8 Changes in Matter

8.1 Physical changes and chemical changes

Tear a paper into small pieces. Burn another piece of paper.

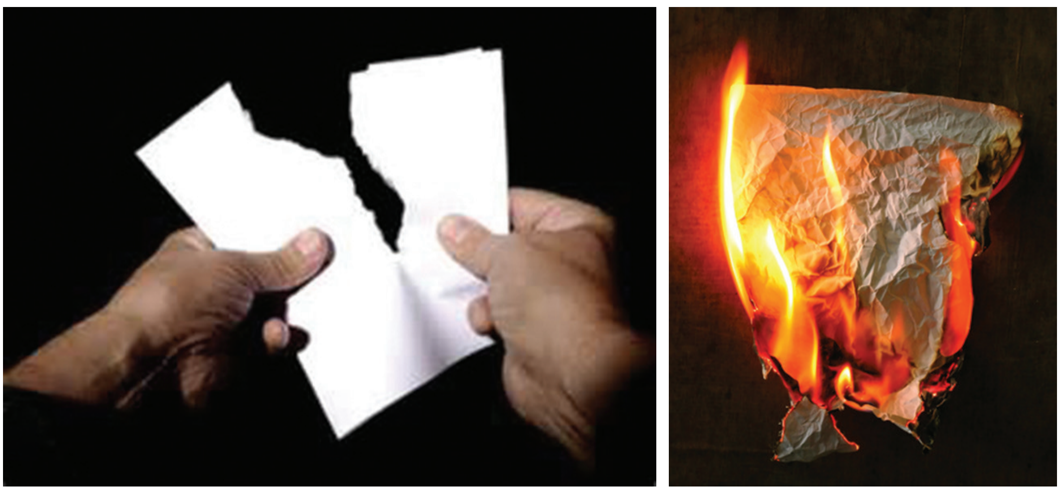


Figure 8.1

Can you explain the difference between these two changes?

Though the paper is torn into pieces, it is still a paper. So, when tearing a paper its composition is not subjected to any change. Something which is not a paper cannot be formed by tearing the **paper**. Therefore, such changes are known as **physical changes**.

Changes in which the composition of matter does not change, even though its nature of existence changes, are called physical changes.

However, when the paper is burnt, ash and smoke are formed. There the composition of the paper changed and new substances are formed. Such changes are known as **chemical changes**.

Changes in which the composition of matter forming new substances are known as chemical changes.

Let us engage in Activity 8.1 to study the nature of physical changes.

Activity 8.1

You will need:- A beaker, water, salt, tripod, spirit lamp/ bunsen burner

Method:-

- Take 250 ml beaker and add about 50 ml of water into it.
- Add about one teaspoon of powdered salt into it and dissolve thoroughly.
- Keep a wire gauge on a tripod and place the beaker on it.
- Heat the beaker using the spirit lamp/bunsun burner until water is completely vapourised.
- Record your observations.

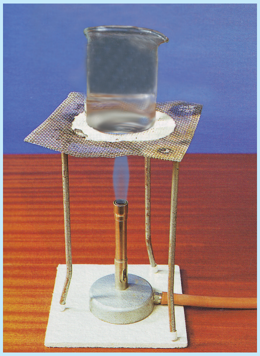


Figure 8.2

A residue can be seen at the bottom of the beaker. That residue is the salt that was previously dissolved in water. From this it is clear that the change happening during the dissolving of salt in water is a physical change.

Let us do Activity 8.2 to investigate the nature of chemical changes.

Activity 8.2

You will need:- A magnesium ribbon, a candle or a spirit lamp

Method:-

- Take a magnesium ribbon and clean it well.
- Burn it by holding to the flame.
- Record your observations.

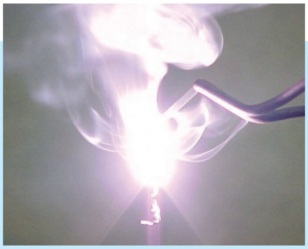


Figure 8.3

Before burning, the magnesium ribbon had a metallic lustre.

When held to the flame, it burnt with a bright flame leaving a white powder. Here, the composition of magnesium has changed and a new substance has formed. Therefore, burning of the magnesium ribbon is a chemical change.

Like this, the changes we experience in our day-to-day life can be divided into two types, physical changes and chemical changes. Engage in Assignment 8.1 to reinforce your knowledge in this regard.

Assignment 8.1

Classify the following changes as physical changes and chemical changes.

- Melting of solid wax
- Vapourisation of water
- Rusting of iron
- Melting of ice
- Breaking granite into pieces
- Burning camphor
- Burning firewood
- Lighting a cracker

8.2 Changes of state as physical changes

Let us do Activity 8.3 to gain an understanding about the changes of state.

Activity 8.3

You will need:- A beaker, a tin lid, a bunsen burner, a glass plate, a tripod, a wire gauge, a crucible, a glass funnel, boiling tubes, surgical spirit, water, a piece of wax, naphthalene, iodine

Method:-

Do the activities as indicated in Table 8.1 and record relevant observations.

