6 How Things React with One Another

Learning Objectives

To know about

- physical and chemical changes.
- rusting of iron.
- crystallization.

(a) Milk (b) Curd

Fig. 6.1: Change of milk to curd

Everyday a lot of changes occur around you all the time. What happens when you keep some ice cubes in a container in the open? The ice cubes change to water. What happens when you add sugar in milk? Milk becomes sweet in taste.

If you add some curd in warm milk and keep it at room temperature overnight, it changes to curd (Fig. 6.1). Similarly, cooking of food, digestion of food, photosynthesis, rusting of iron, etc. are changes occurring around you.

Broadly, all the changes occurring in your surroundings are classified as **physical** and **chemical changes**.

Classroom Discussion

Discuss and enlist ten common changes you observe everyday in things around you. For example, boiling of water and peeling of vegetables.

6.1 PHYSICAL CHANGE

*The properties such as size, shape, colour and state of a substance are called its **physical properties**.*

*When a substance undergoes a change in its physical properties, that change is said to be a **physical change**.* During a physical change, no new substance is formed. Physical changes are generally reversible changes.

Reversible Change

A change in which we can get back the initial substance by reversing the action is called a reversible change.

Let us perform Activities 6.1–6.4 to understand physical changes.

Activity 6.1

(Observe)

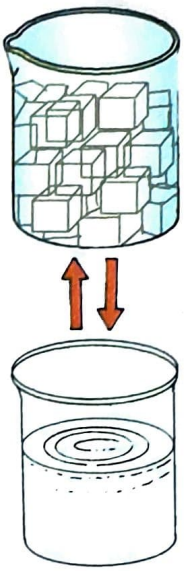
To observe a physical change with the help of ice cubes

- Take a few ice cubes in a beaker.
- Keep them in the open for 4–5 minutes.
- What do you observe?

You will observe that ice (solid) changes into water (liquid). There is a change in the state of ice from solid to liquid.

- Now pour this water back into the ice tray and keep it in the freezer for 30 minutes.
- What do you get?

You will get back the ice. Therefore, it is a physical change.



Ice changes to water and water changes back to ice

Activity 6.2

(Observe)

To observe a physical change with the help of a sugar solution

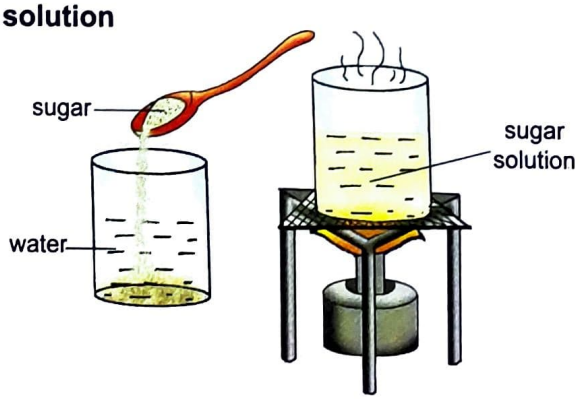
- Take 100 mL of water in a beaker.
- Dissolve a spoonful of sugar into it.
- What do you get?

You will get a solution of sugar and water.

- Now heat this solution over a burner for sometime.
- What do you observe?

You will observe that slowly the water evaporates and sugar is left at the bottom.

- What do you get?



Getting back sugar from sugar and water solution

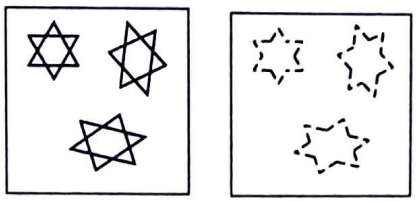
You will be able to get back sugar. Therefore, it is a physical change.

Activity 6.3

(Observe)

To observe a physical change with the help of a paper

- Take a square piece of paper.
- Draw stars on it.
- Cut these stars along their outlines.
- Now try to join all the pieces of paper by keeping them on a table.



Cutting of paper

Can you join all the pieces of paper to get back the original piece of paper?

You will observe that all the pieces of paper cannot be joined to get back the original piece of pa
each piece of paper retains the property of original paper.

The size and shape of the paper have changed but not the physical properties. Therefore, it is a
change.

Activity 6.4 (Observe)

To observe a physical change with the help of chalk dust

- Crush some pieces of chalk into dust. Add a little water to it and make a thick paste.
- Roll this paste into the shape of a chalk piece. Keep it under the fan for 30 minutes for dr
- What do you get?

You will get back the chalk with its original properties. Therefore, it is a physical change.

6.2 CHEMICAL CHANGE

When two or more substances react in such a way th formation of one or more new substances, the chang ***a chemical change*** *or a* ***chemical reaction.***

During a chemical change, reactants undergo change products. Chemical changes, generally, are irreversible

Burning of paper, spoilage of food, cooking of food, of food, photosynthesis, curdling of milk, ripening rusting of iron, etc. are chemical changes. Let us Activities 6.5–6.8 to study some chemical changes.

