17
CHANGES AROUND US

In Class VI, we learnt that many changes are taking place around us. There are certain factors that influence these changes and there are reasons for every change. Among the changes we observe in our daily life some changes are slow and some fast. There are some changes that are temporary and some are permanent. There are many changes which take place naturally but for some we need to initiate or intervene in some way for the change to occur. In this lesson we try to learn about some more changes.

We know that there are certain changes that repeat after roughly a fixed period of time. For example we observe the repetition of sunrise and sunset every day. Similarly we notice changes in seasons after every few months every year.

Can you think of such other changes from your daily life?

Make a list of changes you observe in your daily life that are repeated after some period of time.

Let us do-1: Finding the period of repetition for changes.

Some changes are given in the following table-1. Observe the changes and write the approximate period of time after which they are repeated, for each change. If we observe the above table, we notice that every change mentioned in the table repeats after some period of time. Such changes are known as periodical changes.

S.No.	Name of the Change	Approximate period of time of repetition
1	Change of day and night	12 Hours
2	Withering of leaves	1 Year
3	Rising of the pole star	
4	Change of Seasons	
5	Change of Greenery in the fields of cultivation	
6	Changes in lengths of shadows	
7	Appearance of Full Moon	

Table-1

The events which repeat at regular intervals of time are called Periodical Events

Physical Change:

In our daily life we observe many changes. In the changes like melting of ice, solidification of ghee or coconut oil in winter etc., there is a change in state of the substance. In certain processes like filling balloons with air and pumping of cycle tubes etc., we notice change in shape. In some other changes like burning of wood and rusting of iron we find that new substances are formed. Are all these changes the same?

Let us do- 2: Find the change

Some changes are given in the table.Write possible changes you notice for each case and put ( ) in the appropriate column.

S.No.	Name of Change	Change in State	Change in Colour	Change in Shape	Change in Size	Formation of New Substance
1	Heating of coloured Candle					
2	Heating ice					
3	Heating Water					
4	Melting of Gold Ornaments					
5	Burning of Newspaper					
6	Filling air into Balloons					
7	Cutting a piece of wood					
8	Burning of Crackers					
9	Drying of Clothes in Sunlight					
10	Drying of wet Coconut					
11	Change of milk to curd					
12	Boiling Egg					
13	Change in cut apple/brinjal pieces					
14	Change in mouth due to Pan Chewing					

In how many changes do you notice change in the state/colour/size/shape? Count each separately

In which cases are new substances formed?

In the above activity we notice that only in some examples like burning of paper, burning of crackers, change of milk to curd, boiling of egg, etc., a new substance is formed. But in other examples of changes we notice a change in state or colour or size or shape etc but the substance remains same and no new substance is formed. Let us observe the following change.

Let us do-3: Observe the changes in ice

Take few pieces of ice in a beaker and heat them as shown in the following figure.

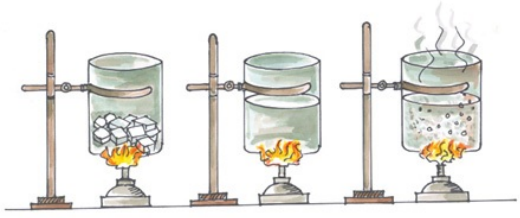

Fig. 1

What do you observe?

We notice that ice slowly melts and becomes water and on further heating it changes to steam. If we reduce the temperature, the water vapour changes back to water and when temperature is further reduced it changes to ice.

What changes do you notice in this experiment?

Is there any change in state?

Is there any change in shape and volume?

Is there any new substance formed?

Repeat the experiment using candle wax. What do you observe?

In the above activity we notice the change of the state of ice to water and to vapour but the substance, water, remains the same. Changes of this type where no new substance is formed are known as physical changes.

When a material undergoes a change in shape, size, color or state it is called a Physical Change.

Generally, no new substance is formed in a physical change

Make a list of some physical changes you observe in your daily life.

