



PHYSICAL AND CHEMICAL CHANGES

The changes around us are classified into two types:

1. Physical Changes
2. Chemical Changes

PHYSICAL CHANGES

- × Properties of substance which are related to shape, size, colour and state of the substance are called its **physical properties**.
- × The changes in which no new substance is formed, but changes occurs only in its physical properties are called **physical changes**.

Example – melting of Ice, freezing of water, breaking of glass, boiling of water, folding of paper mixing sand with water etc.

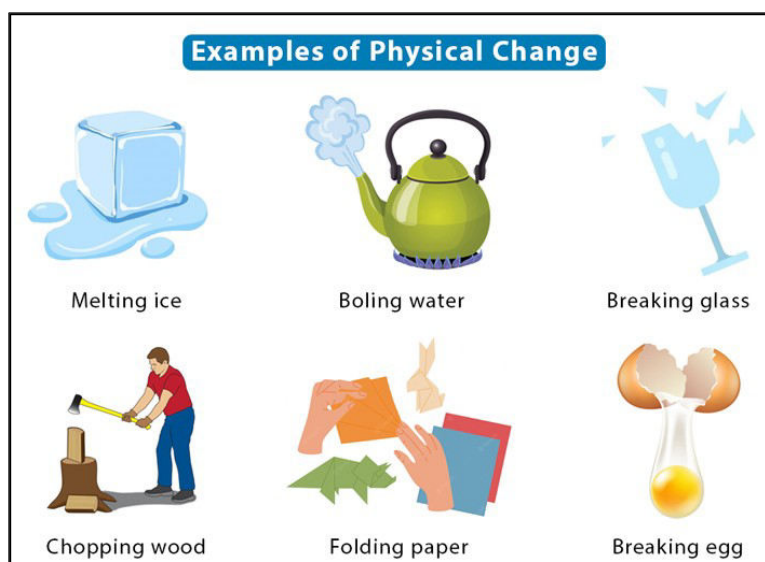
CHARACTERISTICS OF PHYSICAL CHANGES

The important characteristics of physical changes are as follows -

- (i) **No new substance is formed** in this change.
- (ii) It is **temporary change** and **can be easily reversed** to its Original form.

Example – temporary change in colour, size, shape etc.

- (iii) Very **little energy** (heat etc.) is either **absorbed or evolved**.



CHEMICAL CHANGES

- ✗ A chemical change occurs, when **two substances react chemically to form a new substance with different chemical properties.**
- ✗ All new substances, which we use in various fields of our life, are produced as a result of chemical changes.
- ✗ The changes that involve **change in composition and chemical properties** are called Chemical changes.


Example – The formation of curd from milk, digestion of food, burning of crackers, and change in colour of sliced piece of fruits, etc.

CHARACTERISTICS OF CHEMICAL CHANGES


The Important characteristics of chemical changes are as follows -

- New substance(s) is/are formed in this change.
- Heat, light or any other radiation (e.g. ultraviolet) may be released or absorbed.
- Sound may be produced.
- A change in smell or a new smell may be given off.
- A change in colour can take place.
- A gas may be formed.
- It is permanent change and cannot be reversed.