Terms You Should Know

- **Reactant:** A substance that takes part in a reaction and undergoes a change is known as reactant.
- **Product:** A substance that is formed during a reaction is called product.

Irreversible change: A change in which we cannot get back the initial substance by reversing the action is an irreversible change.

Activity 6.5 (Observe)

Aim: To observe the formation of a new substance on heating a magnesium ribbon and then adding water to it

Procedure:

- Take a small piece of a magnesium ribbon.
- Clean its tip by rubbing it with a sandpaper.
- Hold it with a pair of tongs over the flame of a burner.
- What do you observe?

Burning of magnesium

You will observe that it burns with a brilliant white light. It leaves behind a powdery ash after burn ash obtained is not the same as the magnesium ribbon. Magnesium has lost its properties and substance, magnesium oxide (MgO) is formed.

- Collect the ash in a beaker and mix it with a small amount of water.
- Stir it properly.
- With the help of a dropper, put a drop of this solution on red and blue litmus papers to test its chemical nature.
- What do you observe?

You will observe that red litmus paper turns blue and blue litmus paper remains as it is. This shows that the solution obtained is basic in nature.

Inference: Magnesium oxide, on dissolving in water, forms magnesium hydroxide which is a new substance. Thus, it is a chemical change.

This change is represented as:

$$\underset{(Mg)}{\text{Magnesium}} + \underset{(O_2)}{\text{Oxygen}} \longrightarrow \underset{(MgO)\ (Ash)}{\text{Magnesium oxide}}$$

$$\underset{(MgO)}{\text{Magnesium oxide}} + \underset{(H_2O)}{\text{Water}} \longrightarrow \underset{[Mg(OH)_2]}{\text{Magnesium hydroxide}}$$

Note: This activity should be performed by the teacher or under the supervision of the teacher only.

Caution: Staring at a burning magnesium ribbon for long is harmful for the eyes. Use glasses to look at it.

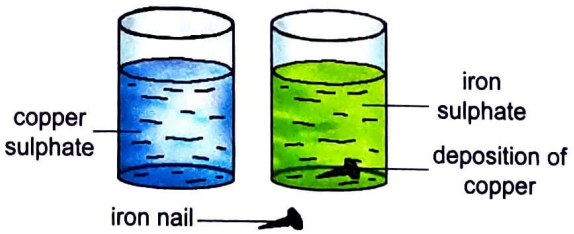
Activity 6.6

(Observe)

Aim: To observe the formation of a new substance on putting an iron nail in copper sulphate solution

Procedure:

- Take 100 mL water in a 250 mL beaker.
- Dissolve a spoonful of copper sulphate (blue vitriol or neela thotha) in it.
- Add a few drops of dilute sulphuric acid to it.
- What do you get?



Reaction between copper sulphate and iron

You will get a blue-coloured solution.

- Divide this solution into two equal parts.
- To the second part, drop an iron nail and leave it for 30 minutes.
- Compare the colour of this solution with the second part of the solution.

You will observe that the blue colour of the solution changes to green colour. Also a brown-coloured layer gets deposited on the iron nail.

Inference: Copper sulphate solution is blue in colour. It changes to green colour due to the formation of a new substance, i.e., iron sulphate. The brown deposit on the iron nail is of copper, another new substance. Hence, this is a chemical change.

This change can be represented as:

$$\underset{(Blue)}{\underset{(CuSO_4)}{\text{Copper sulphate}}} + \underset{(Grey)}{\underset{(Fe)}{\text{Iron}}} \longrightarrow \underset{(Green)}{\underset{(FeSO_4)}{\text{Iron sulphate}}} + \underset{(Brown)}{\underset{(Cu)}{\text{Copper}}}$$

Activity 6.7

(Observe)

Aim: To observe the formation of a new substance on adding baking soda to vinegar

Procedure:

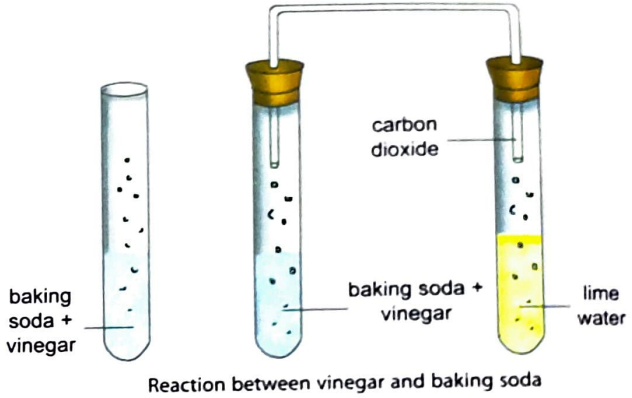
- Take about 2 mL of vinegar in a test tube.
- Add a pinch of baking soda to it.
- What do you observe?