Chemical Changes:

Let us do-4: Observing the changes when burning some materials

Take a piece of wood, a piece of paper and a ball of cotton. Burn them and observe the changes.

Fig. 2

Record your observations in the following Table.

NAME OF THE MATERIAL	CHANGES OBSERVED WHEN BURNT		
A Piece of Wood	1.	2.	3.
A Piece of Paper	1.	2.	3.
A Piece of Cotton	1.	2.	3.

What changes do you notice ?
Is there any change in colour?
Is there any change in the state of material?
Do you find any new material after burning?
Are the materials present before and after burning the same?
In the above activity we notice that when a piece of wood, paper, and cotton are burnt a new material is formed . This is black in colour and in powder form which is different from the original material. We also notice the change in shape and size of new material. This type of change which leads to form a new substance is known as Chemical Change.
Have you observed such changes in your daily life?
Can you name some changes which form new substances?

Rusting of Iron:

Fig. 3

Have you ever observed iron nails, iron gates, iron benches or pieces of iron left in the open ground for a long time?
What did you notice?
You observe a brown layer on the surface of the iron articles. This is called ‘rust’ and the process of formation of this layer is called ‘rusting’.
Observe the iron tawa in your kitchen. You find a brown layer on it if it is unused for a long time. This is nothing but rusting of iron.
Similarly try to observe some other iron articles which are exposed to air like iron gates, iron caps on manholes , iron benches in lawns etc.
Do you find rust on these articles?
Why do iron articles get rust when they are exposed to air for a long time ?
When iron is exposed to air for a long time , the Oxygen present in air reacts with it in the presence of moist air and forms a new substance called iron oxide as rust on iron articles. This process is known as rusting.

$$\text{Iron} + \text{Oxygen (from air)} + \text{Water} \longrightarrow \text{rust (Iron oxide)}$$

Similarly when Copper utensils are exposed to air we find a greenish coat on them. This greenish coat is formed when Copper reacts with Oxygen and Carbon dioxide present in the air. This coat also protects Copper from getting further corroded. It is an example of corrosion.
In all these cases, the metal is changed to its oxide, forming a new substance. Hence rusting or corrosion is a Chemical Change. The speed of rusting depends on the amount of moisture available to it for a long time That is more the humidity in air, faster is the rusting of iron.
The problem of rusting of iron and corrosion of other metal articles are the common experience in almost every home. It spoils

beautiful articles and makes them look ugly. The following are some of the ways to prevent the rusting of iron.

1. Do not allow the iron articles to come in direct contact with Oxygen in the air, water or both.
2. Apply a coat of paint or grease on an iron article.

Are there any other ways by which rusting of iron can be prevented?

Do all the materials react with oxygen in the air?

Observe Gold and Silver. You wear them in the form of ornaments. Even if they get exposed to air for a long time, they do not change colour or corroded. It means that they are resistant to corrosion which is the reason why we use them in making ornaments.

List metals which corroded and which don't corroded when exposed to air.

Galvanisation:

You might have observed handles of bicycle, metal rims of bicycles and motor cycles, white coated metal railings fixed to steps in cinema halls and shopping malls etc.

Do these articles rust? If not why?

Are all the above mentioned articles made of iron ?

How can we know that a given article is made up of iron or not ?

You learnt about magnets in the lesson 'Playing with magnets'.

Do magnets help us find iron articles? Try to find out whether your bicycle handle is made of iron or not. You notice that all the above mentioned articles are made up of iron.

Some articles made up of iron, don't rust even if they are exposed to air. To prevent iron articles from coming in contact with oxygen in air or water or both, a layer of another metal like chromium or zinc is coated on them. This process of depositing a layer of zinc on iron is called Galvanisation.

Have you ever observed in your house that water pipe lines don't rust on them ? Have you noticed any coating over these pipelines? If we observe carefully, we notice that there is some metallic coating on these pipes to prevent rusting. They do not get rusted even after a long time because they are galvanized.