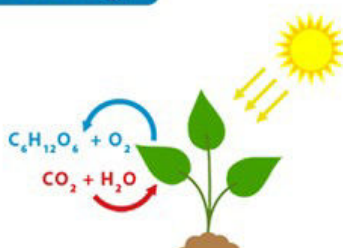
Examples of Chemical Change




Fireworks




Frying eggs




Photosynthesis



Burning wood



Combustion of propane

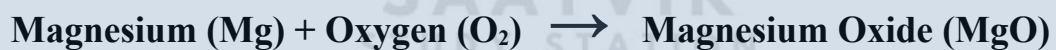
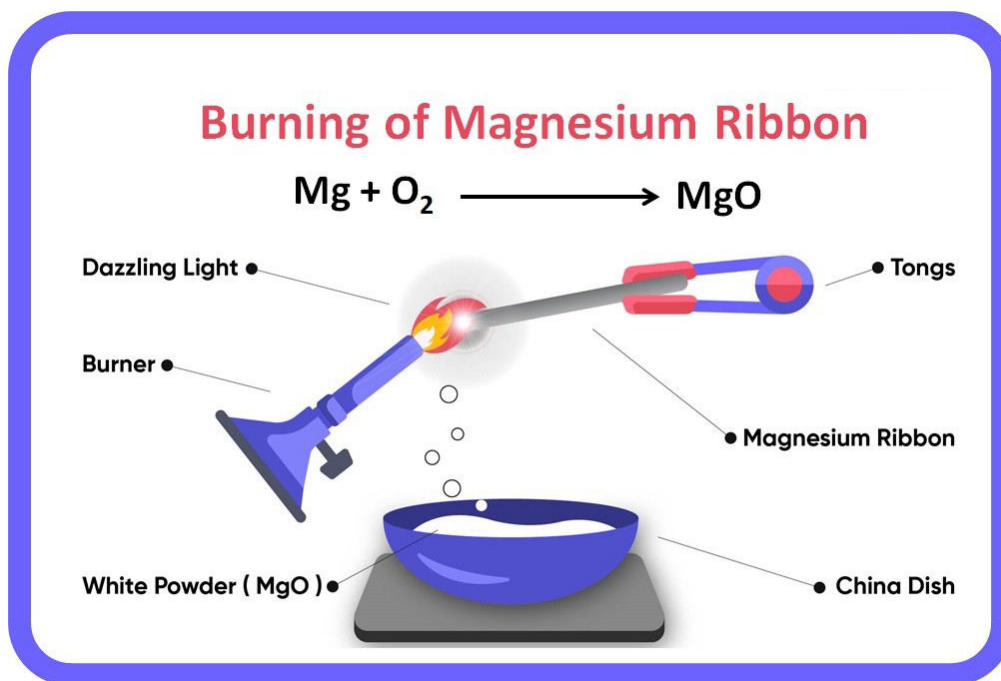


Digestion

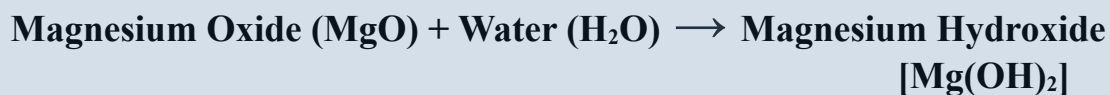
CHEMICAL REACTION AS CHEMICAL CHANGES

1. Burning of Magnesium ribbon

- x When we burn magnesium ribbon, it reacts with air to **form ash of magnesium oxide**.
- x It represents the chemical change in the magnesium ribbon.



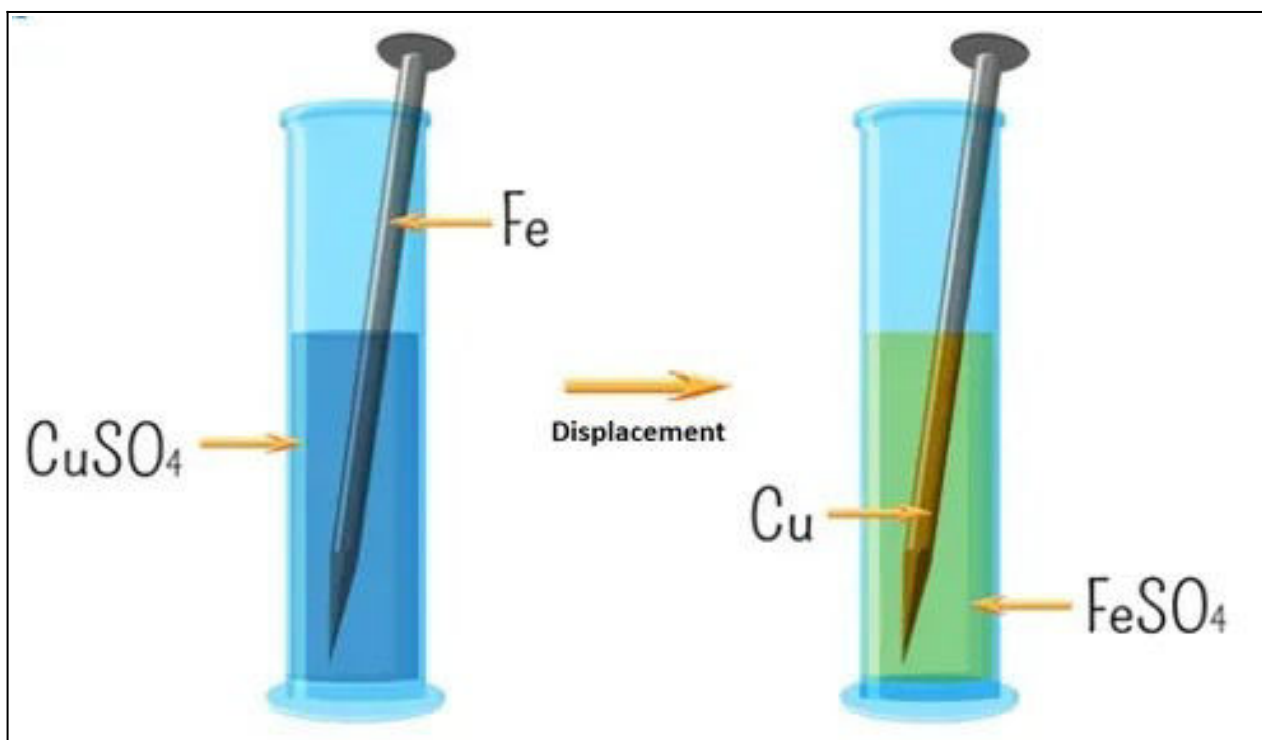
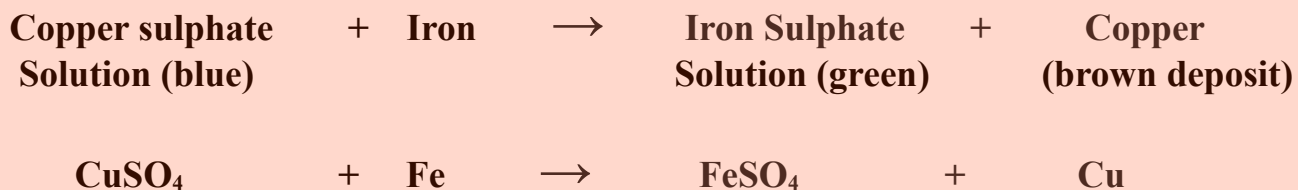
- x When we mix magnesium oxide in water, it forms a new solution (**magnesium hydroxide**) that is a base.



