns rapidly and produces heat and light, this is an example of rapid combustion.

Q22: Cracker is example of_____ combustion.

Ans: Explosion

Q23: Which is the hottest part of a flame?

Ans: Outer zone of complete combustion

Q24: Good fuel is which is

a. **Cheap**
b. **readily available**
c. **produces large amount of heat**
d. **All of these**

Ans: All of these

Q25: Give examples of some gaseous fuel.

Ans: Liquefied petroleum gas (LPG)

Q26: Which of these fuels will produce large amount of heat LPG, coal or wood?

Ans: LPG

Q27: The unit of calorific value is _____.

Ans: Kilojoule per Kg

Q28: Incomplete combustion of these fuels releases _____ gas.

Ans: Carbon mono oxide

Q29: What is acid rain?

Ans: Sulphur and nitrogen oxides present in atmosphere dissolves in rain water and forms acids, such rain is called acid rain.

Q30: What is calorific value?

Ans: Calorific value of the fuel is the amount of heat energy produced on complete combustion of 1 kg of fuel; it is expressed in kilojoule per kg

Q31: Fire produced by oil cannot be controlled by_____.

Ans: Water

Q32: When a cracker is ignited a sudden reaction takes place with the evolution of heat, light and sound, this is an example of what type of combustion?

Ans: Explosion

Q33: Fuel must be heated to its_____ before it starts burning.

Ans: Ignition temperature

Q34: Name a liquid fuel used in our home.

Ans: Kerosene oil

Q35: Name the gases involved in acid rain.

Ans: Gases involved in acid rain are sulphurdioxide and nitrogen dioxide

Q36: Name the modern fuel replacing diesel and petrol in automobiles

Ans: CNG

Short Q&A:

Q1: State the difference between burning of a candle and burning of a fuel like coal

Ans: Candle burns with a flame but coal does not burns with a flame also coal is a carbon product and its burning is harmful for environment but candle is made from wax its burning is not as much harmful as burning of coal

Q2: Explain combustion and combustible along with examples.

Ans: The chemical process in which a substance reacts with oxygen to give off heat is called combustion, in combustion the release of heat can result in the production of light in the form of either glowing or a flame.The substance which undergoes combustion is called combustible or fuel. Fuel may be solid, liquid or gas. Example: burning of a coal shows the process of combustion and coal here is combustible or fuel.

Q3: Food is a fuel for the body. Justify this statement.

Ans: Food is a fuel for our body because inside our body food is broken down into simpler form by reaction with oxygen and with the release of heat and energy.

Q4: Identify the materials in which combustion can take place Wood, paper, kerosene oil, iron nails, brick, stone, charcoal.

Ans: Wood, paper, kerosene oil, charcoal

Q5: Explain with an activity that air is necessary for combustion.

Ans: Take two lighted candle A and B, and place them on a table, now put a transparent glass over candle B and see what happens to the candle B, we will observe that candle flame flickers and produces smoke and finally it goes off, this is because on putting glass over it, the air supply was cut off and candle was unable to burn in the absence of air.

Q6: On putting glass over a lighted candle, the candle flame flickers and produce smoke, why so?

Ans: Take two lighted candle A and B, and place them on a table, now put a transparent glass over candle B and see what happens to the candle B, we will observe that candle flame flickers and produces smoke and finally it goes off, this is because on putting glass over it, the air supply was cut off and candle was unable to burn in the absence of air.

Q7: When the clothes of a person catch fire, the person is covered with a blanket to extinguish fire, explain why?

Ans: To cut off the air supply of the fire, so that the fire gets off and the person could be saved from fire.

Q8: What is forest fire?

Ans: A forest fire is a natural disaster consisting of a fire which destroys a forested area, and is dangerous for the people living in forest area as well as for the wildlife, during extreme heat of summer, at some places dry grass catches fire, the fire get spread from grass to tree, and very soon whole forest catches fire.it is very difficult to control such fires.

Q9: What do you mean by ignition temperature? Why a matchstick dose not catch fire on its own at room temperature?

Ans: The lowest temperature at which a substance catches fire or the lowest temperature at which combustion begins and continues in a substance is called its ignition temperature. Match Stick cannot catch fire on its own at room temperature because it can catch fire only at its ignition temperature not at room temperature.

Q10: Why does the matchstick start burning on rubbing it on the side of matchbox?

Ans: The head of the matchstick is made from antimony trisulphide and potassium chlorate. The rubbing surface has powdered glass and a little red phosphorus. When the matchstick is struck against the rubbing surface, some of the red phosphorus is converted into white phosphorus; this immediately reacts with potassium chlorate in the matchstick head to produce enough heat to ignite antimony trisulphide and starts the combustion of matchstick.

Q11: Why does kerosene oil catch fire faster than wood?

Ans: This is because the specific heat capacity of the wood is more than the kerosene oil. So, the wood takes time to burn but burns for longer period than the kerosene oil.

Q12: Why we should store kerosene oil with proper care?

Ans: Because kerosene oil can catch fire very easily as its ignition temperature is lower than other combustible material.

