Class 7 Chemistry Physical and Chemical Changes Introduction

Introduction

In our day to day life we come across many changes around us. For instance, dissolving sugar in water, burning of fuels, burning of coal or wood, setting of curd, stretched rubber band when left returns back to its original position, cooking of food and many more. In all these reactions the starting material is undergoing changes to either give new product or remain in its changed position.

Fig. Burning Wood (top left) cooking food (top right) Dissolving sugar in water (right) rubber bands (left)

In fact with the passage of time our body is growing and we are becoming taller. This is also a change. Our body is undergoing changes.

Class 7 Chemistry Physical and Chemical Changes

What are changes

What are changes??

Any alteration of a substance from its original shape, size and state is known as a change. But the changes occurring around us can sometimes be reversed and sometimes cannot. Those changes which can be reversed are termed as reversible changes like rolling of roti, melting of ice, melting of wax. Whereas those which cannot be reversed are termed as irreversible changes like cooking food, baking cake, baking roti, tearing paper and many more.

The changes can again be classified into two types namely physical and chemical changes as discussed below.

Class 7 Chemistry Physical and Chemical Changes Physical change

Physical change

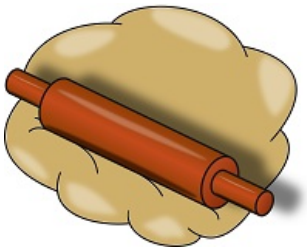
Physical changes refer to the changes in the physical properties of the substances such as shape, size, colour and state. These changes are reversible in nature. In a physical change no new substance is formed.

Tearing a piece of paper changes its shape and size.

Similarly kneading of flour to dough changes its state.

Melting of ice is also a physical change where the matter is changing its state from solid to liquid.

Rolling of chapati/roti



Crushed can

Class 7 Chemistry Physical and Chemical Changes Chemical change

Chemical change

A change leading to the production of a new substance is known as a chemical change. These changes are irreversible. Some of the chemical changes occurring in our day to day life include rusting of iron, silver jewellery getting tarnished or copper articles getting covered by green layer.

- In case of rusting of iron, the iron reacts with the oxygen present in air and moisture and develops rust (hydrated iron (III) oxide).

$$\underset{\text{Iron}}{4Fe} + \underset{\text{Oxygen}}{3O_2} + \underset{\text{Water}}{2H_2O} \longrightarrow \underset{\text{Rust}}{2Fe_2O_3.H_2O}$$

Fig. Iron chain left in moist air got rusted

Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals, specially those of iron.

- In case of rusting of copper, the metallic copper reacts with oxygen, carbon-dioxide and atmospheric moisture and develops a green coloured coating of copper hydroxide and copper carbonate.

$$2Cu + H_2O + CO_2 + O_2 \longrightarrow Cu(OH)_2 + CuCO_3$$

Fig. Copper developing green coloured rust on exposure to moist air

- In case of tarnishing of silver articles, the metallic silver reacts with hydrogen sulphide or sulphur present in air and gets tarnished.

$$4Ag + 2H_2S + O_2 \longrightarrow 2Ag_2S + 2H_2O$$

Fig. Tarnished silver Vs polished silver

- Burning of magnesium is another chemical change. When a ribbon of magnesium is brought near flame it starts burning with a brilliant white light leaving behind a powdery ash on complete burning. Magnesium burns in air to form magnesium oxide.

$2Mg + O_2$ - --> $2MgO$

On dissolving the ash in water it forms a new substance.

$MgO + H_2O$ - -> $Mg(OH)_2$

- Rotten fruit

Class 7 Chemistry Physical and Chemical Changes

Changes occurring in a chemical change

Changes occurring in a chemical change

Chemical changes occurring in our day to day life involves following changes.

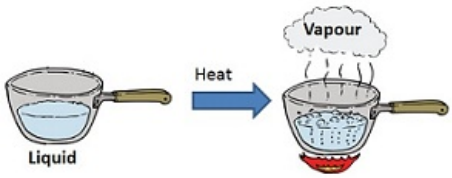
- **Change in colour**

During rusting the iron articles undergoes change in colour. We have also observed that silver gets tarnished when kept for a long time. The metallic silver reacts with hydrogen sulphide or sulphur present in air and gets tarnished.

$$4Ag + 2H_2S + O_2 \longrightarrow 2Ag_2S + 2H_2O$$

- **Change in state**

On heating liquid changes its state and converts to vapour due to reaction within the particles caused by heat.