- x **Magnesium oxide** is a new substance **formed on burning of magnesium** and **Magnesium Hydroxide** is another new substance **formed by mixing magnesium oxide with water**.

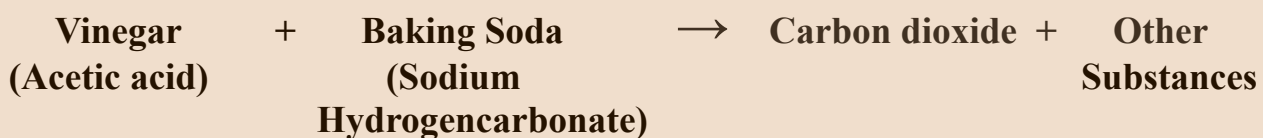
2. Change in colour of Copper sulphate solution due to presence of Iron.

When we place an iron nail in a copper sulphate solution, the colour of the solution changes to Green due to the formation of a new substance (ferrous sulphate).

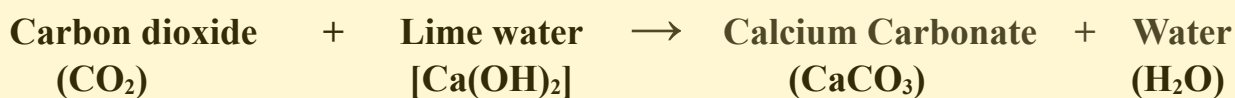
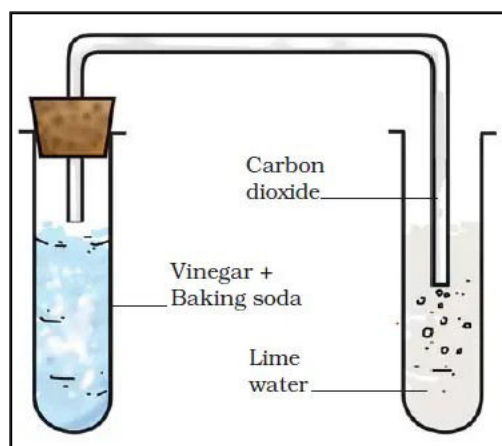


3. Vinegar is mixed with baking soda to give carbon dioxide gas.

A Chemical reaction takes place when vinegar is mixed with baking soda to give carbon dioxide gas.



When this gas is passed through the solution of limewater, it turns milky due to the formation of Calcium carbonate.



IMPORTANCE OF CHEMICAL CHANGES

Chemical changes are very important in our lives. In fact, every new material is discovered by studying chemical changes, e.g.

- If a metal such as iron is to be extracted from its impure form, we need to carry out a series of chemical changes.
- A medicine is the end of a chain of chemical reactions.
- Important and useful new materials such as plastics and detergents are produced by chemical reactions.

Question:

Boiling of an egg is a (a) _____ change while the melting of chocolate is a (b) _____. Fill in the Blanks.

Answer:

The egg is boiled to form a new substance whose chemical composition is also different. So, the boiling of the egg is a chemical change that cannot be reversed.

Thus boiling the egg is (a) **an irreversible chemical change**.

The chocolate is melted to form liquid chocolate. So, the physical state changes from solid to liquid. It can be frozen to form solid chocolate. Thus, the melting of chocolate is (b) **reversible physical change**.