Table 8.1

Activity	Observation
1. Place the piece of wax in a boiling tube and heat. Observe. Allow to cool and observe again.	
2. Put some pieces of ice into a beaker and heat. Observe. Continue heating even after the piece of ice completely turns into water. Make your observations. Hold the plate of glass over the beaker when water boils. (Do as a teacher demonstration)	
3. Put a few pieces of iodine into a crucible and heat. Hold an inverted funnel a little above the crucible.	

You would have observed that the wax melted when it was heated in a boiling tube. You would have also observed that liquid wax turns into solid when it is allowed to cool. When a solid substance is heated, it turns into the liquid state at a certain temperature. The transition of a substance from the solid state to the liquid is called **melting** or **fusion**. Transition of a substance from the liquid state to solid state is called **freezing**.

You would have observed that ice turns into water. Ice is a substance that exists in the solid state. Water is a liquid. The conversion of a substance from the solid state to liquid state is also a change of state and it is known as fusion. When that water is heated further water vapourises. The change of a liquid into a gas is known as **vapourisation**. When water boils, formation of droplets of water on the glass plate can be observed. These droplets were formed by the cooling of steam. The conversion of a substance that exists in the gaseous state into liquid state is called **condensation**.

When crystals of iodine were heated in a crucible, you would have seen that iodine turned directly into a gas. When that iodine gas was brought into contact with a glass surface, crystals of iodine can be seen on the surface from this, it is clear that when iodine vapour cools it directly turns into solid iodine without becoming a liquid. The turning of a solid into vapour without passing through the liquid state is also a change of state. It is known as **sublimation**.

During a change of state no new substances are formed by changing the composition. Therefore, the changes of state are physical changes.

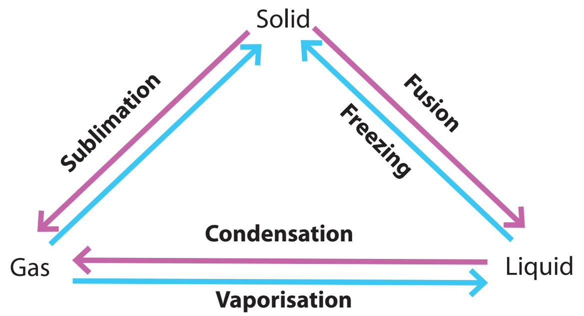


Figure 8.4

8.3 Chemical changes

So far we have discussed about the nature of physical changes. When a physical change occurs, a change in the composition of the substances does not occur.

But when chemical changes occur, new substances are formed.

Let us do Activity 8.4, 8.5, 8.6 and 8.7 to study the nature of chemical changes further.

Activity 8.4

You will need:- Lead nitrate, a boiling tube, a bunsen burner

Method:-

- Take about 1g of lead nitrate to a boiling tube.
- Heat the boiling tube using the bunsen burner.
- Record your observations.

When white lead nitrate is heated a brown coloured gas is evolved leaving a red coloured powder in the boiling tube. Since, the composition of lead nitrate has changed this is a chemical change.

Activity 8.5

You will need:- Copper sulphate, an iron nail, a boiling tube, a thermometer

Method:-

- Add water and copper sulphate crystals to the boiling tube and prepare a light blue solution.
- Put the cleaned iron nail into it.
- Record your observations.

When a cleaned iron nail is placed in a copper sulphate solution you would observe that the blue colour of the solution decreases, a reddish brown subtance deposits on the nail and at the bottom while the temperature rises.

Activity 8.6

You will need:- A solution of copper sulphate, a solution of sodium hydroxide, two test tubes

Method:-

- Mix the copper sulphate solution with the sodium hydroxide solution.
- Record your observations

When the copper sulphate solution is added to the sodium hydroxide solution, a dark blue solution is formed. On further addition of copper sulphate solution, a formation of a light blue solid can be observed. Such solids are called precipitates.

Activity 8.7

You will need:- Dilute hydrochloric acid, a zinc granule, a boiling tube

Method:-

- Add a little dilute hydrochloric acid to the boiling tube.
- Add the piece of zinc into it.
- Record your observations.

When a granule of zinc is added into hydrochloric acid, we see that zinc dissolves and a gas is liberated.

Pay your attention to the above activities. In all of them new substances are formed. You already know that in chemical changes new substances are formed. In the above activities, identify the observations which testify the formation of new substances and complete Table 8.2.

Table 8.2

Reaction	Observations in support of the formation of new substances
1. Heating lead nitrate	Formation of a red powder Evolution of a brown coloured gas
2. Putting an iron nail into a copper sulphate solution	
3. Adding copper sulphate solution to sodium hydroxide solution	
4. Adding a zinc granule to hydrochloric acid	

Based on the observations made with regard to the chemical reactions stated in this chapter before, the following can be given as evidences in support of the fact that a chemical reaction has taken place in the above activities.

- Evolution of gases
- Change in colour
- Change in temperature (exchange of heat)
- Formation of precipitates
- Production of sound/light
- Production of an odour

The formation of a new substance having a different composition or several new substances by one or more substances undergoing change is known as a chemical change or a chemical reaction.

Recall the burning of magnesium again. Magnesium is a metal with a silvery lustre. Upon heating, it combines with oxygen in the air and forms a white powder. That powder is known as magnesium oxide.