You will hear a hissing sound and see bubbles of gas coming out of the test tube.

- Pass this gas through freshly prepared lime water and observe what happens.

You will observe that lime water turns milky.

Inference: When baking soda is added to vinegar, carbon dioxide gas, a new substance, is produced. When carbon dioxide gas is passed through lime water, lime water turns milky due to the formation of calcium carbonate, another new substance.



Reaction between vinegar and baking soda

This change can be represented as:

$$\text{Vinegar } (CH_3COOH) + \text{Baking soda } (NaHCO_3) \longrightarrow \text{Carbon dioxide } (CO_2) + \text{Other substances}$$

$$\text{Carbon dioxide } (CO_2) + \text{Lime water } [Ca(OH)_2] \longrightarrow \text{Calcium carbonate } (CaCO_3) \text{ (Milky)} + \text{Water } (H_2O)$$

Activity 6.8

(Observe)

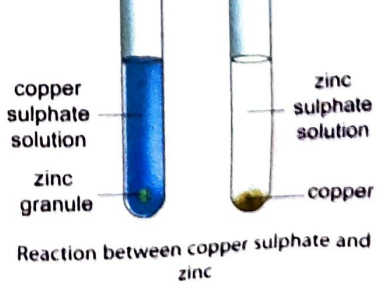
Aim: To observe the formation of a new substance on adding zinc to copper sulphate solution

Procedure:

- Take 5 mL of copper sulphate solution in a test tube.
- Put a zinc granule into it and leave it undisturbed for 5–10 minutes.
- What do you observe?

You will observe that the blue colour of copper sulphate solution fades away. It happens due to the formation of zinc sulphate. You will also see a brown deposit of copper at the bottom of the test tube.

Inference: When a zinc granule is added to copper sulphate solution, zinc sulphate, a new substance, is formed. Also, copper gets deposited at the bottom of the test tube.



Reaction between copper sulphate and zinc

This change is represented as:

$$\underset{\text{(Blue)}}{\text{Copper sulphate } (CuSO_4)} + \underset{}{\text{Zinc } (Zn)} \longrightarrow \underset{}{\text{Zinc sulphate } (ZnSO_4)} + \underset{\text{(Brown)}}{\text{Copper } (Cu)}$$

In Activities 6.5–6.8, one or m
during the reactions. So, all th
changes.

Recall Activity 5.4 of Chapt
neutralization reaction betwee
hydroxide. In that reaction, s
new substances were formed.

In addition to the formation
change may be accompanied
six changes:

(i) Evolution of gas

For example:

- When zinc granules are
hydrogen gas is evolve
brought near the mouth o
sound.

$$\underset{(H_2SO_4)}{\text{Sulphuric acid}} + \underset{(Zn)}{\text{Zinc}} -$$

- When solid sodium nitrat
If a glowing splinter is br
tube, it bursts into flame.

$$\underset{2(NaNO_3)}{\text{Sodium nitrate}} \xrightarrow{\text{Heat}}$$

- When solid calcium carb
gas is evolved. If this ga
lime water turns milky.

$$\underset{(CaCO_3)}{\text{Calcium carbonate}} \xrightarrow{\text{Heat}}$$

(ii) Change of colour

For example, when solid lead
nitrogen dioxide gas is evol
monoxide is formed.

$$\underset{2[Pb(NO_3)_2]}{\text{Lead nitrate}} \xrightarrow{\text{Heat}} \text{Nitroge}$$

In Activities 6.5–6.8, one or more new substances are formed during the reactions. So, all these reactions involve chemical changes.

Recall Activity 5.4 of Chapter 5, in which you observed neutralization reaction between hydrochloric acid and sodium hydroxide. In that reaction, sodium chloride and water, two new substances were formed. So, it was also a chemical change.

In addition to the formation of new substances, a chemical change may be accompanied by one or more of the following six changes:

(i) Evolution of gas

For example:

- When zinc granules are added to dilute sulphuric acid, hydrogen gas is evolved. If a burning matchstick is brought near the mouth of a test tube, it burns with a pop sound.

$$\underset{(H_2SO_4)}{\text{Sulphuric acid}} + \underset{(Zn)}{\text{Zinc}} \longrightarrow \underset{(ZnSO_4)}{\text{Zinc sulphate}} + \underset{(H_2)}{\text{Hydrogen}}$$

- When solid sodium nitrate is heated, oxygen gas is evolved. If a glowing splinter is brought near the mouth of the test tube, it bursts into flame.

$$\underset{2(NaNO_3)}{\text{Sodium nitrate}} \xrightarrow{\text{Heat}} \underset{2(NaNO_2)}{\text{Sodium nitrite}} + \underset{(O_2)}{\text{Oxygen}}$$

