

St. Andrews Scots Sr. Sec. School

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Session: 2022-2023 – Q & A

Class: VIII

Subject: Science

Topic: Combustion and Flame

Chapter: 5

Check Point (Page 60)

Q.1. Name the three zones of a candle flame.

Ans - There are three zones of a candle flame, namely,

- The outer zone: this is blue in colour
- The middle zone: this is pale yellow in colour
- The innermost zone: it has unburnt wax vapours and is black in colour

Q.2. Explain the following zones of flame in detail:

Ans - **a) The outer zone:** This is called the non-luminous zone or the zone of complete combustion. Complete combustion takes place here as the wax vapours can get sufficient oxygen from the air. Due to complete combustion, this zone is blue in colour and no residue is left on the objects that come in contact with this zone. This is the hottest zone and is faintly visible.

b) The middle zone: This is the luminous zone or the zone of incomplete combustion. It is pale yellow in colour. It is moderately hot middle zone of the flame. Here, the wax vapours do not get enough oxygen to burn completely. Carbon monoxide and some carbon particles are formed due to partial combustion. Some carbon particles are also left unburnt. These unburnt carbon particles become white hot and make the flame yellow in colour. This zone leaves black soot or carbon particles as residue on the objects that come in contact with this zone.

c) The innermost zone: This is the dark zone or the zone of no combustion, it is the area around the wick that is black in colour. In this zone, no combustion takes place as there is no oxygen available for burning as it is the innermost zone of the flame. It mainly contains wax vapours.

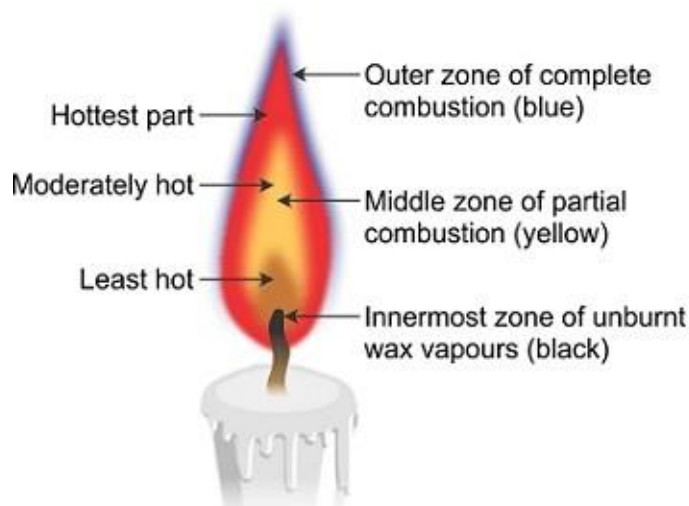


Diagram to show different zones of flame

Q.3. How does a candle flame work?

Ans - When a candle is lit, the heat of the match used to light the candle melts and vaporises a small amount of wax. Once vaporised, it combines with oxygen in the atmosphere to form a flame. This flame provides sufficient heat to keep the candle burning through a self-sustaining chain of events: the heat of the flame melts the top end of the solid fuel, the liquefied fuel then moves upward through the wick, and the liquefied fuel is then vaporised to burn within the candle's flame.

Check Point (Page 63)

Q.1. List the harmful effects of burning fuels.

Ans -The harmful effects of burning fuels are listed as follows:

- Burning of fossil fuels release ash and unburnt carbon particles called suspended particulate matter (SPM) in the air. SPM are very harmful pollutants that spoil

clothes, reduce visibility and cause blackening of the buildings. It also causes respiratory diseases like asthma and bronchitis.

- Combustion of fuels releases carbon dioxide. An increase in the concentration of carbon dioxide in the atmosphere leads to an increase in the temperature of the Earth as they are greenhouse gases. This is known as global warming which is causing melting of polar ice caps.

- Incomplete combustion of fuels release carbon monoxide which is a highly poisonous gas. When inhaled it causes suffocation and even death.
- Burning of fuels like coal and wood, releases sulphur dioxide gas in the atmosphere whereas burning of petrol gives off oxides of nitrogen. These oxides of sulphur and nitrogen dissolve in rain water and form acid which comes down as acid rain. Acid rain is harmful for crops, building and soil.
- Lead compounds are released by the usage of leaded petrol. These compounds are very harmful and poisonous.

Q.2. Explain the harmful effects of the following:

a) Suspended Particulate Matter (SPM): SPM are very harmful pollutants that spoil clothes, reduce visibility and cause blackening of the buildings. It also causes respiratory diseases like asthma and bronchitis. In winter, these fine particles form smog.

b) Carbon monoxide: Carbon monoxide is a highly poisonous gas. When inhaled it causes suffocation and even death.