The process of depositing zinc metal on iron is called galvanisation

Let us do-5: Observing colour layer on cut fruits and vegetables

Take an apple, a brinjal, a potato, a tomato, a cucumber, a banana; cut each into small pieces; place them in separate plates and expose them to open air for sometime.

Fig. 4

What changes do you notice?

S.No.	Name of the Fruit	Whether turned brown or not?	
		Yes	No
1	Apple		
2	Brinjal		
3	Potato		
4	Tomato		
5	Cucumber		
6	Banana		

Record your observation in the above table.

In which fruit or vegetable do you notice change in colour?

Why does this change occur?

Can you prevent the browning of cut vegetables and fruits?

Some fruits and vegetables, when cut , react with Oxygen in the air. This makes them to get a brown layer on the surface.

How to prevent browning of cut vegetables and fruits:

Have you observed your mother any time in the kitchen keeping cut potatoes or brinjals in cold water?

Fig. 5

Why does she put them in cold water?

Cold water prevents the outer surface of the potato and brinjal from colouring. Small quantities of acids like vinegar or lemon juice in water will also prevent browning of vegetables.

You can also rub the surface of the cut fruits with juices of citrus fruits like lemon to avoid from browning. The layer of lemon juice reduces the reaction on the surface of the fruit. Ascorbic acid (vitamin C) can also be used to prevent browning.

Let us do-6: Observe the changes in Magnesium ribbon

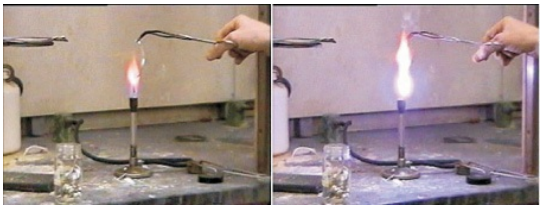

Fig. 6

Take a small piece of Magnesium ribbon. Burn it on a flame of candle. You will find brilliant white dazzling light leaving a powdery substance behind.

• Does the ash formed look like Magnesium ribbon?

• Do you think the Magnesium ribbon and the ash have the same composition?

When Magnesium burns in the presence of Oxygen, it forms Magnesium Oxide in the form of powder ash, which is a new substance. Thus there is a change in the composition.

$$\text{Magnesium} + \text{Oxygen} \xrightarrow{\text{(From Air)}} \text{Magnesium Oxide}$$

Collect the ash and mix it with a small quantity of water and dissolve it. Another new substance is formed.

$$\text{Magnesium Oxide} + \text{Water} \longrightarrow \text{Magnesium Hydroxide}$$

What do you observe ?

Do you observe any change in the state of the substance?

It is an acid or base?

Test the dissolved mixture with blue and red litmus papers to decide whether it is a acid or a base.

Let us do-7: Observe some chemical changes

Take a glass tumbler half-filled with water and add a teaspoonful of Copper Sulphate to it. Now add a few drops of Sulphuric Acid to the Copper Sulphate solution. Do you observe any change in colour ? Take some sample solution of it in another beaker and keep it aside. Add an Iron nail to the solution in the first beaker and keep it undisturbed for
half an hour. Compare the colour of the solution in which iron nail is dropped to that of sample solution kept aside.
Now remove the nail from the beaker and observe.

1. Is there any change in the colour of the solution that had iron nail in it?
2. Is there any change in the nail?

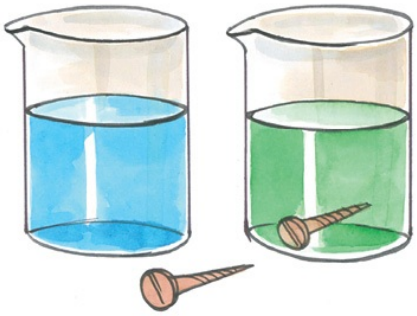

Fig. 7

We notice that the blue coloured solution changes into green colour and a brown colour deposit is seen on the iron nail.