The substances that get subjected to change during a chemical reaction are called reactants.

Hence, the reactants of the above reaction are magnesium and oxygen.

The new substances formed by a chemical reactions are referred to as products.

The product of this reaction is magnesium oxide. This reaction can be shown in the form of a word equation as follows.

$$\textbf{Magnesium + Oxygen} \longrightarrow \textbf{Magnesium oxide}$$

Hence, in a chemical reaction, reactants turn into products.

Rusting of iron, tarnishing of metals, combustion of materials, decay of organic matter, ripening of fruits, blast of a cracker and digestion of food by enzymes are some chemical reactions taking place every day.

Law of conservation of mass

What kind of a change do you think will happen to the total mass of the substances that are subjected to the chemical changes or chemical reactions you have identified? To inquire into this let us do following activities.

Activity 8.8

You will need:- Iron wool, two identical iron wires, a horizontal rod

Method:-

- Take two equal masses of iron wool and lump them loosely
- Using the two iron wires tie them to the horizontal rod as shown in Figure 8.5.
- Suspend the rod on a support to balance it horizontally. Light one lump of iron wool.

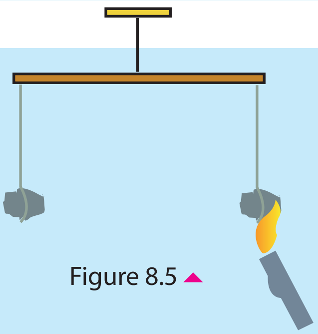


Figure 8.5

Iron wool burns giving reddish sparks. At the same time the side with burnt wool moves down. From this we can infer that when iron wool turns into the products of combustion, the mass increases.

Activity 8.9

You will need:- A few heads of matches, a boiling tube

Method:-

- Put a few heads of matches to a boiling tube. Weigh the boiling tube with them.
- Heat the boiling tube strongly with an open flame until the match heads catch fire.
- After cooling, weigh the boiling tube with its contents.
- Record your observations.

Here, you will be able to observe that the mass after the reaction is lower than the mass before the reaction.

Here, you may have the problem why there was an increase in the mass when iron wool was burnt in Activity 8.8 while a decrease in mass was shown when the match heads were burnt in Activity 8.9. In the above experiments, the substances were burnt in open environments. Therefore, when those substances react there is a chance to combine with some substances in the environment and also to release the products of combustion to the environment. An increase in mass occured due to addition of some substances. A decrease in mass was noticed due to the loss of some substances to the environment.

- **Open systems** - The systems in which the substances can exchange between the system and the surroundings are referred to as open systems.
- **Closed systems** - The systems in which the substances cannot exchange between the system and the environment are called closed systems.

Therefore, to find out whether a change occurs in the total mass of substances taking part in a chemical reaction, the experiment should be conducted in a closed system in which substances are neither gained from nor lost to the surrounding. Let us engage in Activity 8.10 and Activity 8.11 which have been designed after taking these facts into consideration.

Activity 8.10

You will need:- A few matches, a boiling tube, a rubber balloon

Method:-

- Let us now conduct Acitvity 8.9 in a closed system.
- As shown in Figure 8.6, close the mouth of the boiling tube containing matches with a balloon. Measure its mass.
- Apply heat close to the bottom of the tube until the matches light up.
- Allow the boiling tube to cool and weigh again.

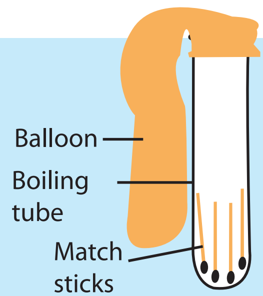


Figure 8.6

When the matches burn, the balloon get inflated gradually.

During the reaction the products are not lost. Also it is seen that there is no change in the total mass before and after the reaction.

Activity 8.11

You will need:- A conical flask, lead nitrate 1 g, water 20 ml, sodium chloride 1 g, a boiling tube

Method:-

- Take about 1g of lead nitrate to a conical flask and dissolve in about 20 ml of water.
- Take about 1g of sodium chloride to a test tube, dissolve it in about 5ml of water and transfer this solution to an ignition tube.
- Tie the ignition tube with sodium chloride solution with a string and suspend it inside the conical flask containing the lead nitrate solution with the help of a stopper as shown in Figure 8.7.

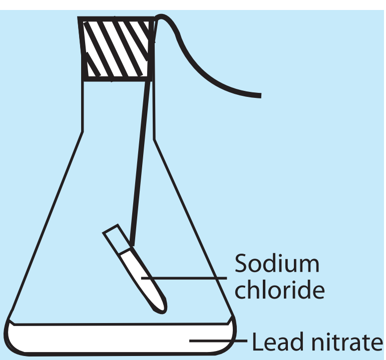


Figure 8.7

- Seal the conical flask by applying vaseline around the stopper. Weigh the flask with its contents.
- Slant the apparatus slowly and let the two solutions mix. Record your observations.
- Weigh the apparatus again and note the mass.

Formation of a white precipitate on mixing the two solutions indicates the occurrence of a chemical reaction in the apparatus. The result of the experiments also shows that there is no change in the total mass before and after the reaction.