- When solid calcium carbonate is heated, carbon dioxide gas is evolved. If this gas is passed through lime water, lime water turns milky.

$$\underset{(CaCO_3)}{\text{Calcium carbonate}} \xrightarrow{\text{Heat}} \underset{(CaO)}{\text{Calcium oxide}} + \underset{(CO_2)}{\text{Carbon dioxide}}$$

(ii) Change of colour

For example, when solid lead nitrate is heated, reddish-brown nitrogen dioxide gas is evolved. Also, a yellow-coloured lead monoxide is formed.

$$\underset{2[Pb(NO_3)_2]}{\text{Lead nitrate}} \xrightarrow{\text{Heat}} \underset{\substack{4(NO_2)\\ \text{Reddish-brown}}}{\text{Nitrogen dioxide}} + \underset{\substack{2(PbO)\\ \text{Yellow}}}{\text{Lead oxide}} + \underset{(O_2)}{\text{Oxygen}}$$

Displacement Reaction

Iron is a more reactive metal than copper. Iron replaces copper from copper sulphate solution to form iron sulphate. Such reactions, in which a more reactive metal replaces a less reactive metal from its salt solution is called **displacement reaction**.

Splinter

Splinter is a thin strip of wood used for lighting a fire.

Do you know?

When you leave cut slices of apple, brinjal, potato, etc. they acquire a brown-coloured layer. This change of colour is due to the formation of a new substance on reaction with atmospheric air.

Precipitate

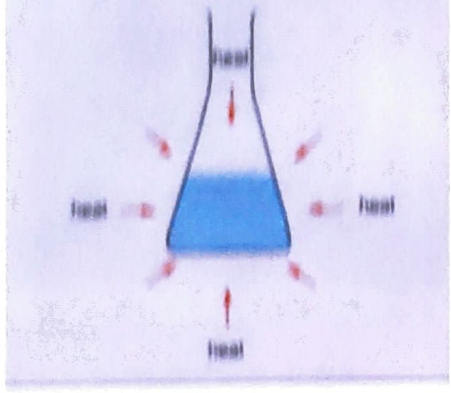
Precipitate is a solid substance that deposits from a solution.

Key Fact

Almost all reactions are accompanied by energy changes.

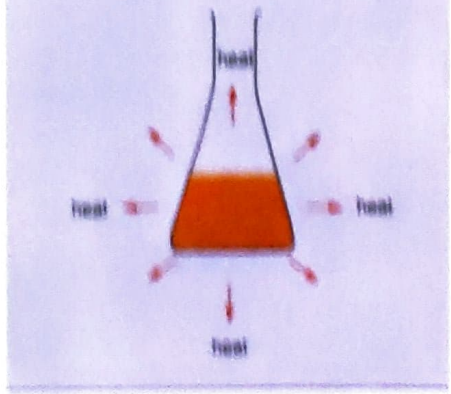
Endothermic Reaction

The reaction in which heat energy is absorbed is called **endothermic reaction**.



Exothermic Reaction

The reaction in which heat energy is evolved is called **exothermic reaction**.



(iii) Formation of precipitate

For example:

- When hydrogen sulphide gas is passed through blue coloured copper sulphate solution, black precipitate of copper sulphide is formed.

Copper sulphate ($CuSO_4$) + Hydrogen sulphide (H_2S) → Copper sulphide (CuS) + Sulphuric acid (H_2SO_4)

- When ammonium hydroxide and iron sulphate solutions are mixed together, a brown coloured precipitate of iron hydroxide is obtained.

Ammonium hydroxide (NH_4OH) + Iron sulphate ($FeSO_4$) → Iron hydroxide [$Fe(OH)_2$] + Ammonium sulphate [$(NH_4)_2SO_4$]

- When sodium chloride and silver nitrate solutions are mixed together, a white precipitate of silver chloride is formed.

Sodium chloride ($NaCl$) + Silver nitrate ($AgNO_3$) → Silver chloride ($AgCl$) + Sodium nitrate ($NaNO_3$)

(iv) Absorption or evolution of heat, light or any other radiation

For example:

- When carbon and sulphur are heated, i.e., heat energy is absorbed, then carbon sulphide is formed.

Carbon (C) + Sulphur (S) —Endothermic reaction→ Carbon sulphide (CS_2)

- When water is added to quicklime, heat energy is evolved.

Quicklime (CaO) + Water (H_2O) —Exothermic reaction→ Calcium hydroxide [$Ca(OH)_2$] + Heat

(v) Sound may be produced

For example, in Activity 8.7, you observed that when baking soda is added to vinegar, carbon dioxide gas is produced with a hissing sound.

Vinegar + Baking soda $\longrightarrow$ Carbon dioxide + Hissing sound
(CH_3COOH) ($NaHCO_3$) (CO_2)

(vi) Change of smell may occur or a new smell may be given off

For example, when cooked food containing oils and fats is kept in the open (not refrigerated) for long, it gets spoiled and gives a foul smell.