Why did these changes take place?

The change in colour of the solution is due to the formation of Iron Sulphate, a new substance. The brown deposit on the Iron nail is Copper, another new substance.

$$\text{Cooper Sulphate (Blue)} + \text{Iron} \longrightarrow \text{Iron Sulphate (green)} + \text{Cooper (brown deposit)}$$

Let us do-8: Observe reaction of Vinegar with Baking soda

First set up the apparatus has shown in Fig-8. Take a teaspoon of vinegar (acetic acid) in a test tube and add a pinch of baking soda (Sodium bi Carbonate) to it. If you do not have vinegar, lemon juice can also be used. You observe bubbles coming out with a hissing sound. Pass this gas through freshly prepared Limewater (Calcium Hydroxide)

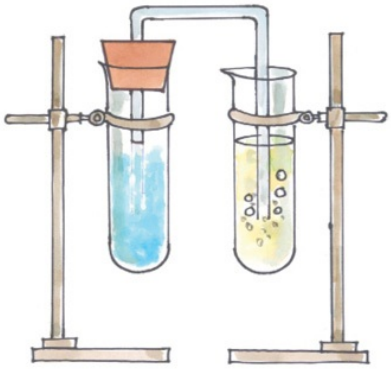

Fig. 8

What is the change you observe? Limewater changes to milky white showing that the gas sent into the test tube is Carbon dioxide.

$$\text{Vinegar} + \text{Baking Soda} \longrightarrow \text{Carbon dioxide} + \text{other substance}$$

$$\text{Carbon dioxide} + \text{Lime Water} \longrightarrow \text{Calcium Carbonate} + \text{Water}$$

In these reactions the new substances like Carbon dioxide and Calcium Carbonate are formed. Hence it is a chemical change

When a material undergoes a change in its composition it is called a chemical change

Let us do-9: Burning of Camphor

Have you ever seen “harathi” ?

Have you ever thought of the material used in harathi?
It is “Camphor”, we burn it to get flame (harathi). Observe what happens when you burn Camphor? Initially it changes into liquid and then burns. It is also considered to be a chemical change.
Take a small quantity of Camphor in a dish and place it in the open air. Observe it after some time. What happens? Its quantity reduces and you sense the smell of it. It happens because camphor evaporates. Since it has strong smell, it is used to keep insects and flies away. It is also used in medicines.
From the activities discussed above we conclude that, in a chemical change, material undergoes a change in its composition and a new substance is formed.
In addition to new products the following may also occur in a chemical change.

1. Heat, light or any other radiation may be given out or absorbed.
2. Loud sound may be produced.
3. A change in smell may take place or a new smell may be produced.
4. A colour change may take place.
5. A change in the state may occur.

All chemical changes do not have the 5 traits mentioned above.
Chemical changes are very important in our lives. Mostly, new substances are formed as a result of chemical changes.
Think about some of the chemical changes you observe around in your daily life.
Can you list them?

Crystallisation :

Have you seen large crystals of sugar (Missri) or crystal salt?
Do you know how we get these crystals?
Have you ever observed the formation of small sugar crystals on sweets like Jilebi and badushah, which are kept aside for a long period?
What is the reason for this?
Let us find out.

Let us do-10: Observe crystallisation of Sugar.

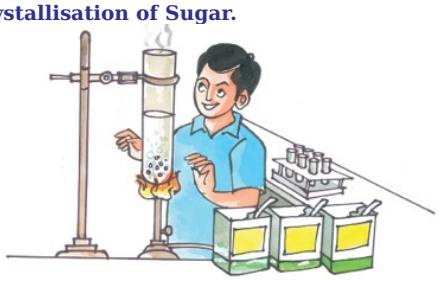

Fig. 9

Take a big size test tube . Fill half of it with water. Add some sugar to it and stir it. Keep adding sugar and stirring until saturation is attained. Then heat this sugar solution and add some more sugar to it while stirring continuously. Continue adding sugar till no more sugar can be dissolved in it. Now filter the solution and allow it cool for half an hour.
What changes do you notice at the end?
We notice formation of large size crystals of sugar at the bottom of the beaker. Thus sugar the small granules of sugar added changed into large size sugar crystals.
What type of change is it ?

