5. CHANGES AROUND US

Change is the law of nature. If we look around us we will find that things continuously change. The temperature changes from morning to evening, the day into night and night into day, the drying of wet clothes, the growing of plants, the rusting of iron are examples of changes around us. We have become so accustomed to these changes that we even fail to notice them.

Observe the changes that occur around you in your daily life and record them in your notebook in Table 5.1.

TABLE 5.1

S. No.	Area of change	Changes seen
1.	Kitchen	Cooking of food
2.	Pond	----------
3.	Field	----------
4.	Weather	----------

If we look at Table 5.1, we can see that in the changes recorded, some things are similar while some other things are dissimilar. To understand them further we will need to classify them.

5.1 Fast and Slow changes

ACTIVITY 1

Materials Required – A Matchbox, Iron filings, cloth piece, water.

Strike a matchstick and note the during which the matchstick remains lighted. Write it in the table below.

Wrap iron filings in a cloth and soak them in water. Then place these in an airy place. Note the time taken for the iron filings to rust and write in the table below.

TABLE 5.2

S. No.	Name of Activity or Experience	Time taken for the activity
1.	Burning of match stick	
2.	Rusting of iron filings	

Those changes that take a long time to complete are known as slow changes, whereas those changes which take very little time to complete are known as fast changes.

Copy the table given below in your notebook and on the basis of the time taken for the change, classify the changes as slow or fast.

TABLE 5.3

S. No.	Example	Slow / Fast Change	Cause of Change
1.	Germination of seeds	----------	----------
2.	Lighting the electric bulb	----------	----------
3.	Making curd from milk	----------	----------
4.	Curdling of milk	----------	----------
5.	Growth of hair	----------	----------
6.	Bursting of crackers	----------	----------
7.	Lightening	----------	----------

We can modify the pace at which changes occur according to our need. Rusting of iron is a slow change. Sometimes this change can cause a lot of damage. We try to prevent rusting. For this, we can apply coats of zinc or paint on objects made of iron. This coat protects the iron from exposure to air and water and prevents it from rusting.

When we store foodgrains for a long time they get infested by insects. This results in the wastage of foodgrains. This wastage can be reduced if we place insecticide tablets wrapped in a cloth with the foodgrains. This will protect the food grains for a longer time.

5.2 Reversible and Irreversible changes

ACTIVITY 2

Materials required – Tea kettle, source of heating, water, plate

Take some water in the tea kettle and heat it. On heating, water is converted to vapour. If we place a plate in front of the emerging vapours then the steam condenses to form water again. (Figure 5.1).

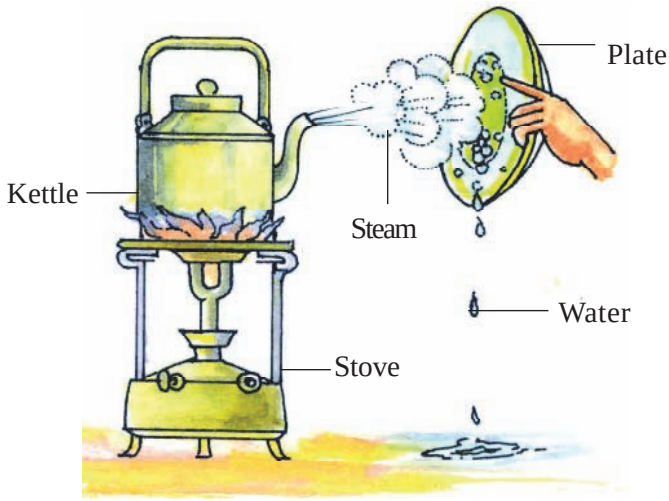


Figure 5.1: Reversible change

When we stretch out a rubber band or a cycle tube it expands but on release it regains its original shape.

In Activity 2 we saw that when we remove the cause for change (heating or stretching) the change occurs in the reverse direction.

$$\text{Water} \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} \text{Vapour (steam)}$$

"The changes that can happen in the opposite directions as well are known as reversible changes." These changes are temporary.

The smoke emitted by burning paper and the ash formed cannot be used to regenerate paper. Similarly, cooked food cannot be changed to the raw form again.

"The changes that cannot be reversed are known as irreversible changes." Irreversible changes are generally permanent in nature.

