

## Chapter – 5: Physical and Chemical Changes

- Daily life – many changes – may involve one or more substances
- Making sugar solution – change
- Setting curd from milk – change
- Milk becomes sour – change
- 2 kinds of changes – **physical** and **chemical**

### Physical Changes

- Cut a piece of paper – arrange them as original – cannot join them back – no change in properties
- Crush – small chalk – make powder – add water – make paste – roll it as chalk – dry it – use it again – no change in properties
- Take some ice – let it melt – mixture of ice and water – place it in freezing mixture (ice + salt) – water changes to ice
- Boil some water – hold a pan over it – collect steam – steam cools down – changes to water
- Take a metal blade – hold it with tongs over flame – colour of blade changes – after some time – colour changes again
- 1<sup>st</sup> and 2<sup>nd</sup> activities – paper and chalk – change in size
- 3<sup>rd</sup> and 4<sup>th</sup> activities – water – changed state
- 5<sup>th</sup> activity – blade – changed colour
- Properties – shape, size, colour, state – **physical properties**
- Change – physical properties change – **physical change**
- Generally reversible – no new substance formed

### Chemical Change

- Rusting of iron – quite familiar
- Leave iron in open – layer of brownish – deposit over iron – **rust** – **rusting**
- Every iron item – rust – kept in open atmosphere
- Rust – different from iron
- Take a small piece of magnesium strip – clean it with sandpaper – burn it – burns with white light – leaves a powdery ash – different from ribbon
  - Magnesium (Mg) + Oxygen (O<sub>2</sub>) → Magnesium oxide (MgO)
- Mix it with water – stir it – make aqueous solution – test it with litmus paper – red turns blue – basic
  - Magnesium oxide (MgO) + Water (H<sub>2</sub>O) → Magnesium hydroxide [Mg(OH)<sub>2</sub>]
- Magnesium hydroxide – new substance
- Dissolve teaspoonful of copper sulphate (blue vitriol / *neela thotha*) in water – add dilute sulphuric acid – blue coloured solution (copper sulphate) – add iron nail or used blade – solution changes to green colour (iron sulphate) – copper deposit on iron nail – 2 new substances
  - Copper sulphate solution (blue) + Iron → Iron sulphate solution (green) + Copper (brown deposit)
- Take a teaspoonful of vinegar – add pinch of baking soda – hissing sound and bubbles of gas – pass into lime water – lime water turns milky

- Vinegar (Acetic acid) + Baking soda (Sodium hydrogencarbonate) → Carbon dioxide + other substance
- Carbon dioxide (CO<sub>2</sub>) + Lime water [Ca(OH)<sub>2</sub>] → Calcium carbonate (CaCO<sub>3</sub>) + Water (H<sub>2</sub>O)
- Above activities – each change produce new substances
  - 1<sup>st</sup> activity – ash of magnesium oxide formed
  - 2<sup>nd</sup> activity – iron sulphate and copper formed
  - 3<sup>rd</sup> activity – vinegar and baking soda formed – lime water turned milky – calcium carbonate formed
- Change – one or more new substance formed – **chemical change**
- Also called – **chemical reaction**
- Very imp. – new substances formed this way
- Digestion of food, ripening of fruit, fermentation of grapes – series of chemical changes
- Medicine – end product – series of chemical reactions
- Every new material – discovered by studying chemical changes
- One or more new substance produced – in addition to these –
  - Heat, light and radiation – may be produced or absorbed
  - Sound may be produced
  - Change in smell may be observed
  - Colour may change
  - Gas may be formed
- Burning of magnesium, wood, coal or any other substance – chemical change
- Burning – accompanied by heat
- Explosion of firework – chemical change – produce heat, light, sound, harmful gases
- Food gets spoiled – produce foul (bad) smell – chemical change
- Change of colour on slice of fruits and vegetables – chemical change
- Ozone layer – atmosphere – absorb ultraviolet radiation – breaks down to oxygen – chemical change – natural protection against radiation

## Rusting of Iron

- Change – affects iron items – destroys them
- Iron used in many items – bridges, ships, cars, truck bodies – huge monetary (financial) loss due to rusting
  - Iron (Fe) + Oxygen (O<sub>2</sub>) + Water (H<sub>2</sub>O) → Rust (iron oxide – Fe<sub>2</sub>O<sub>3</sub>)



- Rusting – oxygen and water(water vapour) – essential
- Content of moisture – high – rusting – faster

- Prevent contact of iron items with oxygen, water or both
- Simple way – layer of paint or grease
- Another way – deposit layer – chromium or zinc – **galvanization**
- Iron pipes in our house – carry water – galvanized
- Ships – always in water – ocean water contain salts – makes rusting faster – lots of monetary (financial) losses

## Crystallization

- Salt – obtained by evaporation of sea water – not pure – shape of crystals – not clear
- Large crystals of pure substance – obtained from solutions – **crystallization** – physical change
- Take some water – add dilute sulphuric acid – heat it – add copper sulphate powder when boiling starts – continue adding till no more can be added – filter it and cool it down – after some time – crystals of copper sulphate – become visible