Lesson 6. Physical and Chemical Changes

Grade VII Basic concepts – A Flow Chart

Changes

Physical Change

- A change in which only the physical properties of any substance get changed and no new substance is formed.
- Example : dissolution of sugar in water, glowing of an electric bulb, tearing of paper

Chemical Change

- A change in which the composition and chemical properties of the substance get changed.
- This change is permanent and irreversible.
- Example : burning of a candle, formation of curd from milk, ripening of fruits.

Chemical Reactions in Everyday Life

Rusting of Iron

- Iron(Fe)+ Oxgen (O_2, from air + Water H_2O) Rust (Fe_2O_3, xH_2O)
- Rust is a reddish –brown flaky Substance that forms on the surface of iron objects after the process of rusting

Prevention of Rusting

- Painting
- Oiling and greasing
- Plastic coating
- Chromium plating
- Galvanising
- Alloying

Cooking of Food

- Cooking causes breakdown of complex molecules of carbohydrates, fats and proteins into smaller molecules.
- It is regarded as a decomposition reaction.
- Cooked food is easier to digest than uncooked food.

Decay of Organic Substances

- Microorganisms like fungi and bacteria produce enzymes which break down complex organic compounds into simpler substances.
- It is also regarded as a decomposition reaction.

Crystallisation

- It is used to obtain a substance in the pure form.
- **Crystal:** A solid structure with flat sides.

Know the Terms

- **Chemical Change :** A change in which one or more new substances with different properties are formed is called chemical change.
- **Physical properties:** Properties such as shape, size, colour and state of a substance are called physical properties.
- **Physical Change :** Change in which only physical properties of any substance change and no new substances is formed is called a physical change. A physical change is mostly reversible and does not from a new substance.
- Some examples of physical changes and chemical changes our daily life are:

Physical Change	Chemical Change
1. Kneading dough from flour.	1. Marking chapatis from dough
2. Cutting vegetables into small pieces.	2. Cooking vegetables.
3. Heating an iron object.	3. Rusting of iron

- **Rusting :** If a piece of iron left in the open for some time, if acquires a film of brownish substance. This substance is called rust. The process by which rust is formed on an iron object is called rusting. For rusting, the presence of moisture (or water vapour) and oxygen are essential.
- The process of rusting can be represented by the following equation.

  Iron (Fe) + Oxygen (O_2 from air) + Moisture (H_2O) → Rust (Iron oxide Fe_2O_3)
- **Galvanisation :** The process of depositing a layer of zinc on iron is known as galvanisation. The iron pipes are galvanised to prevent rusting.
- **Crystallisation :** Large crystals of pure substances can be formed form their solutions, especially from their concentrated solution. The process of formation of crystals is called Crystallisation.

Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. Which method is used to prevent rusting ?

(a) Galvanisation (b) Crystallisation (c) Sedimentation (d) None of these

2. Which one is a physical change ?

(a) Melting of ice (b) Melting of wax

(c) Formation of steam from water (d) All of these

3. What is the formula of rust ?

(a) Fe304 (b) Fe203 (c) FeO (d) None of these

4. Which one is a chemical change ?

(a) Burning of paper (b) Germination of seed

(c) Formation of coal from wood (d) All of these

5. Select a chemical change :

(a) Blooming of a flower (b) Stretching of a rubber band

(c) Burning of petrol (d) Condensation of steam

6. Select a method to prevent rusting :

(a) Sedimentation (b) Centrifugation (c) Electroplating (d) Crystallization

7. Crystallization is a process to obtain :

(a) Pure solids only (b) Pure liquids only

(c) Pure solids and liquids (d) Solid or powder

8. Which of the following is a chemical change ?

(a) Burning of food (b) Cooking of food (c) Germination of seed (d) All of these

9. Which of the following is a physical change ? **[NCERT Exemplar]**

(a) Rusting of iron (b) Combustion of magnesium ribbon

(c) Burning of candle (d) Melting of wax

10. Which of the following is a chemical change ? **[NCERT Exemplar]**

(a) Twinkling of stars (b) Cooking of vegetables

(c) Cutting of fruits (d) Boiling of water

11. A chemical change may involve : **[NCERT Exemplar]**

(a) change in colour only (b) change in temperature only

(c) evolution of gas only (d) all of the above

12. Which of the following is/are true when milk changes into curd ? **[NCERT Exemplar]**

(i) Its state is changed from liquid to semi solid

(ii) It changes colour

(iii) It changes taste

(iv) The change cannot be reversed Choose the correct option from below :