Classify the following examples of changes and list them in your notebook-

TABLE 5.4

S. No.	Example	Reversible / Irreversible change	Cause of changes
1	Falling of fruits from trees	----------	----------
2	Stretching of rubber	----------	----------
3	Melting of wax	----------	----------
4	Formation of ice from water	----------	----------
5	Growth of plant from seed	----------	----------
6	Growth of our nails	----------	----------
7	Lighting of a bulb	----------	----------

5.3 Cyclic (Periodic) and Acyclic (Non periodic) changes

Look carefully at the minute and second hands of the clock. The seconds needle or hand take 60 seconds to come back to the initial position. It continues to move at the same speed. In the same way the minute hand also comes back to the initial position after 60 minutes and continues moving at its own unchanging speed.

In the same way night and day, low and high tide, new moon and full moon etc. occur after regular time intervals. The "changes that repeatedly occur after a regular time interval are known as periodic changes."

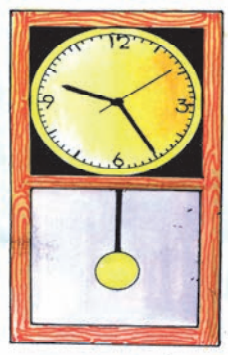


Fig 5.2 Cyclic change

You must have seen ripened fruits fall from trees. Does the fruit fall after a fixed time period? Can you predict the time of fall of the next fruit?

The recurrence of events such as movement of rocks and shifting of mountains, cyclone or floods cannot be predicted.

Therefore "changes which do not occur after a fixed time period are known as non periodic changes."

Classify the following as periodic or non periodic changes and write them in you notebook.

TABLE 5.5

S. No.	Example	Periodic / non periodic changes	Reason
1	Rising of the sun		
2	Railway accident		
3	Tides in the sea		
4	Sneezing		
5	Occurrence of day and night		
6	Change of Seasons		
7	Cyclones		

5.4 Desirable and Undesirable changes

There are some changes that are natural and some other changes that are effected by human beings for their own use, for example conversion of milk into yoghurt, cooking food, formation of manure from cow-dung, growing of fruit-trees, blooming of flowers etc. Hence the changes that are useful to us and give us pleasure are called desirable changes.

There are changes which are destructive, painful, and not useful to humans. They are known as undesirable changes. Decay of food, breaking of a glass plate, flooding of the river, rusting of parts of the machine, explosion, burning etc. are examples of undesirable changes.

There are some changes that are desirable from one point of view but may become undesirable from another point of view.

We can see this from the following table –

TABLE 5.6

S. No.	Example	One point of view	Another point of view
1	Rusting of iron	Undesirable	Desirable for mineral cycling in nature, Ecological imbalance
2	Manufacturing silk	Desirable	Ecological imbalance, loss of silk worm undesirable
3	Manufacturing things from animal skins	Desirable	Killing animals for their skins is causing ecological imbalance, hence undesirable.
4	Manufacturing plastic items	Since light and useful it is desirable	Plastic is not bio degradable, hence undesirable
5	Flood in the river	Loss of life and material hence undesirable	Increase in fertility of soil after floods, desirable.

Curdling of milk is otherwise an undesirable change but it is desirable when we want to make cottage cheese, paneer from milk. If we do not heat the milk properly then there is an increase in the level of microbes and the milk is spoiled. Nowadays, to prevent spoiling of milk a special technique is used. The milk is heated to a high and a desired temperature and then cooled immediately. In this method the microbes that spoil the milk die and the milk is pasteurised. This process is known as pasteurisation. This method was first used by a scientist in France, Louis Pasteur.

Classify the following examples as desirable or undesirable changes and write them down in your notebook –

TABLE 5.7

No.	Example	Desirable / Undesirable changes	Reason
1	Occurrence of rain		
2	Cutting trees in the forest		
3	Changing the course of the river to build dams		
4	Formation of manure from cow-dung		
5	Contamination of food		
6	Increase in the population of the fishes		
7	Release of smoke from industries		

5.5 Physical and Chemical Changes

If a big chalkpiece breaks the pieces are smaller in size. But they do not differ in colour or appearance. We can use these chalk pieces in the same way as we use a bigger chalk. Similarly, when we write on the black board chalk-dust keeps falling. If we collect this dust and mix it with a little water and dry it then we can reuse it as chalk. During this process the chalkpiece changed its external shape but no new product was formed.

We know that if we keep ice in the open then due to the higher temperature in the environment the ice melts and forms water. When water is heated it turns into water-vapour (figure 5.3). In this example water changes its state but no new substance is formed.