The french scientist Antoine Lavoisier (1743-1794) who conducted many experiments such as the above in relation to various chemical reactions showed for the first time that the total mass of the substances taking part in a chemical reaction (reactants) is equal to the total mass of the products obtained after the reaction. Later this finding came to be known as the **Law of conservation of mass**.

Law of conservation of mass

During chemical reactions the total mass does not change. That means the mass is conserved.

8.4 Combustion

When magnesium burns in air, magnesium reacts with oxygen in the air forming magnesium oxide.

Oxygen gas in air is essential for combustion. Oxygen is the gas in air that supports combustion. There are substances which can be burnt and which cannot be burnt. The substances that can be burnt are known as combustible substances. The substances that cannot be burnt are non-combustible substances.

- **combustible** substances: e.g. :- camphor, wax, sulphur, sugur, lacquer, paper, tar, flour, petrol, kerosene
- **non-combustible** substances: e.g. :- asbestos, glass, sand, rock

Combustion is the reaction of a combustible substance with a gas which acts as a supporter of combustion. **The special feature of the reaction of combustion is that it is a chemical change which takes place releasing thermal energy and light energy.**

A combustible substance has to be heated to a certain temperature for combustion (to start to reacting with oxygen gas). This temperature changes from substance to substance. **The temperature at which a combustible substance begins combustion in the air is called its ignition temperature (ignition point).**

Let us do Activity 8.12 to compare the ignition temperatures of several combustible substances.

Activity 8.12

You will need:- A tin lid, a stand, a match, a piece of paper, cotton wool, magnesium ribbon, sugar, a piece of sulphur

Method:-

- Fix the tin lid to the stand.
- Place the above substances on the tin lid.
- Keep the Bunsen burner underneath the tin lid and heat.
- Observe the sequence in which the combustible substances placed on the tin lid ignite and note it down.

The substances which ignite early have low ignition tempratures.

A combustible substance starts to burn after it gets heated to its ignition point.

Thus, three main factor essential for combustion can be identified. They are;

- Presence of a combustible substance
- Having access to a supporter of combustion (Oxygen).
- Heating the combustible substance to its ignition temperature.

Fire triangle

Pay your attention to a fire broken out by accident. The fire should be extinguished to prevent damage. If a fire is to be extinguished the factors causing fire should be removed from the fire. The following figure which shows the relationship among the factors required to create a fire is known as the fire triangle. Examine it well.

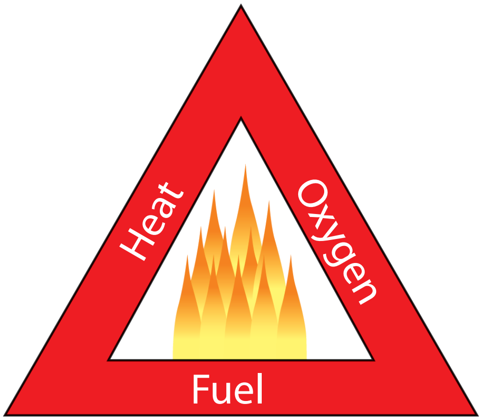


Figure 8.8 ▲ Fire triangle

To extinguish a fire it is required to prevent the access of the supporter of combustion to the fire, prevent reaching the ignition temprature (i.e.prevent receiving heat) and remove the combustible substance.

The method we use to extinguish a fire mostly is throwing water over the burning material. In addition to this covering the burning substance with sand and wet gunnies is also done.

- When water is sprayed over the fire it is doused. This is because when water vaporises absorbing heat from the burning material, temperature of under falls below the ignition temperature.
- When somebodys, clothes catch fire, the most suitable method to extinguish it is to roll on the ground. This helps break the connection between air, the supporter of combustion, and the material that has cought fire. When the clothes are on fire you should never run. During running more and more oxygen is supplied to the fire, so it spreads faster.

The same method cannot be used to extinguish all fires. The nature of the fire should be identified and then the appropriate method should be selected.

Fuels

Fuels are substances used to generate heat energy and light energy by combustion.

- Examples for solid fuels :- Firewood, coconut husks, coconut shells, wax
- Examples for liquid fuels :- Kerosine, petrol, diesel, coconut oil
- Examples for gaseous fuels :- Liquid petrolium gas (LP gas), coal gas, methane (bio gas)

Almost every fuel contains the elements carbon and hydrogen.

Let us carry out Activity 8.13 to identify the products formed during the combustion of fuels.

Activity 8.13

You will need:- A candle, a boiling tube, a bottle, a funnel, lime water, copper sulphate

Method:-

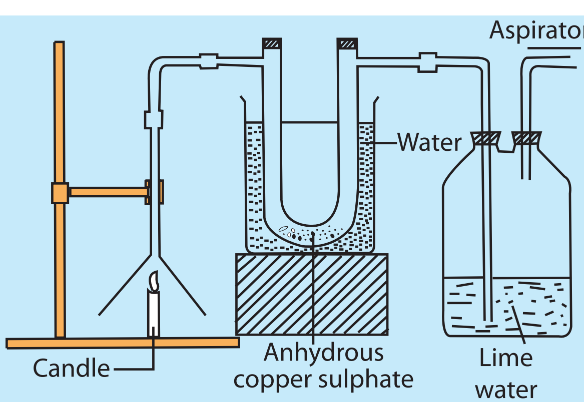


Figure 8.9

- Arrange the apparatus as shown in Figure 8.9. Connect the boiling tube/bottle with lime water to the aspirator. Light the candle and operate the aspirator. When the aspirator works an air current is drawn through the apparatus from the funnel to the boiling tube.