Classroom Discussion

Discuss the products obtained on explosion of fireworks.

Why should you not burn crackers on festivals?

Answer Orally

1. What are physical properties?
2. Cutting of paper into small pieces is a _____ change.
3. Photosynthesis is a chemical change. (True/False)

6.3 RUSTING OF IRON

You must be familiar with the rusting of iron. When iron objects are left exposed to moist air (oxygen and water both), a substance with a brown flaky layer is observed on their surfaces. This brown flaky layer is hydrated iron oxide. It is called **rust** (Fig. 6.2).

Fig. 6.2: Rusting of iron

Rust falls off the surface, exposing the iron surface beneath. **Rusting of iron** is a slow change that destroys the whole iron object.

Iron is an important metal. It is used in making bridges, cars, ships, trucks, gates, benches and various other useful articles. Every year, a lot of monetary loss occurs due to damage of iron articles by rusting.

The process of rusting of iron is represented as:

Iron + Oxygen + Water $\longrightarrow$ Rust
(Fe) (O_2) (H_2O) (Hydrated iron oxide $Fe_2O_3 \cdot xH_2O$)

Key Fact

Rusting of iron takes place in the presence of both oxygen and water (or water vapour). If any one of these is not present, rusting will not occur.

Rusting of iron becomes faster if the content of moisture in the air increases. For example, the part of the ship that always remains under water (salty water) rusts faster. Rusting is faster in salty water.

6.3.1 Prevention of Rusting of Iron

Rusting of iron can be prevented in many ways.

Classroom Discussion

Discuss why ships suffer a lot of damage from rusting in spite of being painted.

Electroplating

It is the deposition of a metallic coating (say gold) by passing electric current through a solution containing dissolved metal ions and the metal object to be electroplated.

This is the process by which wrist watches, jewellery and other items are plated with gold.

(i) **By avoiding direct contact with air and moisture:** It is done by using the following methods:

- **Applying grease or oil** on the exposed parts of iron articles.
- **Painting** the surface of iron articles.
- **Galvanizing** the surface of iron articles. Galvanizing is a process in which a layer of metals like chromium or zinc is deposited on the surface of iron articles **electrolytically**, i.e., by passing electric current.
- **Electroplating** the surface of iron articles with metals, which are not attacked by atmospheric moisture. The shining parts of bicycles are given a coating of chromium (chrome plating) to protect them from rusting.

(ii) **By alloying:** When mixed with certain corrosion resistant metals or some non-metals, iron forms alloys which are resistant to rusting. Stainless steel, an alloy of iron, nickel and chromium does not rust.

Corrosion

Corrosion is the deterioration of materials by chemical interaction with their environment.

6.4 CRYSTALLIZATION

Closely observe common salt and sugar. You will notice that all common salt and sugar particles are of uniform shape and size, i.e., almost cubical. Such uniform structures are called **crystals.**

In a crystal, atoms are arranged in a regular pattern. The crystals of common salt, sugar, alum, etc. are obtained from the solutions of these substances in water by a process called **crystallization.**

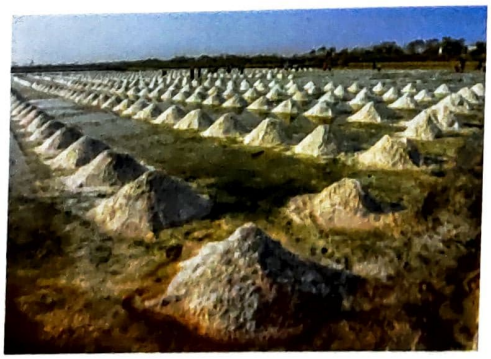


Fig. 6.3: Extracting salt from seawater

During crystallization, a solid is first dissolved in water. Then the water in the solution formed is allowed to evaporate. By this method, large crystals of pure substances can be obtained.

Seawater contains salt. Salt is obtained by collecting seawater in shallow ponds (Fig. 6.3). The water gets evaporated under the heat of the sun and solid salt is left behind.

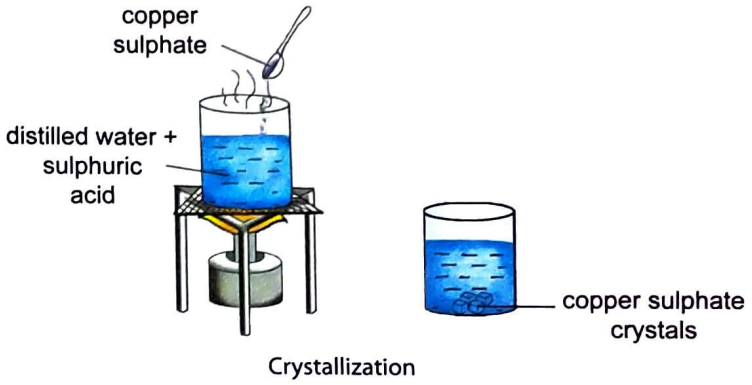
Let us perform Activity 6.9 to understand crystallization.