Q.3. Write at least five characteristics of a good fuel.

Ans - A fuel is said to be a good fuel if it has the following characteristics:

- It should be cheap and easily available
- It should be easy to store, transport and handle.
- It causes minimum pollution.
- It should have a high calorific value, i.e. it produces large amount of heat per unit consumption.
- It should leave no residue after burning.
- It should have low ignition temperature but it should be above room temperature.

Exercises (Page 63)

A. Choose the correct answer:

1. **Flame** is the zone of combustion of gaseous fuel.

a) Light b) **Flame** ✓ c) Heat d) None of these

2. The luminous zone of flame is **middle zone**.

a) outer zone b) **middle zone** ✓ c) innermost zone d) both a and b

3. The fuel having maximum calorific value is **hydrogen gas**.

a) **hydrogen gas** ✓ b) methane c) kerosene d) animal dung

4. Water cannot be used as fire extinguisher to put off fire due to **conduction of electricity**.

a) **conduction of electricity** ✓ b) high ignition temperature c) presence of oxygen d) none of these

5. Which of these is not a gaseous fuel?

a) producer gas b) **LPG** ✓ c) Biogas d) Natural gas

B. Fill in the blanks:

1. **Carbon monoxide** gas is formed due to incomplete combustion.

2. The hottest part of candle flame is **non-luminous** zone.

3. S.I unit of calorific value is **kJ/Kg**.

4. Good fuel requires **low** ignition temperature.

5. During combustion **heat** and **light** are evolved.

C. Very short question answers:

Q.1. Which gas is obtained on complete and incomplete combustion of fuel?

Ans. Methane, on complete combustion, gives carbon dioxide, water and energy. Methane, on incomplete combustion, gives carbon monoxide, water and energy.

Q.2. White phosphorus on exposure to air indicates which type of combustion?

Ans. Spontaneous combustion

Q.3. Name the main constituents of gel candle.

Ans. Paraffin and plastic

Q.4. Which substances has the highest calorific value?

Ans. Hydrogen gas

Q.5. Name the compounds that causes acid rain.

Ans. Oxides of sulphur and nitrogen

Q.6. Name two excellent fuels used most commonly in our day-to-day life.

Ans. Petrol and LPG

D. Short answer questions. (Page 64)

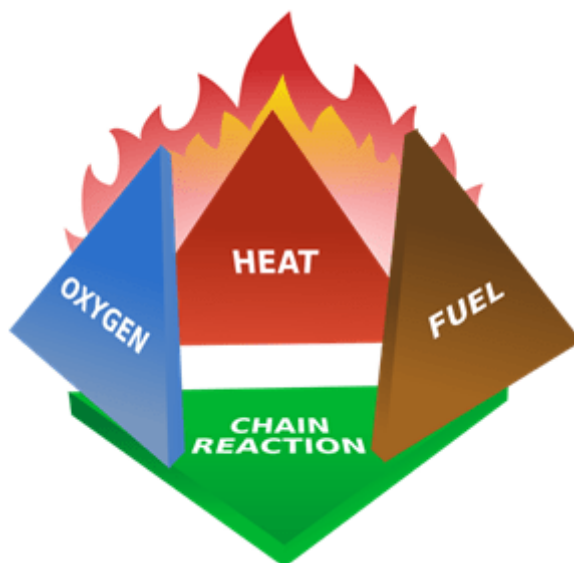
Q.1. Give three conditions which are necessary for combustion.

Ans -The three conditions necessary for combustion are:

a. a combustible substance

b. a supporter of combustion

c. attaining ignition temperature



Fire triangle

Q.2. What is a calorific value of a fuel?

Ans - The efficiency of a fuel is expressed in terms of calorific value which is the amount of heat produced on complete burning of one kg of a fuel.

Q.3. Differentiate between luminous and non- luminous zone of a candle.

Luminous zone	Non- luminous zone
1. The luminous zone is the zone of incomplete combustion. It is pale yellow in colour. It is moderately hot middle zone of the flame.	1. In the non-luminous zone, complete combustion takes place as the wax vapours can get sufficient oxygen from the air.
2. The wax vapours do not get enough oxygen to burn completely. This zone leaves black soot or carbon particles as residue on the objects that come in contact with this zone.	2. Due to complete combustion, this zone is blue in colour and no residue is left on the objects that come in contact with this zone.

Q.4. What do you mean by ignition temperature of a substance?