U tube contains anhydrous copper sulphate (white). The boiling tube/bottle contains colourless lime water. When the candle is lit and the aspirator is set to work you will observe that white anhydrous copper sulphate turns blue. Also, it can be seen that the lime water turns milky.

White anhydrous copper sulphate turns blue because of the water (water vapour) drawn into the U tube. Lime water turns milky due to carbon dioxide gas.

This activity indicates that when a candle burns, water and carbon dioxide gas are produced. Thus, in the combustion of fuels water and carbon dioxide gas are produced as the products.

Complete combustion and incomplete combustion of fuels

Complete combustion occurs when an adequate oxygen gas (supporter of combustion) is supplied for combustion. You know that fuels contain the elements carbon and hydrogen. On complete combustion carbon gives carbon dioxide and hydrogen gives water. More heat is produced by complete combustion.

The combustion occurring in an inadequate supply of oxygen is called incomplete combustion. In this carbon monoxide and unburnt carbon particles are also produced in addition to carbon dioxide and water. In incomplete combustion, the quantity of heat produced by the flame is relatively low.

Candle flame

When a candle is lit, solid wax turns into liquid wax. Liquid wax moves up through the wick and vapourises. This wax vapour, reacts with oxygen and produces heat and light giving rise to the flame of the candle.

Observe the candle flame well. It has three clearly visible zones.

The inner zone is the non-luminous zone. It contains wax vapour. Its temperature is low relatively to that of the other zones. Outer to the non-luminous zone is the luminous zone. The unburnt carbon particles present in that zone becomes incandescent emitting a yellow light. The temperature in this zone is greater than that of the non-luminous zone. Outer to the luminous zone is another zone which appears in blue colour at the base of the flame but is hardly visible in other areas. This is known as the outer zone (invisible zone) and has the highest temperature.

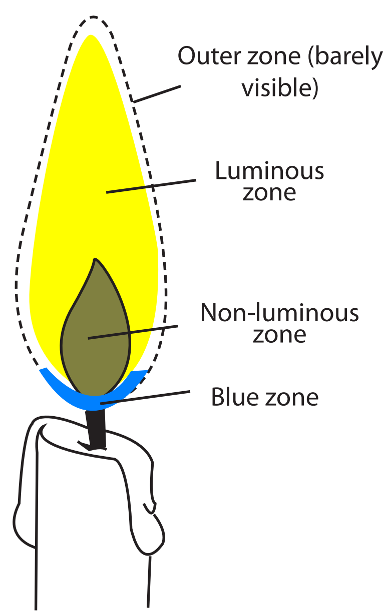


Figure 8.10 ▲ Candle flame

Bunsen flame

The colour of the bunsen flame changes with the amount of oxygen gas supplied for combustion. When the oxygen supply decreases the flame turns yellow and when the flame receives enough oxygen it turns blue. By observing the blue flame well, several zones of it can be identified.

At the centre of it is the non-luminous zone consisting of unburnt gas. Outer to the non-luminous zone lies a dark blue zone and a light blue zone respectively. The outerpart is the invisible zone. In the invisible zone complete combustion occurs.

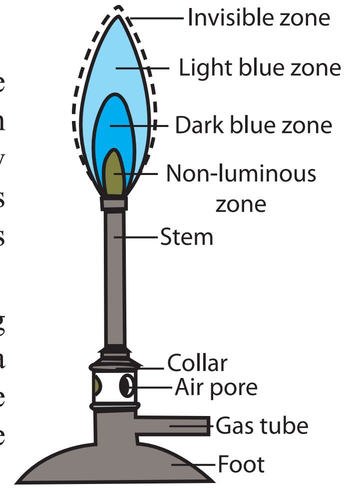


Figure 8.11 ▲ Bunsen flame

8.5 Tarnishing of metals

You have learnt that having a shiny surface is a property of metals. When metals are exposed to air for a long period, that lustre disappears. The change in surface of metals like this is called tarnishing. Almost every metal tarnishes.

A substance called rust is formed on the surface of iron due to tarnishing. This is reddish brown in colour and is called iron rust. This process is called rusting of iron. Due to tarnishing and rusting the surfaces of metals corrode. This is called corrosion of metals. Tarnishing of metals and rusting of iron are chemical changes.

Rusting of iron

Let us do Activity 8.14 and Activity 8.15 to investigate the factors essential for rusting of iron.

Activity 8.14

You will need:- Three test tubes, cleaned iron nails, coconut oil

Method:-

- Take some water into a test tube and heat to boiling. Put a cleaned iron nail into it and cover the water surface with a layer of oil (setup A). Oil layer is placed to prevent the dissolving of air when water cools.