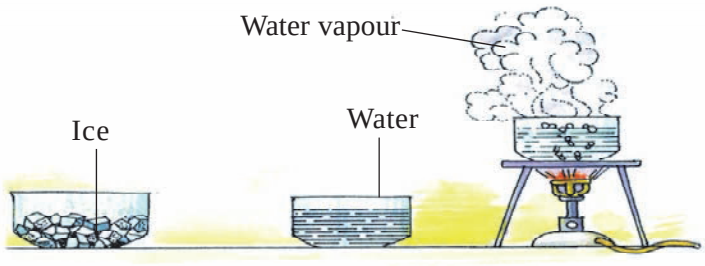


Figure 5.3: Physical change

"Changes in which no new substance is formed are known as physical changes."

A few examples of physical changes are tearing of paper, mixing of salt with water, sublimation of ammonium chloride etc..

Characteristics of physical changes are –

1. There is change in physical properties like colour, shape, size and state.
2. No new substance is formed.
3. The characteristic properties of the substance are not changed.

Come, let us see a few more examples. These can be the formation of ash after burning of wood, formation of curd from milk, rusting of iron, digestion of food etc. You will note that in all these examples the characteristics of the substances formed (products) after the reaction are different from the characteristics of the initial substance used (reactants). Also these reactions are irreversible.

ACTIVITY 3

Materials required – Conical flask or plastic bottle, washing soda, lemon juice, candle and match sticks.

Take a conical flask and add one spoon of washing soda and some water to it. Stir this mixture till the washing soda dissolves completely. Now add lemon juice into this mixture. You will see that gas comes out in the form of bubbles. Now hold a burning match stick or candle at the mouth of the flask. You will see that the candle or the match stick blows out because the gas released in the form of bubbles is Carbon dioxide which does not support burning.

Now carefully observe the mixture in the flask, you will see that it is different from what it was before. The washing soda and lemon juice have reacted with each other. This has resulted in the formation of Carbon dioxide and other products. We cannot regain the washing soda or lemon juice from this mixture – this is an irreversible change.

In the above examples new products were formed due to chemical reactions.

Therefore, 'changes where new products are formed are known as Chemical changes'.

ACTIVITY 4

Materials required – A plastic bottle with a cap, phenolphthalein solution, washing soda, water, boiled rice, cotton, test tube, urea.

Take some boiled rice in the bottle and add just enough water such that the rice is immersed in it. Add some urea to this. Now tie some cotton to both ends of a piece of thread and dip them in an alkaline phenolphthalein mixture. Place them in such a way that one end is in the bottle and the other outside. Now close the lid tightly. Keep this for two to three days. On the fourth day you

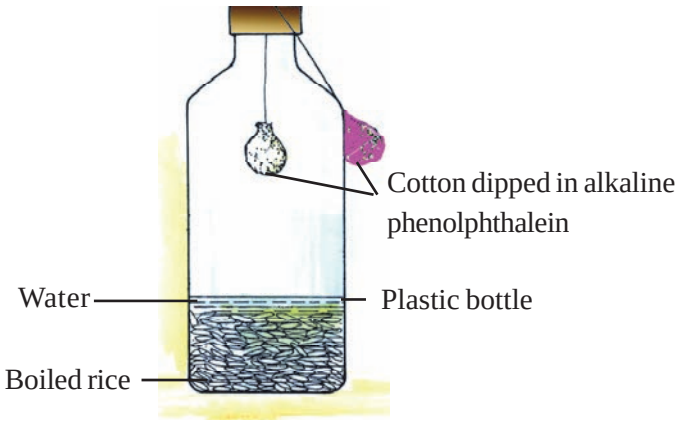


Figure 5.4 : Chemical change

will see that the pink cotton inside the bottle has become colourless, while the cotton outside is pink, as it was before.

To prepare alkaline phenolphthalein, take phenolphthalein and add a bit of washing soda, the solution turns pink in colour.

The colour change inside the bottle shows that a new product (Carbon dioxide) was formed from the rice kept inside the bottle. This turned the pink cotton colourless. In this way if we keep the cooked rice immersed in water for few days then the rice decays, this is called fermentation.

The break down of complex carbon compounds to simpler compounds in the presence of enzymes is called fermentation. This is a chemical reaction.

Characteristics of chemical reactions

1. Chemical reactions occurs between reactants.
2. New products are formed.
3. The characteristics of the reactants and the products are different.
4. Most of the chemical changes are irreversible.