Ans - The minimum temperature at which a substance spontaneously ignites in a normal atmosphere is called the ignition temperature or kindling point of a substance.

Q.5. How does combustion of fuels cause global warming?

Ans - Combustion of fuels releases carbon dioxide. An increase in the concentration of carbon dioxide in the atmosphere leads to an increase in the temperature of the Earth as carbon dioxide is a greenhouse gas. All the greenhouse gases, including carbon dioxide are responsible for keeping the Earth warm by maintaining its temperature. This is known as

greenhouse effect. It causes global warming which is causing melting of polar ice caps. As a result, there is a rise in the level of water in seas and oceans leading to flooding of coastal regions.

Q.6. What is SPM? Explain.

Ans - Burning of fossil fuels release ash and unburnt carbon particles called suspended particulate matter (SPM) in the air. SPM are very harmful pollutants that spoil clothes, reduce visibility and cause blackening of the buildings. It also causes respiratory diseases like asthma and bronchitis. In winter, these fine particles form smog.

Q.7. What is greenhouse effect? Explain.

Ans - All the greenhouse gases, including carbon dioxide are responsible for keeping the Earth warm by maintaining its temperature as these gases absorb sunlight. This is known as greenhouse effect.

Q.8. What is unleaded petrol? What is its advantage.

Ans - Unleaded petrol does not contain any lead compounds therefore, it is called unleaded petrol. The advantage of using unleaded petrol is that it does not emit harmful gases into the environment and hence prevents pollution.

Q.9. What are secondary fuels? Give examples.

Ans - Secondary fuels are fuels which are obtained from primary fuels after certain processing. They are also known as processed fuels. For example, charcoal, coke, petrol, diesel and kerosene.

Q.10. Why is the lowermost zone of flame called the dark zone?

Ans - The innermost zone of the flame is known as the dark zone or the zone of no combustion because it is black in colour. In this zone, no combustion takes place as there is no oxygen available for burning because it is the innermost zone of the flame. It mainly contains wax vapours.

E. Long answer questions. (Page 64)

Q.1. How are fuels classified on the basis of their physical properties state? Give at least two examples of each.

Ans - Fuels can be categorised into three major types on the basis of their physical state:

a. Solid fuels: The fuels which occur in solid state at room temperature are called solid fuels; for example, coal, wood, coke, charcoal, animal dung and bagasse.

b. Liquid fuels: The fuels which occur in liquid state at room temperature are called liquid fuels; for example, petrol, LPG, diesel, kerosene and spirit.

c. Gaseous fuels: The fuels which occur in gaseous state at room temperature are called gaseous fuels; for example, natural gas, biogas, coal gas, water gas and producer gas.

Q.2. What is fire extinguisher? Explain its working.

Ans - A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. Typically, a fire extinguisher consists of a hand-held cylindrical vessel containing compressed gas which can be discharged to extinguish fire. A fire extinguisher works on two principles:

- a. to cut off the contact with oxygen (air)
- b. by bringing the temperature down below ignition temperature by cooling.



Fire Extinguisher

Q.3. Mention the different method by which fire can be extinguished.

Ans - A fire can be extinguished by targeting the following conditions in the following ways:

- a. Combustible substances should be quickly removed from the area to prevent the further spreading of fire.
- b. The supply of supporter of combustible that is air (oxygen) should be cut off. This can be done by increasing the concentration of non-supporters of fire, like carbon dioxide. Carbon dioxide forms a protective blanket around the fire as it is heavier than oxygen. For this purpose, fire extinguishers are used which release carbon dioxide. This method is especially used for fire caused by petrol/diesel and electricity.
- c. Bringing the temperature of the substance below its ignition temperature. This is done by cooling the substance mainly by using water. Fire from wood, paper or any other substance with high ignition temperature is preferably put off using water.

Q.4. Describe the different zones of a candle flame.

Ans - The three zones of a candle flame are as follows:

- a. The outer zone: This is called the non-luminous zone or the zone of complete combustion. Complete combustion takes place here as the wax vapours can get sufficient oxygen from the air. Due to complete combustion, this zone is blue in colour and no residue is left on the objects that come in contact with this zone. This is the hottest zone and is faintly visible.

b. The middle zone: This is the luminous zone or the zone of incomplete combustion. It is pale yellow in colour. It is moderately hot middle zone of the flame. Here, the wax vapours do not get enough oxygen to burn completely. Carbon monoxide and some carbon particles are formed due to partial combustion. Some carbon particles are also left unburnt. These unburnt carbon particles become white hot and make the flame yellow in colour. This zone leaves black soot or carbon particles as residue on the objects that come in contact with this zone.

c. The innermost zone: This is the dark zone or the zone of no combustion, it is the area around the wick that is black in colour. In this zone, no combustion takes place as there is no oxygen available for burning as it is the innermost zone of the flame. It mainly contains wax vapours.