- Take equal volumes of cold water to two other test tubes and put a cleaned iron nail into each. Put an oil layer to one of them (set-up B).
- Leave the other test tube as it is (set-up C).
- After a few days observe the setups.
- Record your observations.

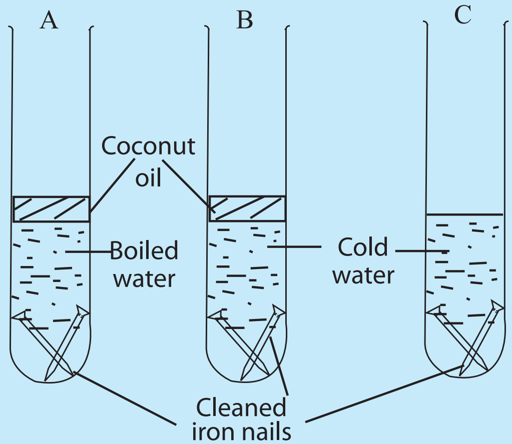


Figure 8.12

The nail in test tube A does not rust. As it contains boiled water all the air dissolved in it has been expelled. Putting a layer of coconut oil on water has prevented the dissolving of air when water cools.

Test tube B contains cold water. Therefore, its water contains air. Because there is air dissolved in water the nail in it rusts.

The nail in the test tube C is open to the outer environment. As it receives air from outside rusting occurs. Hence it can be concluded that air is essential for rusting.

Activity 8.15

You will need:- A boiling tube, two cleaned iron nails, cork stopper, calcium chloride crystals, wax, coconut oil

Method:-

- Clean the two iron nails with sand paper.
- Fix them to the cork stopper as shown in the Figure 8.13.
- Add calcium chloride crystals to the boiling tube and fix the stopper with the iron nails to it.
- Make the tube air tight with wax.
- Observe this setup for several days.
- Record your observations.

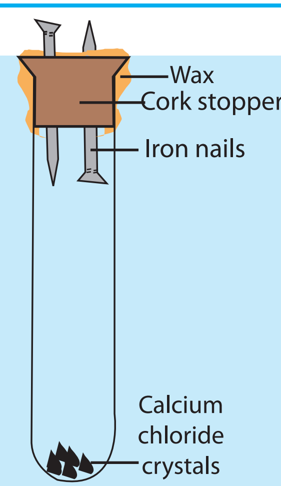


Figure 8.13

After a few days it can be seen that the parts of the nails outside the boiling tube have rusted while the parts inside the tube remain without rusting.

Calcium chloride crystals absorb moisture in the air in the boiling tube. Placing wax around the stopper makes the tube air tight and prevents the entry of moisture in air into the tube. As the air inside the tube is free from moisture, the parts of nails inside the tube do not rust.

What is expected by driving the two nails into the cork in opposite directions is to ensure that the pointed tip or the flat head of nails have no effect on rusting.

Activity 8.16

You will need:- A beaker, two test tubes, iron filings, cotton wool

Method:-

- Take two test tubes. In one of them (A) trap some moist cotton wool. In the other tube (B), trap a similar plug of moist cotton wool with some iron filings on it.
- Take some water into a beaker and dip the two inverted test tubes A and B in water as shown in Figure 8.14.
- Observe this setup a few days.
- Record the observations.

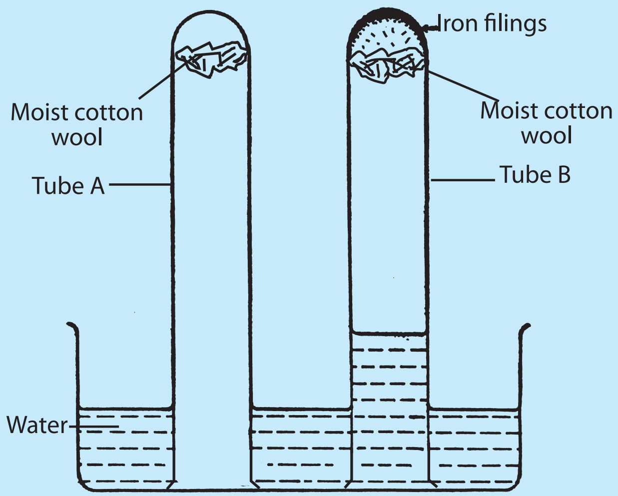


Figure 8.14

It can be seen that iron filings in tube B have undergone rusting while water has risen up to about one fifth of its height.

The percentage of oxygen in air by volume is 21%. That is, nearly 1/5 th of air in a given space is oxygen. If oxygen gas is used up for rusting, 1/5 th of the volume of air contained in space where rusting occurs should have been spent.

For the rusting of iron filings in tube B, oxygen gas in the air in that tube is used up. As 1/5 th of the volume of air is oxygen the water level rises to 1/5 th the height of the test tube. From this it is clear that oxygen gas is consumed during rusting.

These activities prove us that oxygen and water vapour/water in air are essential for the rusting of iron.

Protection of iron from rusting

Iron objects rust only when they are able to come in contact with air and water.

Figure 8.15 ▲ A galvanised bucket

Figure 8.16 ▲ A Painted gate

You would have seen that paints are applied on objects made of iron such as grills, gates and bridges. Application of paint is a frequently used method to prevent rusting of iron. It prevents iron from coming into contact with air and water. Grease is also applied in machinery made from iron to prevent rusting.

