Combustion And Flame

SUMMARY

Combustion

The **chemical process** in which a **substance** reacts with **oxygen** to give off **heat** is called **combustion**.
A **substance** that undergoes **combustion** is called a **combustible substance**, or a **fuel.**
Liquefied Petroleum Gas or **LPG** burns very quickly producing a lot of heat. This is called **rapid combustion**.
When **white phosphorous** is left out in the open at **room temperature** for some time, it burns all by itself. This is called **spontaneous combustion**.
Forest fires and **fires in coal mines** are because of **spontaneous combustion.**
The **burning of crackers** produces a **large amount of heat**, **light** and **sound** because of **chemical reaction**. This type of **combustion** is called **explosion.**
Without **oxygen**, even a **combustible substance** will not burn.
Temperature is an **important condition** for **combustion** to occur.

The **lowest temperature** at which a substance **catches fire** is called its **ignition temperature**.
Kerosene is a **fuel** that has a **low ignition temperature**.
A **low ignition temperature** means the substance will **catch fire quickly** and is highly **inflammable**.
Some **inflammable substances** are **petrol**, **LPG, ether** and **alcohol**.

A **matchstick** is made of a mixture of **antimony trisulphide** and **potassium chlorate** mixed with a little bit of **red phosphorous**.
A **lighter** depends on **lighter fluid**, which is **highly inflammable** as well. It is made out of **naphtha** or **liquid butane**.
Air, heat and **fuel** are needed for a **fire** to be created.

Fire can be easily stopped by **stopping the supply** of either **air or heat.**
Water is not a **good extinguisher** for **electrical fires**. If **electrical wiring** is on **fire**, **pouring water** on it will **conduct the electricity** through the water and may cause the **person dousing** the fire to be **electrocuted.**
As **water is heavier than petrol**, it is not useful for **extinguishing oil** or **petrol fires**. For **electrical and oil fires,** it is best to use **carbon dioxide as an extinguisher**. **Carbon dioxide is heavier than oxygen**, so it **covers the flame** like a **blanket,** cutting off contact between the **fuel and oxygen**. **Powder of sodium or potassium bicarbonate** can also be used to get **carbon dioxide.**
The **first automatic fire extinguisher** was patented in **England** by a **celebrated chemist** called **French C. Hopffer**.
The **modern fire extinguisher** was invented by **British Captain George William Manby.**

Flame

Kerosene oil and **molten wax** are **substances** that give a **flame** while **burning.**

Wood and **charcoal** are substances that do not **vaporise,** but still burn, **without any flame**.

A **luminous flame** is a **bright yellow flame** that **gives off light**. A luminous flame undergoes **incomplete combustion** as it does not get the **oxygen** that it **requires**.

A **non-luminous flame** is **colourless** and is **much hotter**. A non-luminous flame undergoes **complete combustion** as it draws much **more oxygen** and gets **much hotter**.

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There are several "**zones**" within a **non-luminous flame**, and **each zone** has a **different temperature**

The **outermost zone** of the **flame** is **blue in colour** and it is the **hottest part**. This is due to **complete combustion**.

The **middle zone** is **moderately hot** and is **yellow in colour**. This is because of **partial combustion**.

The **innermost zone** is the **least hot** and **black in colour.** This is due to the presence of **unburned wax vapours.**

Fuel

Fuel is any **material** that is **burned** to **obtain energy** that can be used to **heat** or **move another object**. Fuel releases **energy** through a **chemical reaction** known as **combustion**.

A **good fuel** must:

- Be **readily available**.
- Be **cheap.**
- **Burn easily** at a **moderate rate**.
- Produce a **large amount of heat**.
- Not leave behind any **undesirable substances.**

Wood was the **first fuel** that was used **2 million years ago** by **homo erectus,** the **predecessor** of **human beings.**

Calorific value is defined as the **amount of heat energy** produced on **complete combustion** of **1 kilogram of a fuel**. It is expressed in a **unit** called **kilojoule per kg**. The **higher the calorific value** of a fuel, the **more is its efficiency.**

Each **kilogram of LPG** produces much **more heat** than **one kilogram** of **wood or coal**. The **calorific value of LPG** is the **highest** among **wood, charcoal** and **LPG.**

In **rural areas**, **cow dung** and **wood** are still used as **fuel** because these are **very cheap** and **easily available**.

However, **burning wood** produces a **lot of smoke**, which is very **harmful to humans**, since it causes **respiratory problems. Cutting down trees** for fuel also leads to **deforestation**, which **harms the environment** and also **deprives** us of all the other **benefits of trees**.

Unburned carbon particles released when **carbon fuels** like **wood, coal** and **petroleum** burn, cause **pollution** and **respiratory diseases** such as **asthma.**

Incomplete combustion of **carbon fuels** causes the **release of carbon monoxide** - a very **harmful gas**.

Combustion of fuels causes the **release of carbon dioxide**, which leads to **global warming**.

Such **rise in temperatures** can cause **melting of polar glaciers**, a**rise in sea level**, and the **flooding of low-lying areas of the world**.

Oxides of sulphur and nitrogen dissolve in **rain water** to form **acid rain**, which ruins **soil, crops** and **buildings.**

By choosing the **right fuel,** we can reduce the **negative impact** on the **environment.** A great example of this is **cars, buses** and **auto rickshaws** that run on **Compressed Natural Gas, or CNG**, instead of **petrol**. **CNG** is a much **cleaner** and **cheaper fuel.**