[NCERT Exemplar]

(a) (i) and (ii) are correct (b) (ii) and (iii) are correct

(c) (i), (iii) and (iv) are correct (d) (i) to (iv) are correct

13. A man painted his main gate made up of iron, to : **[NCERT Exemplar]**

(i) prevent it from rusting

(ii) protect it from sun

(iii) make it look beautiful

(iv) make it dust free

Which of the above statement (s) is/are correct ?

(a) (i) and (ii) (b) (ii) and (iii) (c) only (ii) (d) (i) and (iii)

14. Iron pillar near the Qutub Minar in Delhi is famous for the following facts. Which of these facts is responsible for its long stability ? **[NCERT Exemplar]**

(a) It is more than 7 metres high (b) It weights about 6000 kg

(c) It was built more than 1600 years ago (d) It has not rusted after such a long period

15. Galvanisation is a process used to prevent the rusting of which of the following :

[NCERT Exemplar]

(a) Iron (b) Zinc (c) Aluminium (d) Copper

16. Paheli's mother made a concentrated sugar syrup by dissolving sugar in hot water. On cooling, crystals of sugar got separated. This indicates a : **[NCERT Exemplar]**

(a) physical change that can be reversed

(b) chemical change that can be reversed

(c) physical change that cannot be reversed

(d) chemical change that cannot be reversed.

17. Which of the following statement is incorrect for a chemical reaction ? **[NCERT Exemplar]**

(a) Heat may be given out but never absorbed (b) Sound may be produced

(c) A colour change may take place (d) A gas may be evolved

18. Two drops of dilute sulphuric acid were added to 1 g of copper sulphate powder and then small amount of hot water was added to dissolve it (step I). On cooling, beautiful blue coloured crystals got separated (step II). Step I and step II are : **[NCERT Exemplar]**

(a) physical and chemical changes respectively

(b) chemical and physical changes respectively

(c) both physical changes

(d) both chemical changes

1. (a)	2. (d)	3. (b)	4. (d)	5. (c)	6. (c)	7. (a)	8. (d)	9. (d)
10. (b)	11. (d)	12. (c)	13. (d)	14. (d)	15. (a)	16. (a)	17. (a)	18. (c)

II. Multiple choice questions

1. The gas we use in the kitchen is called liquefied petroleum gas (LPG). In the cylinder it exists as a liquid. When it comes out from the cylinder it becomes a gas (Change-A) then it burns (Change-B). The following statements pertain to these changes. Choose the correct one. **[NCERT]**

(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.

2. Anaerobic bacteria digest animal waste and produce biogas (Change-A). The biogas is then burnt as fuel (Change-B). The following statements pertain to these changes. Choose the correct one. **[NCERT]**

(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.

1. (b)	2. (c)

I. Fill in the blanks

1. Melting of ice is a _____change.
2. Energy is _____ in the formation of curd from.
3. Burning of paper is a _____change.
4. Burning of coal is a _____change.
5. Crystals of pure substances are obtained from their solutions by_____.
6. Stainless steel is an _____of iron.
7. Heat absorbing reaction is called_____ reaction.
8. Oxygen and _____are must for rusting.
9. A reversible change is a _____change.
10. A chemical change is also called a _____ reaction.
11. Making sugar solution is a _____change. **[NCERT Exemplar]**
12. A physical change is generally_____. **[NCERT Exemplar]**
13. Grinding of wheat grain changes its size. It is a _____change. **[NCERT Exemplar]**
14. Iron benches kept in lawns and gardens get _____. It is a _____change because a new_____ is formed. **[NCERT Exemplar]**

1. physical	2. evolved	3. chemical
4. chemical	5. crystallization	6. alloy
7. endothermic	8. water (Moisture)	9. physical
10. chemical	11. physical	12. reversible
13. physical	14. rusted, chemical, substance.	

II. Fill in the blanks

(i) Formation of curd from milk is a _____ change.

(ii) Large crystals of pure substance are obtained by _____.