Activity 6.9 (Experiment)

Aim: To observe the process of crystallization

Procedure:

- Take 50 mL of distilled water in a 100 mL beaker.
- Add 2–3 drops of dilute sulphuric acid to it.
- Heat it over a burner.
- When it starts boiling, add a small amount of copper sulphate powder to it.
- Stir it continuously to dissolve.
- Continue adding copper sulphate powder till no more powder can be dissolved.
- Carefully filter the hot solution.
- Leave it undisturbed overnight.
- What do you observe?



Crystallization

Observation: You will observe clean blue crystals of copper sulphate at the bottom of the beaker.

Inference: Crystals of copper sulphate are formed by the process of crystallization.

Answer Orally

1. What is rust?
2. What is the shape of a sugar crystal?
3. Define crystal.

Mind Scrambler

Unscramble each of the following to form a word or term:

(a) SEBERILEVR _____

(b) YASTRSLC _____

DEFINITIONS

- **Physical properties:** The properties such as size, shape, colour and state of a substance
- **Physical change:** A change in which a substance undergoes a change in its physical properties
- **Chemical change:** A change in which two or more substances react in such a way that there is formation of one or more new substances
- **Crystallization:** The process by which crystals of pure substances are obtained from their solutions

QUICK ROUNDUP

1. Two types of changes occur around you—physical and chemical changes.
2. During a physical change no new substance is formed. However, a chemical change always involve the formation of one or more new substances.
3. Generally, physical changes are **reversible** in nature and chemical changes are **irreversible**.

4. Rusting of iron articles takes place due to the presence of both water and oxygen.
5. Large crystals of pure substances can be obtained by crystallization.

EXERCISES

A. Answer in Detail

1. Give an experiment to show that change of state of a substance is a physical change.
2. Show that burning of a magnesium ribbon is a chemical change through an experiment.
3. In addition to formation of new substances, what all changes can be observed during a chemical change? Give one example of each type of change.
4. In what all ways can rusting of iron be prevented?
5. How will you obtain pure crystals of copper sulphate?

B. Answer Briefly

1. What do you understand by physical changes? Give example.
2. What do you understand by chemical changes? Give example.
3. What happens when an iron nail is dipped in copper sulphate solution? Why does the colour of the solution and nail change?
4. When a pinch of baking soda is added to vinegar, a hissing sound is produced. Why is it so? How will you identify the gas produced?
5. What happens when a zinc granule is added to copper sulphate solution?
6. What is rusting of iron? What conditions are required for rusting to take place?
7. What is crystallization?

C. Answer in One Word or a Few Words

C1. Match the given columns.

Column A	Column B	Column C
1. Physical changes	(i) Reacts with sulphur	(a) Rust
2. Copper sulphate	(ii) Irreversible	(b) Chemical change
3. Iron	(iii) No new substance is formed	(c) Basic in nature
4. Carbon	(iv) Turns red litmus paper blue	(d) Generally reversible
5. Spoilage of food	(v) Reacts with zinc	(e) Zinc sulphate is formed
6. Magnesium hydroxide	(vi) Oxygen and water	(f) Endothermic reaction

C2. Fill in the blanks.

1. When baking soda is added to vinegar, _____ gas is produced.
2. Dissolving sugar in water is a _____ change.
3. The process of depositing a layer of zinc on iron is called _____.
4. Crystals of pure substances are obtained from their solutions by _____.
5. Hydrated iron oxide is called _____.

C3. State whether the following statements are True (T) or False (F).

1. Cutting of wood is a physical change. [ ]

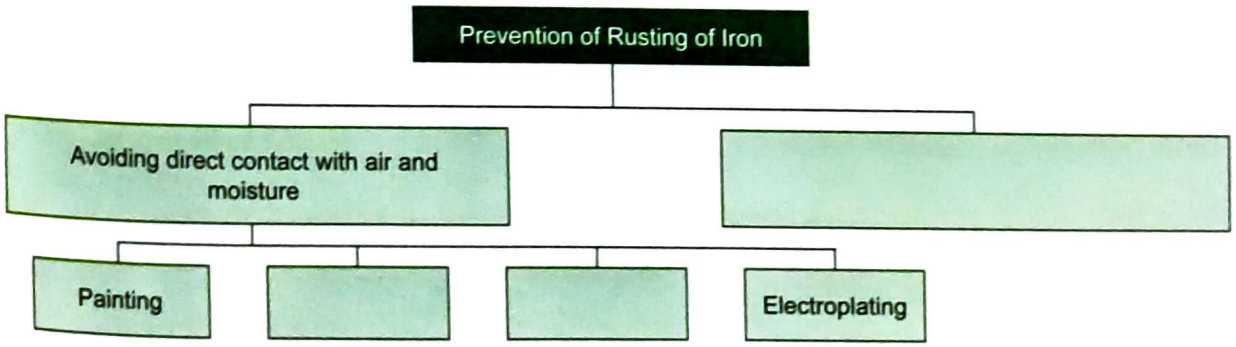
2. During a physical change, new substances are formed. [ ]
3. Energy changes always occur during a chemical change. [ ]
4. Rusting of iron takes place in the presence of water only. [ ]
5. Rusting of iron can be prevented by wrapping iron articles in paper. [ ]