You have heard about the galvanized iron items. During galvanizing, zinc metal is applied on objects made of iron. Iron in galvanized items does not rust even if their zinc coat is scratched exposing some of their points to air. Therefore, galvanizing is a very good protective method. Items such as buckets, roofing sheets and iron nails are protected by galvanizing.

Application of tin metal is also another method used to protect iron from rusting. The containers of sealed food such as sardine and milk powder, though commonly called 'tins' are vessels made of iron. In them tin is present only as a coating. However, when scratched tin coated vessels rust very fast.

8.6 Neutralisation

Recall what you have learnt in grade 7 about acids, bases and neutral substances. Let us do Activity 8.17 to revise facts about them.

Activity 8.17

You will need:- Test tubes, red litmus, blue litmus, pH papers, hydrochloric acid, sodium hydroxide solution, sodium chloride (salt) solution, phenolphthalein

Method:-

- Take hydrochloric acid solution, sodium hydroxide solution and sodium chloride (salt) solution separately into three test tubes.
- Test these three solutions with red litmus papers.
- Test these three solutions with blue litmus papers.
- Test these three solutions with pH papers.
- Add two drops of phenolphthalein to these solutions.
- Record your observations.

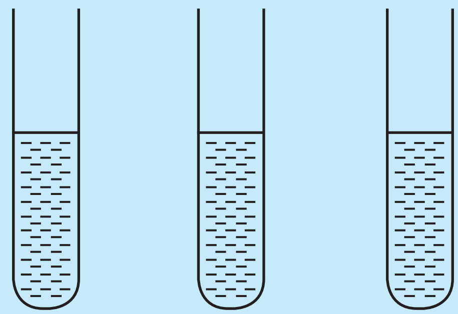


Figure 8.17

- A Solution A turns the blue litmus paper into red. Solution A does not change the colour of red litmus.When examined with a piece of pH paper, a value less than 7 is obtained. On addition of phenolphthalein it stays colourless.
- Solution B does not change the colour of blue litmus. It turns red litmus into blue. When tested by a pH paper the pH value is greater than 7. The solution gives a pink colour with phenolphthalein.
- Solution C does not change the colour of blue litmus or red litmus. The colour it gives with the pH paper corresponds to 7. It does not show a colour change with phenolphthalein.

From the above observations it can be identified that solution A is acidic, B is basic and C is neutral.

Investigating what type of a change occurs when an acid is added to a base

You might have heard that milk of magnesia liquid is given to relieve the acidity in stomach. Milk of magnesia is a basic substance. What is the reason for giving a basic substance like this to minimize the affect of an acidic substance? Lets us conduct Activity 8.18 to look into this.

Activity 8.18

You will need:- A beaker, a dropping pipette, dilute sodium hydroxide solution, dilute hydrochloric acid, phenolphthalein

Method:-

- Pour dilute sodium hydroxide solution to a beaker. Add a few drops of phenolphthalein into it. Then add dilute hydrochloric acid dropwise into it using a dropping pipette and observe the colour change in the solution.
- When the acid is added the pink colour of the solution gradually decreases and at a certain moment the solution becomes colourless. This indicates that when an acid is added to a base, the basic property of the base gradually disappears.

a - Sodium hydroxide solution with a few drops of phenolphthalein

b - Nutralised to some extent due to the addition of acid

c - Totally neutralised solution

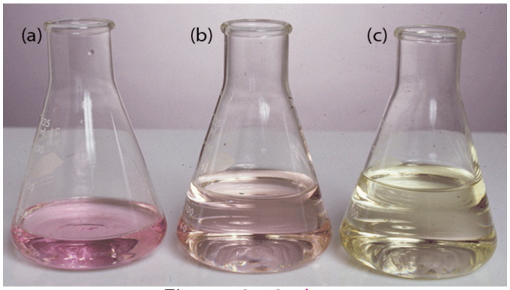


Figure 8.18

When an acid is added to a base or base is added to an acid, their acidic and basic properties decrease and at a certain point acidic and basic properties totally disappear. This process is called neutralisation. You know that sodium hydroxide is a base and hydrochloric acid is an acid. When these two react sodium chloride and water are formed which are neutral substances.

Sodium hydroxide + Hydrochloric acid $\longrightarrow$ Sodium chloride + Water

This reaction between an acid and a base is a chemical reaction. It is referred to as a neutralisation reaction.

Let us now explore about some instances in which we happen to meet acid-base neutralisation in day-to-day life.

When acidity in the stomach increases milk of magnesia is administered. Milk of magnesia means the base magnesium hydroxide. This base neutralises the excess hydrochloric acid in the stomach.

The pain caused by bee stings disappear on application of lime. When bees sting, acidic substances are introduced into the skin. Lime is a base. It neutralises the acid. That is why the pain subsides.

Figure 8.19

The wasp sting is basic. Therefore, when an acidic substance such as vinegar or lemon juice is applied, the poison gets neutralised relieving the pain.

Lime is applied to acidic soils. Lime which is a base neutralises acids in the soil.