(i) chemical	(ii) crystallisation

I. Match the following.

Column A	Column B
(i) Lime stone	(a) CH_3COOH
(ii) Ozone	(b) $NaHCO_3$
(iii) Neela Thotha	(c) $CaCO_3$
(iv) Vinegar	(d) 0_3
(v) Baking soda	(e) $CuSO_4$

i. c	ii. d	iii. e	iv. a	v. b

II. Match the following.

I. Column A	Column B
(a)	(i) Spoilage of food
(b) Water to steam	(ii) $CuSO_4$
(c) Chemical change	(iii) Substance produced as a result of chemical change
(d) Salted water of sea	(iv) Crystallization
(e) Products	(v) Galvanization
(f) Process to obtain pure solid	(vi) Rusting proceeds solids faster
(g) Coating of zinc on iron objects	(vii) Endothermic Change objects
(h) Neela thotha	

a. viii	b. vii	c. i	d. vi	e. iii	f. iv	g. v	h. ii

II. Column A	Column B
(a) Large crystals	(i) Turns lime water milky
(b) Depositing a layer of zinc or iron	(ii) Physical change
(c) Souring of milk	(iii) Rust
(d) Carbon dioxide	(iv) Sugar candy (Mishri)
(e) Iron oxide	(v) Chemical change
(f) Dissolving common salt in water	(vi) Galvanisation

a. iv	b. vi	c. v	d. i	e. iii	f. ii

I. True or False

1. When a candle burns, both physical and chemical changes take place.
2. Anaerobic bacteria digest animal waste and produce biogas.
3. Ships suffer a lot of damage though they are painted.
4. Stretching of rubber band is not a physical change. **[NCERT Exemplar]**

1. True	2. True	3. True	4. True

II. True or False

(i) Cooking of rice is a physical change.

(ii) Formation of clouds is a reversible change.

(iii) In physical changes new substances are formed.

(iv) Both moisture and air are essential for rusting. Rusting is a chemical change.

1. False	2. True	3. False	4. True	5. True

Quiz Time

1. What type of change is called in which new substance with new properties is formed?
2. What are those substances called which start any reaction?
3. Give two examples of a chemical change.
4. What is the colour of flame when magnesium is burnt?
5. What happens when carbon dioxide is passed through lime water?
6. What are the essential conditions for rusting?
7. When baking soda is mixed with vinegar then a gas is released. Name the gas.
8. What is the colour of rust?
9. What is the colour of solution of copper sulphate when iron nails are dipped in it?
10. What is galvanisation?

1. Chemical change	2. Reactants
3. i. Rusting of iron, ii. Formation of curd	4. White colour
5. The lime water becomes milky	6. i. Presence of moisture, ii. Presence of air
7. Carbon dioxide	8. Reddish brown colour
9. Green colour	10. The process of depositing a layer of zinc on iron is called galvanisation.

NCERT Corner

Intext Question

1. Make a list often changes you have noticed around you.

i. lighting of bulb.

ii. Motion of fan.

iii. Sound produced by radio.

iv. Changing of day and night.

v. Changes in the shape of moon.

vi. Changing in size of the baby dog.

vii. Blooming of flower.

viii. Melting of ice.

ix. Vaporisation of water.

x. Lightning

2. Obviously, you cannot join the pieces back to make the original piece, but is there a changes in the property of the paper?

No, no change takes place in the property of the paper.

3. Did you recover chalk from the dust?

No.

4. Does the water become solid ice once again?

Yes

5. Do you see any droplet of water there?

Yes, droplets of water appear there.

6. Does the colour of the tip of the blade change?

Yes, it turns red.

7. Does it get back its original colour?

Yes, it is restored to original colour.

8. Does the ash look like the magnesium ribbon?

No.

9. Does the mixture turn red litmus blue?

Yes.

10. Does the mixture turn blue litmus red?

No.

11. On the basis of this test, how do you classify the aqueous Solution- acidic or basic?

Basic, because it makes red litmus blue.

12. Do you see any change in the colour of the solution?

Yes, the solution becomes green from blue.

13. Has it changed in any way?

There is a brown coat deposited on the nail.

14. What happens to the lime water?

Lime water becomes milky.

15. Can you name the new substance formed in this reaction?

Calcium carbonate.

16. When food gets spoiled, it produces a foul smell. Shall we call this change a chemical change?

Yes, because new substance are formed.

17. Are not these changes chemical changes?

Yes.