Identify the following as Physical or Chemical changes and write in your notebook.

TABLE 5.8

S. No.	Example	Physical / Chemical change	Reason for your answer
1	Dissolving sugar in water for preparation of 'sherbat'		
2	Preparing lime for white-washing of the walls		
3	Igniting the gas for cooking		
4	Cooking of pulses		
5	Drying of clothes		
6	Manufacture of soap from vegetable oils		

Classify examples given in Table 5.8 into reversible or irreversible changes and answer the following questions-

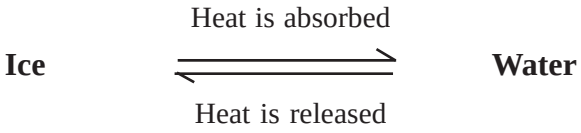
(a) Are all chemical changes irreversible?

(b) Are all physical changes reversible?

We see that generally physical changes can be reversible. Find the examples of chemical changes which are reversible.

5.2 Energy is utilised during change

In a physical change heat can be absorbed or released. For example, formation of water from ice and ice from water.



In chemical reactions also heat is either absorbed or released, for example in the formation of Nitric oxide heat is absorbed. If water is poured on lime stone heat is released. Hence in all physical and chemical changes either heat is released or absorbed.

WE HAVE LEARNT

- A lot of changes occur around us daily.
- Changes can be classified, for example as slow or fast, as reversible or irreversible, as cyclic or non-cyclic, as desirable or undesirable and as physical and chemical changes.
- Those changes which take a short time period are known as fast changes while those changes that take a longer time to be completed are known as slow changes.
- If the changed products can be brought back to their original form then it is known as a reversible change. If the changed product cannot be brought back to the original form then the change is an irreversible change.
- Those changes which occur after a fixed time period are known as **periodic** changes, while those changes which do not have a fixed time period of occurrence are known as **non-periodic** changes.
- No new product is formed in a physical change, while in chemical changes new products are formed.
- In Physical and Chemical changes heat can be released or absorbed.

EXERCISE

1. Classify the following changes as slow or fast, reversible or irreversible, desirable or undesirable, cyclic or acyclic, physical or chemical changes –

1. Formation of phases of moon
   _____,
   _____,
   _____,
2. Lightening in the sky
   _____
   _____
   _____
3. Formation of natural gas from cow dung
   _____,
   _____,
   _____,
4. Combustion of petrol in a vehicle
   _____
   _____
   _____
5. Formation of curd from milk
   _____,
   _____,
   _____,

2. Fill in the blanks with the words physical or chemical –

1. Digestion of food is a _____change.
2. Formation of water from ice is a _____change.
3. Curdling of milk is a _____change.
4. Melting of wax of a candle is a _____ change whereas its burning is a _____change.

3. Match items in Column A with appropriate item in Column B

Column A	Column B
Occurrence of earthquake	Periodic change
Sprouting of seeds	Chemical change
Melting of wax	Slow change
Occurrence of day and night	Physical change
Bursting of crackers	Non-periodic change

4. Answer the following questions –

1. Explain whether the melting of 'kulfi' is a physical change or a chemical change.
2. Write with reasons what kind of a change evaporation of water is.
3. What is the kind of change that occurs when there is discolouration of the walls? State the reasons.

4. How is Pasteurisation done? What are the benefits?
5. State with examples how the same changes under different situations can be desirable or undesirable.
6. State with examples the role of energy in bringing about changes.
7. What is the kind of change that occurs during leaf fall in autumn? Explain.
8. Write down any cyclic changes that may occur in your body.

5. Write down the reasons for the following –

1. Cooked food is kept in the refrigerator.
2. Salt is kept in an airtight box during rainy season.
3. Ripening of guava is a chemical change.
4. A coat of tin is put on iron sheets before making a box.
5. Rotation of fan is a cyclic change.

THINGS TO DO

1. Observe the changes that occur around you and write in your notebook as per the classification given in the table.

S. No.	Changes observed	Type of change	Type	Reason
1		Slow / Fast Reversible/ Irreversible Cyclic/Acyclic Desirable/ Undesirable Physical / Chemical		
2		Slow / Fast Reversible/ Irreversible Cyclic/Acyclic Desirable/ Undesirable Physical / Chemical		

2. Based on your imagination prepare a list of possible future changes in the field of science.

S.No.	Changes
1	
2	
3	
4	

3. Collect articles on undesired changes occuring in the world. Discuss on their causes and the various measuses to control these changes.