Let us do-11: Observe Crystallisation of Urea.

Take some water in a test tube and add urea to it. Heat the test tube till all the urea dissolves. Add more urea to it. Keep on adding to it until no more urea can be dissolved in it. Let the solution cool down for sometime. Observe the test tube after about half an hour.
Do you find any crystals in the solution?
What is the shape of the crystals?
Repeat the experiment with Alum. Compare the type of crystals formed by urea and Alum.

Let us do-12: Observing Crystallisation of Copper Sulphate.

Take some hot, saturated solution of Copper sulphate in a test tube. Pour some of it in an evaporating dish. Allow the solution to cool quickly.
Observe with a magnifying glass, the size, colour and shape of the crystals formed.
From the above three activities we notice that we can separate dissolved substances in the form of crystals.

The process of separating a soluble solid from the solution by heating or evaporating the solvent is called crystallization.

What type of change is this? In crystallization no new substance is formed. Hence it is physical change.
Till now we have discussed about some physical and chemical changes. In physical changes no new substance is formed whereas in chemical change we have seen that one or more new substances are formed.

Identifying physical and chemical change

Have you ever thought of the process behind setting milk into curd? Is it a physical change or chemical change ?
What type of change is the boiling of an egg? Is it a chemical change or a physical change?
Think about the following changes and decide whether they are physical or chemical changes. Write the type of change and reasons for that in the table.

Sl. No.	Item	Physical / Chemical Change	Reasons
1.	Preparation of Idly Mix		
2.	Making dough for roti		
3.	Preparation of Tea		
4.	Ripening of fruits		
5.	Applying pain balm for different kinds of pain.		
6.	Applying cosmetic creams, antiseptic creams and lotions to skin		
7.	Taking tablets, capsules and syrups		
8.	Tearing of paper		
9.	Change in skin colour in hot summer		
10.	Growing of plant		

Everyday we use many types of batteries and many of these batteries are recharged regularly. Can you identify the types of change taking place in this process?
We use Turmeric with Limewater (Calcium Hydroxide) to decorate the feet (Parani) during some occasions at our homes. What type of change is this? Think about the reasons why chewing of Pan (Killi) turns our mouth red.
Look at the picture and circle all the Physical and Chemical changes. Write them in the table given below.

Fig. 10

S.No.	Item	Physical / Chemical Change	Reason
1.	Burning of Chichubuddi	Chemical	Forms powder, gives light & sound.
2.			
3.			
4.			

What we learnt:

- Changes mainly are of two types. Physical and Chemical.
- When a material undergoes a change in shape, size, colour or state without the formation of a new substance, then it is called a physical change.
- In a physical change generally no new substance is formed.
- When a material undergoes a change in its composition, it is called a chemical change.
- In a chemical change new substance is formed.
- A chemical change is also called chemical reaction.
- In any change heat, light, radiation or sounds may also be produced.
- In a change new colour or smell may appear.
- The process of separating a soluble solid from the solution on heating is called Crystallization.
- The process of depositing zinc on either metal is called Galvanisation

Key Words:

Chemical Change, Reversible, Irreversible, Rust, Physical Change, Composition , Vinegar, Baking Soda, Lime Water, Galvanisation, Crystallization, Corrossion.