18. Is neutralisation a chemical change?

Yes.

19. We learnt in Chapter 1 that plants produce their food by a process called photosynthesis. Can we call photosynthesis a chemical change?

Yes.

20. Can we call the breaking down of ozone a chemical change.

No because ozone is only a different form of oxygen with the same chemical properties.

21. How do we prevent rusting?

Rusting can be checked by_____.

i. Preventing iron from coming in contact with air and moisture by applying grease or paint.

ii. An alternative way is to deposit a layer of a metal like chromium or zinc on iron.

22. Try to identify changes that you observe around you as physical or chemical change.

	Changes	Nature
i	Lighting of blub	Physical
ii	Motion of fan	Physical
iii	Sound produced by radio	Physical
iv	Changing of day and night	Physical
v	Changes in the shape of moon	Physical
vi	Changes in size of the baby dog	Chemical
vii	Blooming of flower	Chemical
viii	Melting of ice	Physical
ix	Vaporisation of water	Physical
x	Lighting	

Intext Question

1. Classify the changes involved in the following process as physical or chemical change.

a. Photosynthesis

b. Dissolving sugar in water

c. Burning of coal

d. Melting of wax

e. Heating aluminium to make aluminium foil

f. Digestion of food

a, c, f → Chemical changes

b, d, e → Physical changes

2. State whether the following statement are true or false. In case a statement is false, write the corrected statements in your notebook.

a. Cutting a log of wood into pieces is a chemical change.

b. Formation of nature from leaves is a physical change.

c. Iron pipes coated with zinc do not get rusted easily.

d. Iron and rust are the same substances.

e. Condensation of steam is not a chemical change.

a. Cutting a log of wood into pieces of a physical change.

b. Formation of nature from leaves is a chemical change.

d. Iron and rust are the different substances.

a. False	b. False	c. True	d. False	e. True

Fill in the blanks in the following Statements.

3. 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.

a. Calcium carbonate	b. Sodium hydrogen carbonate
c. Painting and galvanisation	d. Physical
e. Chemical	

4. When baking soda is mixed with lemon juice, bubbles are formed with the evolution of a gas. What types of change s it? Explain.

Lemon juice contains citric acid. When lemon juice is mixed with baking soda, the bubbles of carbon dioxide are formed. This is an example of a chemical change because a new substance i.e., carbon dioxide is formed in it.

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.

When we burn a candle, its wax starts melting. This a chemical change. When the candle starts burning, we cannot get back the original wax. This burning of candle is also accompanied by giving off heat and light. Therefore, the burning of a candle is a chemical change.

6. How would you show that setting of curd is a chemical change?

When a little quantity of curd is added to pre-boiled milk, after few hours the entire milk changes into curd. The properties of curd are quite different from those of milk. Curd is sour and thick, whereas Milk is a sweet liquid. Curd is a new substance obtained from milk. The curd cannot be changed back into milk. Therefore the setting of curd milk is a chemical change.

7. Explain why burning of wood and cutting it into small pieces are considered as two different types of changes.

When wood is cut into small little pieces, no new substances are formed. Therefore the cutting of wood is a physical change but when wood is burnt, carbon dioxide is formed along with the generation of heat. From the burnt wood, we cannot get back the original wood. Hence the burning of wood is a chemical change.

8. Describe how crystals of copper sulphate are prepared.

In order to make the crystals of copper sulphate a cupful of water is poured into a beaker. Some drops of dilute sulphuric acid are also added to this water. The water is now boiled and copper sulphate powder is slowly mixed with it by constant stirring. We go on mixing the copper sulphate powder until it dissolution stops. The solution is then filtered, cooled and kept undisturbed. After some time, the crystals of copper sulphate are formed.

9. Explain how painting of an iron gate prevents it from rusting.

We know that rusting takes place in presence of oxygen and water If we some how from coming in contact with iron articles, there will be no rusting. Hence if iron gates are painted all over, then they will not come in contact with oxygen and water, and consequently no rusting will occur on the gates.

10. Explain why rusting of iron objects is faster in coastal areas than in deserts.

Air in the surroundings of coastal areas contains moisture. We know that moisture and oxygen are essential for the rusting of iron objects. For that reason, rusting is faster and more in the coastal areas. There is no moisture in desert area, therefore the process of rusting is slow there.