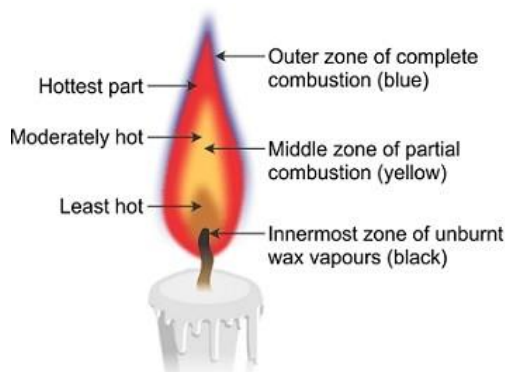


Diagram to show different zones of flame

Q.5. Differentiate between complete and incomplete combustion. Give their word equations.

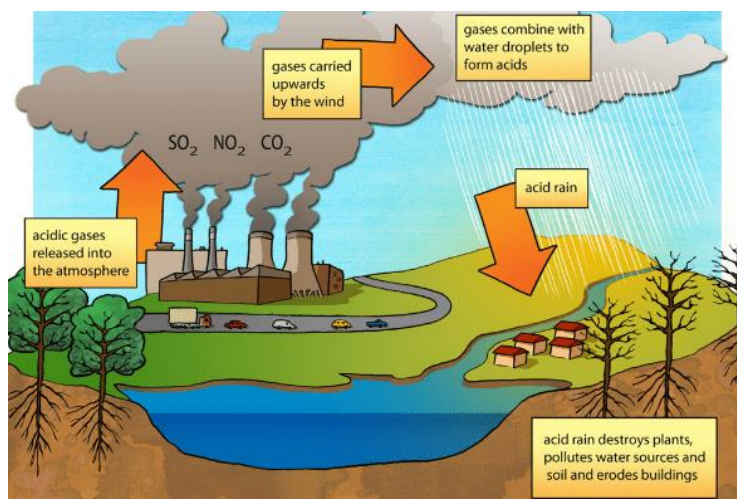
Complete combustion	Incomplete combustion
1. If there is enough oxygen to support combustion or burning process, the combustion is called complete combustion.	1. If there is insufficient oxygen to support combustion or burning process, the combustion is called incomplete combustion.
2. For example, methane on complete burning in sufficient oxygen gives carbon dioxide, water and energy.	2. When methane is allowed to burn in insufficient oxygen, the products obtained are carbon monoxide, water and energy.

Q.6. What do you mean by fuel efficiency? What role it plays in the selection of a fuel?

Ans - The efficiency of a fuel is mainly decided by the amount of heat it releases on complete combustion of its one kg of fuel, and this is known as the calorific value of a fuel. The higher the calorific value of a fuel, the higher is the efficiency of the fuel. Thus, the fuel which is the best, has the highest calorific value. Therefore, we should choose a fuel with high calorific value or higher efficiency.

Q.7. How is acid rain caused? Explain briefly.

Ans - Burning of fuels like coal and wood, releases sulphur dioxide gas in the atmosphere whereas burning of petrol gives off oxides of nitrogen. These oxides of sulphur and nitrogen dissolve in rainwater and form acid which comes down as acid rain. Acid rain is harmful for crops, building and soil.



Acid Rain

Let's Think (Page 65)

Q.1. Charcoal or coal burns with a glow not a flame. Why?

Ans - Charcoal and coal do not release any gases of vaporisation or volatile gases. Therefore, they only glow. Whereas substances like camphor, that release volatile gases on heating, burn with a flame when these gases come in contact with oxygen from air.

Q.2. How does wick of a candle helps flame to burn? What are the constituents of a wick?

Ans - The wick of a candle is usually braided cotton that holds the flame of a candle. A candle wick works by capillary action, by letting the fuel travel to the flame. When the melted candle wax reaches the flame, it vaporises and combusts. The candle wick helps the melted wax to reach the flame.

Q.3. Spilling of crude oil is a severe threat to our seas and oceans. Explain.

Ans - Spilling of crude oil into the sea causes widespread pollution in sea and causes destruction of marine life. The animals that rely on the water of the sea for survival get adversely affected by oil spills as it can lead to poisoning of sea water and destruction of marine life.