Q13: Explain why inflammable substance can easily set on fire?

Ans: Inflammable substances have very low ignition temperature and thus they can easily catch fire with a flame, example: diesel, kerosene oil, alcohol, Liquefied Petroleum Gas (LPG) etc.

Q14: How do we control fire?

Ans: As we know there are three essential requirements for producing fire these are fuel, air and heat. Fire can be controlled by removing one or more of these requirements that is either by cutting of the air supply, or by bring down the temperature of the fuel or both.

Q15: How a fireman extinguishes fire?

Ans: Fireman through water with pressure on fire, water helps in cooling down of the combustilbe material so that its temperature is brought below its ignition temperature and fire does not get spread. A part from this combustible material is surrounded by water vapour which helps in cutting of the air supply and finally fire is extinguished.

Q16: Write short notes on fire extinguisher.

Ans: The most commonly used fire extinguisher is water, it works when wood and paper are on fire, but if electrical equipment is on fire water may conduct electricity and may harm those trying to douse the fire, also water is not suitable for fires involving oil and petrol, since water is heavier than oil it sinks below the oil and oil keeps burning on the top. So if electrical equipment and inflammable materials are on fire Carbon dioxide is the best extinguisher. Since it is heavier than oxygen it covers the fire so that the contact between fuel and oxygen is cut off and the fire is controlled, it also bring s down the temperature of the fuel. For this purpose carbon dioxide is stored at high pressure as a liquid in cylinders.

Q17: Explain the essential requirements for producing fire.

Ans: Following are the essential requirements for producing a fire:

a. Fuel: that is the combustible material
b. Air: air supplies oxygen which supports combustion and without which it is impossible to set on a fire.
c. Heat: heat is important as it raises the temperature of the fuel beyond the ignition temperature.

Q18: Why water is not a good fire extinguisher in case of electrical equipment and inflammable materials?

Ans: The most commonly used fire extinguisher is water, it works when wood and paper are on fire, but if electrical equipment is on fire water may conduct electricity and may harm those trying to douse the fire, also water is not suitable for fires involving oil and petrol, since water is heavier than oil it sinks below the oil and oil keeps burning on the top. So if electrical equipment and inflammable materials are on fire Carbon dioxide is the best extinguisher. Since it is heavier than oxygen it covers the fire so that the contact between fuel and oxygen is cut off and the fire is controlled, it also bring s down the temperature of the fuel. For this purpose carbon dioxide is stored at high pressure as a liquid in cylinders.

Q19: Name the fire extinguisher used for fires involving electrical equipment and inflammable materials. What are its advantages as a fire extinguisher?

Ans: The most commonly used fire extinguisher is water, it works when wood and paper are on fire, but if electrical equipment is on fire water may conduct electricity and may harm those trying to douse the fire, also water is not suitable for fires involving oil and petrol, since water is heavier than oil it sinks below the oil and oil keeps burning on the top. So if electrical equipment and inflammable materials are on fire Carbon dioxide is the best extinguisher. Since it is heavier than oxygen it covers the fire so that the contact between fuel and oxygen is cut off and the fire is controlled, it also bring s down the temperature of the fuel. For this purpose carbon dioxide is stored at high pressure as a liquid in cylinders.

Q20: How many types of combustion are there? Name them.

Ans: There are three types of combustion:

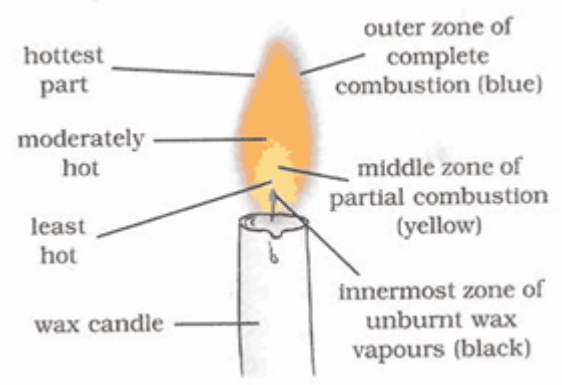
a. Rapid combustion: Bring a burning matchstick or gas lighter near a gas stove and turn on the knob of gas stove, we will find the gas burns rapidly and produces heat and light, such combustion is called as rapid combustion
b. Spontaneous combustion: In this type of combustion a material suddenly bursts into a flame, without the application of any apparent .e;g spontaneous combustion of coal dust.
c. Explosion: When a cracker is ignited a sudden reaction takes place with the evolution of heat, light and sound, this type of combustion is called Explosion.

Q21: What is flame?

Ans: A flame is the visible, gaseous part of a fire. The substance which vaporise during burning give flames, It is caused by a highly exothermic reaction taking place in a thin zone.

Q22: Explain different zone of a candle flame with a diagram.

Ans:



Q23: Introduce a glass plate into the luminous zone of the steady candle flame and hold it for few seconds, then remove it? What did you observe on the glass plate?

Ans: We will observe a circular blackish ring formed on the glass plate, this indicates the deposition of unburnt carbon particles present in the luminous zone of the flame.

Q24: State some of the characteristics of a good fuel.