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

i. Process - A is a chemical change

ii. Process - B is a chemical change

iii. Both processes A and B are chemical changes.

iv. None of these processes is a chemical change.

ii. Process – B is a chemical change.

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

i. Process - A is a chemical change.

ii. Process - B is a chemical change.

iii. Both process A and B are chemical changes.

iv. None of these processes is a chemical change.

iii. Both processes A and B are chemical changes.

I. Very Short Answer Type Questions.

1. What are the two main kinds of changes?

There are two kinds of changes:

i. Physical changes ii. Chemical changes

2. If you cut off a paper into various pieces, is there any changes in the property of the paper?

No, there is no change in the chemical property of paper.

3. Give two examples of physical changes.

i. Melting of ice ii. Boiling of water

4. What is rust?

When a piece of iron is kept for some days in the open it acquires a film of brownish substance. This substance is called rust.

5. What do you mean by rusting?

The process of formation of rust on iron is called rusting.

6. What is the nature of aqueous solution of magnesium oxide?

The aqueous solution of magnesium oxide is basic in nature because it turns red litmus into blue.

7. What kind of change is rusting?

Chemical change

8. What is the colour of flame when magnesium is burnt?

White colour

9. What is the colour of copper sulphate solution?

Blue colour

10. What are the essential conditions for rusting?

(i) Presence of moisture

(ii) Presence of air

11. What is the final colour of the solution when iron nails are dipped in the copper sulphate solution?

Green colour.

12. Write the reaction that takes place when iron nails are dipped in copper sulphate solution.

Copper sulphate (blue) + Iron → Iron sulphate (green) + copper (brown deposit).

13. What kind of change takes place when iron reacts with copper sulphate?

Chemical change

14. Name the gas released when baking soda is mixed with vinegar.

Carbon dioxide

15. What happens when carbon dioxide is passed through lime water? Write the equation of the reaction.

Lime water becomes milky due to formation of calcium carbonate.

$CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$ calcium hydroxide calcium carbonate

16. What is galvanisation?

The process of depositing a layer of zinc on iron is called galvanisation.

17. What do you understand by crystal- lisation?

The process of getting crystals of pure substances from their solutions is called crystallisation.

18. Can you prepare a doll from dust particles? Can you

Yes.

19. The above doll is broken. Can you recover the doll again by broken piece of doll?

Yes.

20. What type of change is this?

This is physical change.

21. Does any new substance is formed in chemical change?

Yes.

22. Name two more element on which rusting takes place.

Copper and aluminium.

23. Keep a blade on the flame of a gas stove. Does the colour of blade change?

Yes.

24. Does blade get its original colour again?

Yes.

25. When magnesium ribbon is burnt, a flame is formed. What is the colour of flame?

White colour.

26. What type of change is this?

This is chemical change.

II. Very Short Answer Type Questions.

1. What is electroplating ?

Electroplating is the deposition of a metallic coating by passing electric current through dissolved metal ions on the object to be coated.

2. What is alloying ?

Mixing of metals with other metals or non-metals in molten form is called alloying.

3. Define corrosion.

Corrosion is the damage of metals due to air and moisture.

4. Define an endothermic change.

In an endothermic change, heat is absorbed.

5. Explain crystallization.

The process by which pure crystals of a substance are obtained from solution of its crude sample in water is called crystallization.

6. Melting of wax is a change where a solid changes to liquid state. Give one more such change which you observe in your surroundings. [NCERT Exemplar]

Melting of ice.

7. What kind of change is shown by tearing of paper ? **[NCERT Exemplar]**

A physical change that cannot be reversed.

III. Very Short Answer Type Questions.

1. Why is carbon dioxide gas used in fire extinguishers?

Carbon dioxide cuts the contact of fire with oxygen which is needed for combustion and fire extinguishes from lack of oxygen.

I. Short Answer Type Questions.

1. Classify the following processes into physical or chemical changes: **[NCERT Exemplar]**

(a) Beating of aluminum metal to make aluminum foil.

(b) Digestion of food.

(c) Cutting of a log of wood into pieces.

(d) Burning of crackers.

(a) and (c) are physical changes.

(b) and (d) are chemical changes.