C4. Multiple Choice Questions (MCQs): Choose the correct answer for each of the following.

1. Crystallization is a process of obtaining
   (a) pure solids only. (b) pure liquids only. (c) pure gas only. (d) all of these.
2. Observe the following two changes. Change A: Biogas is produced by decomposition of animal and plant waste by anaerobic bacteria. Change B: Biogas is burnt as other fuels. Which of these is a chemical change?
   (a) Change A (b) Change B (c) Both (a) and (b) (d) None of these
3. Rusting of iron can be prevented by
   (a) galvanizing. (b) electroplating. (c) alloying. (d) all of these.
4. LPG (Liquefied Petroleum Gas) is used as fuel in kitchen. It exists as a liquid in a cylinder. When it comes out of the cylinder, it becomes a gas (Change A). It is burnt to produce heat energy (Change B). Which of the following statement is correct?
   (a) Change A is a physical change and Change B is a chemical change.
   (b) Change A is a chemical change and Change B is a physical change.
   (c) Both changes A and B are physical changes.
   (d) Both changes A and B are chemical changes.
5. When an iron nail is dipped in blue copper sulphate solution,
   (i) colour of the solution changes to green.
   (ii) colour of the solution fades.
   (iii) brown deposit is observed on the iron nail.
   (iv) brown deposit is observed at the bottom of the beaker.
   Which of the above statements are correct?
   (a) (i) and (ii) are correct. (b) (i) and (iii) are correct.
   (c) (ii) and (iv) are correct. (d) (i) and (iv) are correct.

DO AND LEARN

A. Complete the Web Chart.



B. Laboratory Experiments

1. Hold a back-saw blade with a pair of tongs. Burn the tip of the free end in a flame for 4–5 minutes. What changes do you observe? Is it a physical change or a chemical change?
2. **Crystallization of alum:** Take water in a beaker. Dissolve some alum in it. Heat it over a gas burner. Take a pencil and tie a small piece of thread to it. Place the pencil on top of the beaker. Keep the beaker undisturbed for 2–3 days at some clean and dry place. You will get a bigger crystal of alum formed at the end of the thread. Compare the size of your crystal with your partner.

C. Pair Work

In pairs, identify the changes taking place when a candle burns. Classify the changes into physical and chemical changes.

D. Group Discussion

Hold a group discussion on the topic 'Change is the law of nature.'

Surf to Know More

1. Go to *http://www.learner.org/courses/essential/physicalsci/session4/closer1.html* to have a closer look into chemical change verses physical change.
2. Go to *http://www.asminternational.org/content/ASM/storefiles/06691G_Chapter_1.pdf* to study about the effects and economic impact of corrosion.

Iron Pillar at Qutab Minar

An iron pillar is situated in the Qutab Minar complex of New Delhi. It is about 1600 years old. The base of the pillar is tied to its foundations by small pieces of iron. It is a wonder that this iron has not rusted since then, despite Delhi's harsh weather. Metallurgists at Kanpur IIT have discovered that a thin layer of "misawite", a compound of iron, oxygen and hydrogen, has protected the cast iron pillar from rusting. The protective film was formed within three years after erection of the pillar and has been growing ever so slowly since then. Even after 1600 years, the film has grown just 1/12th of a millimetre thick, according to R. Balasubramanium of IIT. Isn't it amazing?