A PROTECTIVE SHIELD

There is a layer of ozone gas high up in the atmosphere. It protects us from the harmful ultraviolet radiations, which come from the sun. Ozone absorbs this radiation and break down to oxygen. In this way, ozone layer prevents radiations from reaching to the Earth.

The breaking down of ozone into oxygen is a chemical change. If ultraviolet radiations were not absorbed by ozone layer, they would reach the Earth's surface and cause harm to us and other living things.

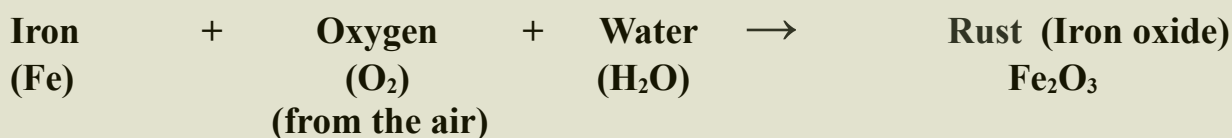
RUSTING OF IRON

- x When an iron object is left exposed to moist air, it chemically reacts with oxygen and water in the air to form a **red brown flaky substance** called **Rust**.
- x The process of formation of this flaky substance on the iron object is called **Rusting**.



CHEMICAL CHANGES DURING RUSTING -

The process of rusting can be represented by the following equation



The more humid the air, faster the rusting occurs. The rust slowly eats away or corrodes the iron, leading to considerable loss.

PREVENTION OF RUSTING

Rusting can be prevented by not allowing iron to come in contact with moisture and air.

Some methods of prevention of rusting are given below -

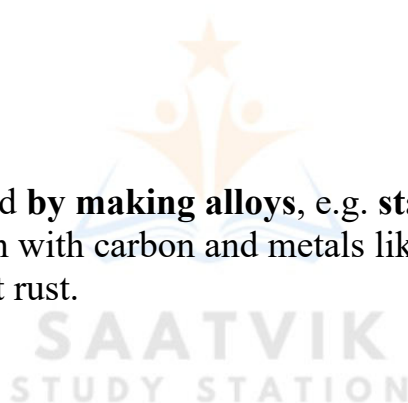
- i. The simple method is to **coat the iron** with oil, grease or paint. The coats should be applied regularly to prevent rusting.



- ii. A more effective method is to coat the iron with another metal such as **zinc or chromium**. The process of depositing a layer of zinc on iron is called **Galvanisation**. The iron pipes used in our homes to carry water are galvanised to prevent rusting.



- iii. It can also be prevented **by making alloys**, e.g. **stainless steel**. Stainless steel is made by mixing iron with carbon and metals like chromium, nickel and manganese. It does not rust.



The Rust-Free Iron Pillar

Near the Qutub Minar in Delhi, an iron pillar stands which is more than 7 meters high. It weighs about 6000 kg. It was **built in the Gupta period, about 1600 years ago**. Even after such a long period, **it has not rusted**.

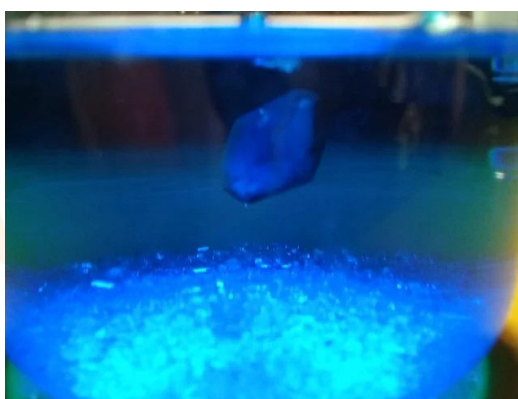
For its unique rust-resistance, it has been examined by scientists from all over the world. This monument is a reflection of advances, India had made in metal technology so long ago.



CRYSTALLISATION

- The process of cooling a hot concentrated solution of a substance to obtain crystals is called **Crystallisation**.
- The process of crystallisation is used to obtain crystals of a pure solid substance from the impure solid substance.

Example – Impure Copper Sulphate powder can be purified by the process of crystallisation to obtain large crystal of pure copper sulphate.



GLOSSARY

- **Chemical changes** – A change in which two or more substances react to form new substance.
- **Chemical reaction** – A reaction in which one or more new substances are formed.
- **Crystallisation** - A process by which crystals of pure substances can be formed from their solutions.
- **Galvanisation** – A process of depositing a layer of zinc to protect from rusting.
- **Physical changes** – A change in which a substance undergoes a change in its physical properties such as colour, shape and size.
- **Rusting** – It is the formation of rust, i.e. iron oxide due to the reaction of air and moisture on iron.