2. Classify the changes involved in the following processes as physical or chemical changes: **[NCERT]**

(a) Photosynthesis — (a) Chemical change

(b) Dissolving sugar in water — (b) Physical change

(c) Burning of coal — (c) Chemical change

(d) Melting of wax — (d) Physical change

3. Explain the following: **[NCERT Exemplar]**

(a) Lime water turns milky on passing carbon dioxide gas into it.

(b) Bubbles are produced when acetic acid is added to a solution of sodium hydrogen carbonate.

(a) This is because of the formation of white coloured insoluble calcium carbonate which is milky.

(b) Carbon dioxide is evolved due to the chemical reaction between acetic acid and sodium hydrogen carbonate.

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. . [NCERT]

This is a chemical change. When baking soda is mixed with lemon juice, carbon dioxide is evolved in the form of bubbles.

Sodium Hydrogen carbonate + Citric acid → Carbon dioxide + Other products

(Baking soda) (Lemon juice)

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. [NCERT]

When a candle burns, melting of wax is the physical change and burning of wax is the chemical change. Similar changes can be seen in eating food. Here, chewing of food is physical change and digestion of food is chemical change.

6. How would you show that setting of curd is a chemical change? [NCERT]

Once curd is formed it cannot be changed back to milk. Also, properties of milk and curd are different from each other. These are the characteristics of a chemical change.

7. Explain why burning of wood and cutting it into small pieces are considered as two different types of changes. [NCERT]

When wood is burned it forms a completely new substance, i.e., coal. The properties of coal are different from wood. This is a chemical change. Whereas, when wood is cut no new substance is formed. This is a physical change.

8. Explain how painting of an iron gate prevents it from rusting. [NCERT]

Painting the iron gate prevents the contact of iron from air. Since rusting is possible only in presence of moist air, no rusting occurs on painting.

9. How can iron articles be prevented from rusting?

Iron articles can be prevented from rusting by greasing, painting, galvanising electroplating, alloying, plastic coating or chromium plating.

10. Why does a magnesium ribbon burn with a dazzling white flame?

This is because magnesium reacts with oxygen in air to form white coloured magnesium oxide.

11. Give example of two substances that can undergo physical and chemical changes, depending upon the conditions.

(i) On heating, wax melts (physical change) but on burning it forms carbon dioxide (chemical change).

(ii) On heating, water converts to water vapours (physical change) but on passing electricity through it, it splits into hydrogen and oxygen (chemical change).

12. When chemical reaction takes place, what changes accompany the formation of new substances?

The following changes accompany the formation of new substances: change in state, colour, temperature, odour, sound may be produced or gas may evolve.

II. Short Answer Type Questions.

1. What are physical properties?

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

2. What are physical changes?

The changes in which a substance undergoes a change in its physical properties are called physical changes. Physical changes are generally reversible. In such changes no new substances are formed. For example, melting of ice, formation of steam, etc.

3. What is chemical change?

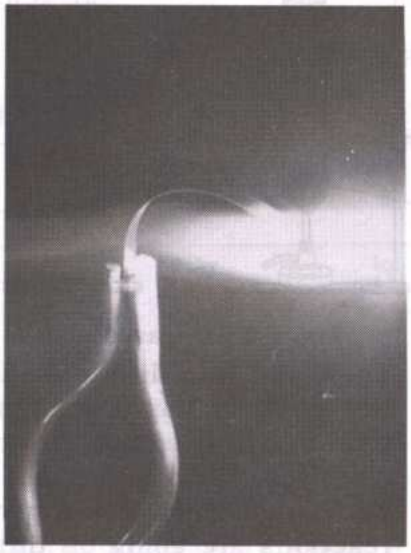
A change in which one or more new substances are formed is called chemical change. A chemical change is also called a chemical reaction. For example: formation of curd from milk, burning of paper, etc.

4. Explain the activity of burning of magnesium ribbon. Represent the change by an equation.

Get a small and thin strip or ribbon of magnesium. Clean its tip with sand paper. Bring the tip near a candle flame. It burns with a brilliant white light. After combustion white powdery ash is left, it is called magnesium oxide. Equation:

$2Mg + 0_2 \rightarrow 2MgO$

Magnesium Magnesium oxide



5. Whether mixing of ash obtained by burning of magnesium with water is a chemical change or physical change. Give reason in support of your answer. Express the change in the form of equation.