Summary

- The changes takes place in matter is of two types, physical changes and chemical changes.
- In the case of physical changes the existing nature of matter changes, though its composition remains unchanged.
- The changes in which the composition of matter changes giving rise to new substances are known as chemical changes.
- Rusting of iron, corrosion of metals, combustion nutralisation are examples for chemical changes.
- Changes of state such as fusion, vapourisation, sublimation, condensation and freezing are physical changes.
- Heat change, evolution of a gas, formation of a precipitate, colour change and change in temperature provide evidence for the occurrence of a chemical reaction.
- The substances take part in a reaction are reactants and the substances formed during a reaction are products.
- During chemical reactions, the total mass does not change. That means, the mass of the reactants that took part in the reaction is equal to the mass of the products formed after the reaction.
- The reaction of combustible substances with oxygen is called combustion.
- When many fuels are subjected to complete combustion, carbon dioxide and water are formed.
- During incomplete combustion unburnt carbon and carbon monoxide are also formed in addition to carbon dioxide and water.
- The quality of heat generated during complete combustion is relatively higher than that generated during incomplete combustion.

- Water/water vapour and oxygen are essential for the rusting of iron.
- Rusting can be prevented by methods such as applying paint, galvanizing and applying grease.
- When an acid reacts with a base, the acidic properties of the acid and the basic properties of the base disappear.
- The chemical reactions between acids and bases are called neutralisation reactions.

Exercises

01) Select the correct or best suitable answer for the following questions.

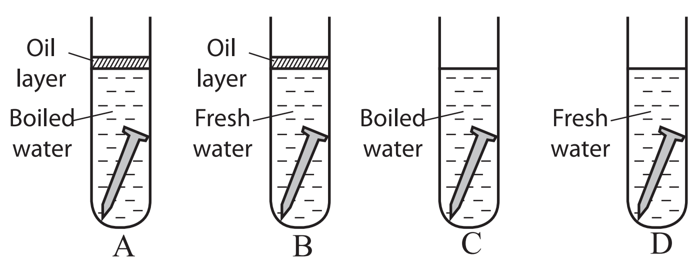
01. Which of the following is **not** a chemical change?

 1. Condensation of steam 2. Burning of magnesium
 3. Rusting of iron 4. Tarnishing of metals

02. Which of the following statement is **false**?

 1. Combustion is a chemical reaction.
 2. Oxygen is essential for the rusting of iron.
 3. It is necessary to heat something to its ignition temperature to burn.
 4. Complete combustion gives rise to a yellow flame.

03. The nail in which test tube does **not** rust?



04. Which of the following is **not** observed when a piece of zinc is placed in a copper sulphate solution?

 1. Gradual dissolution of the piece of zinc.
 2. Deposition of a reddish brown substance around the piece of Zinc.
 3. Slight heating of the solution.
 4. Blue colour of the solution remain same.

05. Which of the following does **not** undergo a chemical change on heating?

 A-Sulphur B-Magnesium C-Iron

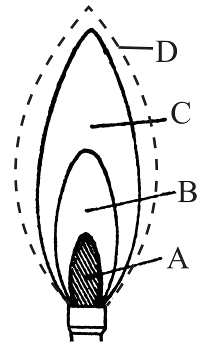
 1. Only A 2. Only A and B 3.Only B and C 4. A, B and C

02. The diagram shows a bunsen flame.

a. Name A, B, C and D zones.

b. In which zone complete burning occurs?

c. What is the fuel that burns in a bunsen burner?



03. Milk of magnesia is prescribed as a remedy for the discomfort caused by increasing acidity of stomach.

a. Is milk of magnesia acidic or basic?

b. How do you name the reaction between milk of magnesia and an acid?

04.Give short descriptions for the following phenomena.

1. Lime is added to avoid acidic nature in soil.
2. Iron is protected from rusting by application of paint.
3. You should never run,when your clothes are on fire.

Technical Terms

Physical changes	- භෞතික විපර්යාස	- பௌதிக மாற்றங்கள்
Chemical changes	- රසායනික විපර්යාස	- இரசாயன மாற்றங்கள்
Tarnishing	- මලින වීම	- மங்குதல்
Melting	- ද්‍රව වීම	- உருகுதல்
Vapourisation	- වාෂ්පීකරණය	- ஆவியாதல்
Sublimation	- ඌර්ධ්වපාතනය	- பதங்கமாதல்
Condensation	- ඝනීභවනය	- ஒடுங்கல்
Freezing	- හිමායනය	- உறைதல்
Combustion	- දහනය	- தகனம்
Corossion	- විඛාදනය	- அரிப்பு
Rusting	- මළකඩ කෑම	- துருப்பிடித்தல்
Neutralisation	- උදාසීනීකරණය	- நடுநிலையாக்கம்
Open system	- විවෘත පද්ධතිය	- திறந்த தொகுதி
Closed system	- සංවෘත පද්ධති	- மூடிய தொகுதி
Reactants	- ප්‍රතික්‍රියක	- தாக்கிகள்
Products	- ඵල	- விளைவுகள்
Law of conservation of mass	- ස්කන්ධ සමස්ථිති නියමය	- திணிவு காப்புவிதி