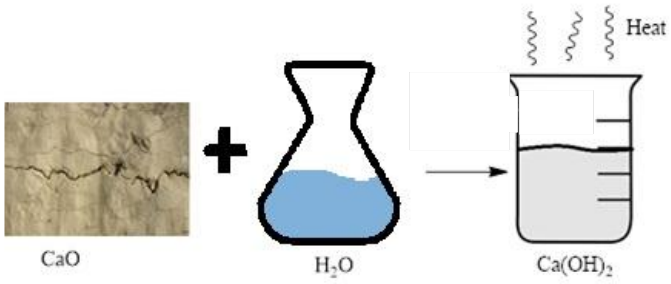
- **Change in odour**

Due to chemical reaction food gets spoiled and smells really bad.

Fig. Fresh apple (left) Spoiled Food (right)

- **Change in temperature**

Lime when mixed with water undergoes certain change that rises its temperature and makes it evolve heat and give a clear solution. Such reactions are called **exothermic reactions**.



- **Release of gas**

During Aerobic cellular respiration in human body energy molecules combines with inhaled oxygen and releases energy needed by the cells. It also releases Carbon Dioxide gas and water. Here is the overall equation for aerobic cellular respiration:

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 \textbf{ (released gas)} + 6H_2O + \text{energy}$$

Class 7 Chemistry Physical and Chemical Changes — Rusting of iron

Rusting of iron

We all must have observed newly bought iron, a silver or copper article appears very shiny but with passage of time they get dull. This is due to the layer of metal oxide that develops on their surface. Rusting of iron, silver jewellery getting tarnished or copper articles getting covered by green layer. Metals react with atmospheric oxygen and produces metal oxides that are basic in nature because they react with water to form bases.

- In case of rusting of iron, the iron reacts with the oxygen present in air and moisture and develops rust (hydrated iron (III) oxide).

$$\underset{\text{Iron}}{4Fe} + \underset{\text{Oxygen}}{3O_2} + \underset{\text{Water}}{2H_2O} \longrightarrow \underset{\text{Rust}}{2Fe_2O_3.H_2O}$$

Fig. Iron chain left in moist air got rusted

Class 7 Chemistry Physical and Chemical Changes Prevention of rusting of iron

Prevention of rusting of iron

Following methods can be used to prevent corrosion:

- ***Galvanisation***

Method to protect steel and iron articles from rusting by coating them with a thin layer of zinc.

Fig. Galvanised iron used for fencing

- ***Alloying***

Homogeneous mixture of two or more metals, or a metal and a non-metal to change the properties of the pure state metals and protect them from rust.

For instance, Iron is used widely for different purposes but it is never used in pure state. It is due to the fact that pure iron is very soft and stretches in hot state. But mixing with small amount of carbon (about 0.05%) makes it strong and tough. Mixing nickel and chromium with iron gives stainless steel, which is hard and does not rust.

Fig. Stainless steel

Another vital property of alloy is that electrical conductivity and melting point of an alloy is less than that of pure metals. For instance, brass is an alloy of copper and zinc (Cu and Zn), and bronze is an alloy of copper and tin (Cu and Sn), possessing poor conductivity towards electricity. On the other hand copper in pure state is used for making electrical circuits.


Fig. Musical instrument made of Brass (left) and bronze statue (right)

Solder is an alloy of lead and tin (Pb and Sn) possessing low melting point and is used for welding electrical wires together

Class 7 Chemistry Physical and Chemical Changes — Crystallisation

Crystallisation: A physical change

The process of deriving large crystals of pure substances from their solutions is known as crystallisation. It is a physical change. Crystals of salt are obtained by the evaporation of sea water.

Similarly crystals of copper sulphate can be obtained by adding copper sulphate powder to the boiling solution of water and dilute sulphuric acid. This mixture when filtered and allowed to cool produces crystals of copper sulphate.