Dissolving of the ash in water is a chemical change. Reason: When magnesium is burnt in air, it forms magnesium oxide in the form of white ash.

$2Mg + 0_2 \rightarrow 2MgO$

Magnesium oxide

When magnesium oxide dissolves in water, it forms a new substance magnesium hydroxide.

Magnesium oxide (MgO) + Water (H_2O) Magnesium hydroxide [$Mg(OH)_2$] Test the solution with litmus, it turns red litmus blue. So, solution is basic in nature.

6. Write the characteristics of a chemical change.

Characteristics of a chemical change:

(i) Mostly chemical reactions are irreversible.

(ii) They cause release or absorption of energy.

(iii) New substances with new properties are formed.

(iv) The properties of reactants are different from the products.

7. What happens when iron nails are dipped in copper sulphate solution?

When iron nails are dipped in copper sulphate solution, then after some time a brown layer of copper gets deposited on iron nail. This change is due to chemical reaction between copper sulphate and iron. The colour of copper sulphate solution also changes from blue to green colour due to formation of iron sulphate.

Copper sulphate + iron →

(blue)

Iron sulphate + Copper

(green) (brown)

8. Which gas is called natural shield against the radiations? Explain how.

Ozone layer is called natural shield against radiations. It protects us from the harmful ultraviolet radiations which come from the sun. Ozone absorbs these radiations and breaks down to oxygen. If ultraviolet radiations come on earth then they can cause harm to us and other life forms.

9. How many types of changes? What is the main difference between them? There are two types of changes:

(i) Physical change (ii) Chemical change

The main difference between these two changes is this that in physical change no new substance is formed while in chemical change new substance is formed.

10. You are advised not to play with fireworks. Why?

Explosion of a firework is a chemical change. In this explosion heat, light, sound and unpleasant gases are produced. These gases pollute the atmosphere. That is why you are advised not to play with fireworks.

III. Short Answer Type Questions-I

1. How clouds are formed ? What is this change called ? Explain.

Clouds are formed by the condensation of water vapours present in the atmosphere. It comes back to the atmosphere/earth as rain water. No new product is formed. So it is a physical change.

2. Most physical changes are reversible. Comment.

In physical change, no new product is formed. So these changes can be reversed easily. Thus most physical changes are reversible.

(i) Dissolution of sugar in water is a physical change. We can get back sugar and water by evaporation.

(ii) Freezing of ice, from water is a physical change. One melting ice we get back water again.

3. What do you consider explosion of cracker a chemical change?

When a cracker explodes, heat, light and smoke comes out due to the formation of new substances.

Thus, it is a chemical change.

4. What happens when a new substance is formed in a chemical reaction?

When a new substance is formed in a chemical reaction, heat, light is produced or used up. The chemical properties of the reaction mixture becomes different from the reactions.

5. A fraction of ship's iron part has to be replaced every year. Explain.

Ships are made of wood and iron and a part of them remains in water. On the part above water, water keeps clinging. Thin part is exposed to air. Moreover, the water of sea contains many salts which makes the process of rust formation faster. Therefore, ships suffer a lot of damage from rusting inspite being painted regularly. So, a fraction of ship's iron has to be replaced every year.

6. Identify the type of chants and state what happens when sugar is heated.

When sugar is heated strongly, it becomes foggy due to water vapour and a black powder is left behind. The black substance is charcoal. This is called charring of sugar and it cannot be reversed. Thus, this is a chemical change.

7. Give four characteristics of a physical change.

Characteristics of a physical change

(i) It is reversible or irreversible,

(ii) No new substance is formed.

(iii) No change in chemical properties.

(iv) Only change in shape, size, colour or state.

8. Write the characteristics of a chemical change.

Characteristics of a chemical change:

(i) Mostly chemical reactions are irreversible.

(ii) They cause release or absorption of energy.

(iii) New substances with new properties are formed.

(iv) The properties of reactants are different from the products.

9. What happens when iron nails are dipped in copper sulphate solution ?

When iron nails are dipped in copper sulphate solution, then after some time a brown layer of copper gets deposited on iron nail. This change is due to chemical reaction between

copper sulphate and iron. The colour of copper sulphate solution also changes from blue to green colour due to formation of iron sulphate.