Ans: A good fuel is one which is:

- Readily available
- Ignite easily
- Burn well, not with explosion
- Cheap
- Produces a large amount of heat
- Have low smoke and ash content
- Should be easy to store and transport

Q25: How calorific value of a fuel is related to amount of heat produced by fuel? Mention calorific value of wood, coal, petrol, CNG and Biogas.

Ans: Calorific value of the fuel is the amount of heat energy produced on complete combustion of 1 kg of fuel; it is expressed in kilojoule per kg.

Calorific value of wood is 17000-22000 kj/kg
Calorific value of coal is 25000-33000 kj/kg
Calorific value of CNG is 50000 kj/kg
Calorific value of biogas is 35000-40000 kj/kg

Q26: Why we say increasing fuel consumption has harmful effects on environment?

Ans: Increasing fuel consumption has harmful effects on environment because:

- Carbon fuels like wood, coal and petroleum releases unburnt carbon particles that are dangerous pollutants causing diseases like asthma and respiratory disorders
- Incomplete combustion of these fuel releases a very poisonous gas carbon monoxide
- Release of carbon dioxide gas by combustion of fuels is becoming one of the cause of global warming

Q27: Explain global warming and its causes.

Ans: Global warming is the increase in the average temperature of Earth's atmosphere and oceans, reason for the same is;Increasing population that leads to increased use of fossil fuels and agriculture, fossil fuels releases carbon dioxide gas which causes global warming, because of increased population more number of people releases carbon dioxide gas during respiration process and that contributes to global warming, increased demand of agriculture for our increasing population is also one of the reason of global warming as manures used in agriculture contains methane gas.

Q28: What are the effects of global warming?

Ans: Global warming is the increase in the average temperature of Earth's atmosphere and oceans, it results in melting of the glacier of the polar region which leads to rise in sea level,

causing flood in coastal areas. Even low lying coastal region may get permanently submerged under water because of global warming.

Q29: Explain why it is difficult to burn a heap of green leaves but we can easily burn dry leaves?

Ans: A heap of green leaves contains lot of water and has very high ignition temperature, as water is a natural fire extinguisher it do not allow leaves to catch fire easily where as dry leaves contains no water and have low ignition temperature thus they can catch fire easily.

Q30: In an experiment 3.5 kg of a fuel was completely burnt. The heat produced was measures to be 160,000 kj. Calculate the calorific value of the fuel.

Ans: Calorific value of the fuel = Amount of heat energy produced / weight of fuel burnt

= 160000/3.5 kj/kg
= 45714.28 kj/kg

Long Q&A:

Q1: Explain the advantages of CNG as fuel.

Ans: The use of diesel and petrol as fuels in automobiles is a major cause of air pollution to day. During combustion, these fuel release unburnt carbon particles which are highly poisonous and harmful for living beings and environment. These fine particles are dangerous pollutants causing respiratory diseases, such as asthma. Incomplete combustion of these fuels gives carbon monoxide gas. It is a very poisonous gas. Combustion of most fuels releases carbon dioxide in the environment. Increased emission of carbon dioxide in the air is one of the major causes for global warming.The use of diesel and petrol as fuels in automobiles is being replaced by CNG (Compressed Natural Gas), because CNG produces the harmful products in very small amounts. CNG is a cleaner fuel. It has high fuel efficiency. Hence use of CNG in automobiles has reduced pollution in our cities to a noticeable extent.

Q2: Differentiate between LPG and wood as fuel.

Ans:

LPG	WOOD
1. It is costly fuel, but readily available and easy to transport in cylinders and tankers 2. It is more energy efficient 3. Its calorific value is 55000 kJ/kg 4. It causes less air pollution and prevent deforestation by supplementing the fuel need in place of wood as fuel. 5. It is an exhaustible natural resource.	1. It is cheap fuel but not readily available in cities and not readily combustible 2. It is less energy efficient 3. Its calorific value is 17000- 25000Kj/kg 4. It causes air pollution and deforestation 5. It is not an exhaustible natural resource as trees can be grown in 5-10 years

Q3: Explain working and principles of a fire extinguisher.

Ans: The most commonly used fire extinguisher is water, it works when wood and paper are on fire, but if electrical equipment is on fire water may conduct electricity and may harm those trying to douse the fire, also water is not suitable for fires involving oil and petrol, since water is heavier than oil it sinks below the oil and oil keeps burning on the top. So if electrical equipment and inflammable materials are on fire Carbon dioxide is the best extinguisher. Since it is heavier than oxygen it covers the fire so that the contact between fuel and oxygen is cut off and the fire is controlled, it also bring s down the temperature of the fuel. For this purpose carbon dioxide is stored at high pressure as a liquid in cylinders.

Q4: Explain why the process of rusting can be called as slow combustion

Ans: Rusting of iron is a slow oxidation process in which iron using oxygen and water is oxidised and is rusted out, it produces heat at very slow rate. The combustion process is also an oxidation process and is a chemical reaction by which a fuel and an oxidiser react to produce heat and light, thus we can say rusting of iron is a slow combustion process, although combustion is much faster than rusting.