Improve your learning:

1. Why do we paint wooden doors and windows?
2. Some deposits were observed in water preserved in Aluminum containers after two to three days. What could the deposit be? What is the reason for the formation of these deposits?
3. When a candle is burnt, what type of changes take place? Give another example of a similar process.
4. How is an iron gate prevented from rusting?
5. Between coastal and dry land areas, where is rusting of iron objects faster? Give reasons.
6. Classify the changes involved in the following processes as Physical, Chemical or both.

a) Burning of Coal
b) Melting of Wax
c) Beating Aluminum to make Aluminum foil
d) Digestion of food
e) Boiling of Egg
f) Photosynthesis
g) Cutting of Wood

7. Which of the following processes are chemical changes? Give reasons.

a). Making a Salt Solution.
b). Adding Hydrochloric Acid to Marble stone.
c). Evaporation of water.
d). Adding phenolphthalein indicator to acid solution.
e). Respiration
f). Ripening of a Mango.
g). Breaking of Glass.

8. Identify the incorrect statements among the following and rewrite them correctly.

a) Formation of manure from leaves is a physical change.
b) Iron pipes coated with Zinc don't get rust.
c) Setting of curd is a physical change.
d) Condensation of steam is not a chemical change.
e) Burning of Magnesium in air is a chemical change.

9. Fill in the blanks in the following statements

a) The chemical name of vinegar is _____.
b) Changes in which only _____ properties of a substance change are called physical changes.
c) Changes in which new substances are formed are called _____ changes.
d) Magnesium+Oxygen→ _____
e) Copper Sulphate+Iron→ _____

10. Answer the following questions

I) The gas we use in kitchen is in the form of liquid in the cylinder. When it comes out from the cylinder it becomes a gas (step – I), then it burns (step – II). Choose the correct statement from the following.

a. Only step – I is a chemical change.
b. Only step – II is a chemical change.
c. Both steps – I & II are chemical changes.
d. Both steps – I & II are physical changes.

II) Bacteria digest animal waste and produce biogas (step – I). The Biogas is then burnt as fuel (step – II). Choose the correct statement from the following.

a. Only step – I is a chemical change.
b. Only step – II is a chemical change.
c. Both steps – I & II are chemical changes.
d. Both steps – I & II are physical changes.

III) A piece of paper was cut into four pieces. What type of change occurred in the property of the paper?

a. Physical change b. Chemical change
c. Both changes d. No change

IV) Aryan stretched a rubber band. What does it represent? _____

a. Chemical change b. Physical change
c. Both changes d. No change

V) Which of the following changes are reversible or irreversible.

a. Rise of water from ground to the overhead tank.....
b. Setting of cement .....
c. Absorption of water by a sponge .....
d. Migration of birds .....
e. Rise in temperature during summer .....

11) Sudheer wants to make his vessels ,which are made of Brass and copper, clean and shiny. What suggestions you would like to give him?
12) Anurag appreciates the changes in ripe mango as "How nice its colour and taste are"? Give some examples of changes that make you feel happy, or wonder. Appreciate them in your own words.
13) The changes like, chicks came out of eggs, blossoming flowers etc. are very pretty to see. List out such changes around you which make you feel happy on observation.
14) Match the following.

1) Growing hair ( )	a) due to Chemical change
2) Breaking Mirror ( )	b) Acetic Acid
3) Galvanisation ( )	c) Slow change
4) Vinegar ( )	d) Physical change
5) Atmospheric pollution ( )	e) The process of depositing zinc on iron metal

15) Collect information on the changes taking place in the food during the process of digestion. (From the school library / internet and display your observations on the bulletin board).
16) Collect information on the process of artificial ripening of fruits in fruit markets and discuss whether it is useful or harmful.
17) Ravi prepared carbon-dioxide using baking soda and vinegar. Carbon-dioxide changed lime water into milky white. Represent this experiment in a diagram with labelling
18) When you burn a piece of wood different changes take place. Analyse the following.
(a) Predict possible changes and list them all.
(b) Are there any physical changes among them?
(c) How many forms of energy are released in the change?
(d) What chemical changes do you notice? Explain briefly why these occur.