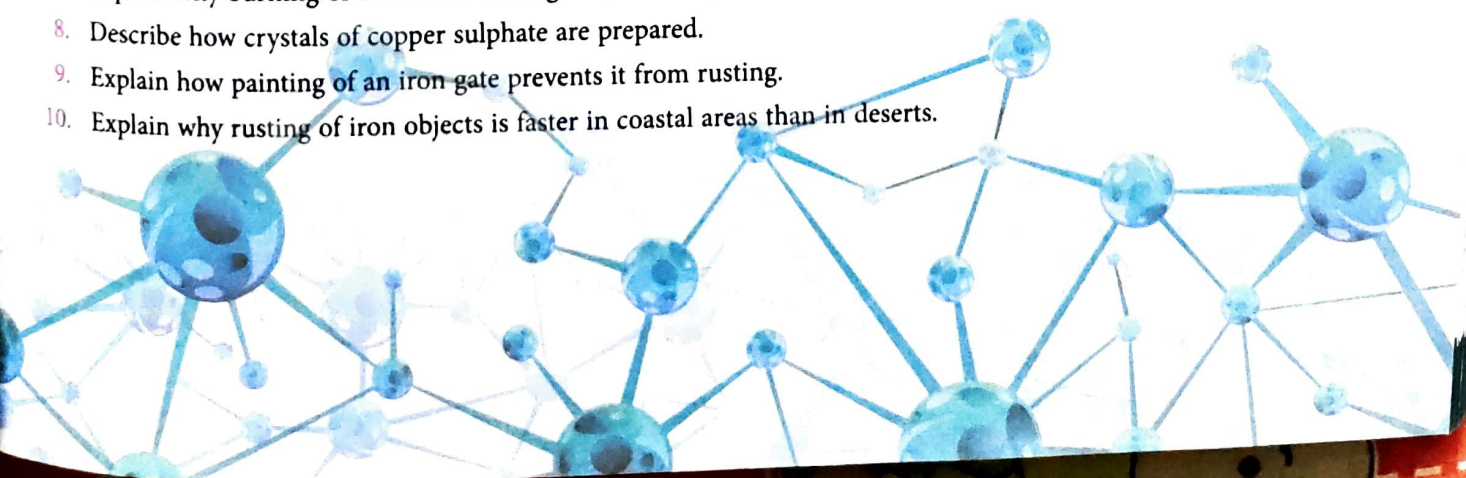
Iron pillar at Qutab Minar

Some Questions from NCERT

Physical and Chemical Changes

Exercises

1. Classify the changes involved in the following processes as physical or chemical changes.
   (a) Photosynthesis
   (b) Dissolving sugar in water
   (c) Burning of coal
   (d) Melting of wax
   (e) Beating aluminium to make aluminium foil
   (f) Digestion of food
2. State whether the following statements are True or False. In case a statement is false, write the correct statement in your notebook.
   (a) Cutting a log of wood into pieces is a chemical change. (True/False)
   (b) Formation of manure from leaves is a physical change. (True/False)
   (c) Iron pipes coated with zinc do not get rusted easily. (True/False)
   (d) Iron and rust are the same substances. (True/False)
   (e) Condensation of steam is not a chemical change. (True/False)
3. Fill in the blanks.
   (a) When carbon dioxide is passed through lime water, it turns milky due to the formation of _____.
   (b) The chemical name of baking soda is _____.
   (c) Two methods by which rusting of iron can be prevented are _____ and _____.
   (d) Changes in which only _____ properties of a substance change are called physical changes.
   (e) Changes in which new substances are formed are called _____ changes.
4. When baking soda is mixed with lemon juice, bubbles are formed with the evolution of a gas. What type of change is it? Explain.
5. When a candle burns, both physical and chemical changes take place. Identify these changes. Give another example of a familiar process in which both the chemical and physical changes take place.
6. How would you show that setting of curd is a chemical change?
7. Explain why burning of wood and cutting it into small pieces are considered as two different types of changes.
8. Describe how crystals of copper sulphate are prepared.
9. Explain how painting of an iron gate prevents it from rusting.
10. Explain why rusting of iron objects is faster in coastal areas than in deserts.



11. The gas we use in the kitchen is called liquified petroleum gas (LPG). In the cylinder it exists as a liquid. Wh comes out from the cylinder it becomes a gas (Change—A) then it burns (Change—B). The following statem pertain to these changes. Choose the correct one.

    (a) Process—A is a chemical change.

    (b) Process—B is a chemical change.

    (c) Both processes A and B are chemical changes.

    (d) None of these processes is a chemical change.

12. Anaerobic bacteria digest animal waste and produce biogas (Change—A). The biogas is then burnt as (Change—B). The following statements pertain to these changes. Choose the correct one.

    (a) Process—A is a chemical change.

    (b) Process—B is a chemical change.

    (c) Both processes A and B are chemical changes.

    (d) None of these processes is a chemical change.

Extended Learning—Activities and Projects

1. Describe two changes that are harmful. Explain why you consider them harmful. How can you prevent them?
2. Take three glass bottles with wide mouths. Label them A, B and C. Fill about half of bottle A with ordinary water. Fill bottle B with water which has been boiled for several minutes, to the same level as in A. In bottle take the same boiled water and of the same amount as in other bottles. In each bottle put a few similar iron n so that they are completely under water. Add a teaspoonful of cooking oil to the water in bottle C so that it for a film on its surface. Put the bottles away for a few days. Take out nails from each bottle and observe them. Expl your observations.
3. Collect information about the types of fuels used for cooking in your area. Discuss with your teachers/parent others which fuels are less polluting and why.