Copper sulphate solution → Iron sulphate (blue) (green) + Copper (brown)

10. Which gas is called natural shield against the radiation ? Explain, how ?

Ozone layer is called natural shield against radiations. It protects us from the harmful ultraviolet radiations which come from the sun. Ozone absorbs these radiations and breaks down to oxygen. If ultraviolet radiations come on earth then they can cause harm to us and other life forms.

11. Write word equations for two chemical reactions with the help of materials given in the box. Air, copper sulphate, iron, vinegar, iron oxide, carbon dioxide, iron sulphate, copper, lime water, water. [NCERT Exemplar]

(1) Iron + Air + Water → Iron oxide

(2) Copper sulphate + Iron → Iron sulphate + Copper

12. If you leave a piece of iron in the open for a few days, it acquires a film of brownish substance, called rust.

(a) Do you think rust is different from iron ?

(b) Can you change rust back into iron by some simple method?

(c) Do you think formation of rust from iron is a chemical change?

(d) Give two other examples of a similar type of change. [NCERT Exemplar]

(a) Yes, rust is quite different from iron.

(b) No.

(c) Yes, it is a chemical change.

(d) (i) Setting of curd from milk.

(ii) Burning of magnesium ribbon to form magnesium oxide.

III. Short Answer Type Questions- II

1. Which of the following changes are reversible or irreversible and physical or chemical?

(a) Chalk stick_____ chalk pieces.

(b) Water_____ steam.

(c) Magnesium ribbon _____burnt magnesium ribbon.

(d) Unripe mango _____ripe mango.

(e) Wood log_____ saw dust.

(f) Plant _____tree.

(a) Physical, reversible

(b) Physical, reversible

(c) Chemical, irreversible

(d) Chemical, irreversible

(e) Physical, irreversible

(f) Chemical, irreversible

2. State the difference between physical and chemical changes.

Difference between chemical and physical changes.

Chemical Change	Physical Change
1. It is irreversible.	It is mostly reversible.
2. The composition of No change in the substances changes.	Composition of the substance.
3. It is a permanent change.	Change in temporary.
4. A new substance is formed.	No new substance is formed.

3. Ice, water and steam have similar chemical properties. In what respect to these differ?

Differences between ice, water and steam :

Ice	Water	Steam
1. Incompressible.	Can be compressed to some extent.	Highly compressible.
2. Does not flow.	Flows from higher level to lower level.	Flow in all directions.
3. Has definite shape and volume.	Has a definite volume but no definite shape.	Has neither definite shape nor a definite volume.
4. Solid state.	Liquid state.	Gaseous state.

4. (a) Why does stainless steel not get rust ?

(b) What type of change takes place when sound is produced by radio ?

(c) Why do iron pipes coated with zinc do not get rust quickly ?

(a) Stainless steel is an alloy of iron mixed with certain corrosion resistant non-metal.

(b) It is a physical change.

(c) The coating of zinc protects iron pipes from the effects of air and moisture and thus does not rust.

5. When a candle burns, both physical and chemical changes occur. Explain.

It is true that when a candle burns, both physical and chemical changes occur. Initially candle burns to produce heat and light. It is a chemical change because candle burns with the formation of gases. Due to the heat produced, some candles simultaneously melts. This is a physical change as the molten candle wax behaves like original candle.

6. Whether mixing of ash obtained by burning of magnesium with water is a chemical change or physical change ? Give reason in support of your answer. Express the change in the form of equation.

Dissolving of the ash in water is a chemical change.

Reason : When magnesium is burnt in air, it forms magnesium oxide in the form of white ash. 1 Mg + 02 → MgO (magnesium oxide)

7. Explain why burning of wood and cutting it into small pieces are considered as two different types of changes.

Burning of wood is a chemical change because in burning, new substances are formed as :

Wood + Oxygen → Charcoal + Carbon dioxide + Heat + Light

But cutting it into small pieces is physical change because no new substance is formed. We can only reduce the size of wood.

8. Describe how crystals of copper sulphate are prepared.

Take a cup full of water in a beaker and add a few drops of dilute sulphuric acid. Heat the water. When it starts boiling, add copper sulphate powder slowly. Continue to add copper sulphate powder till to more powder can be dissolved. During this process continuously stir the solution. Filter the solution. Leave it for cooling. Look it after some time, you can see the crystals of copper sulphate.

9. Give two examples for each of the following cases : [NCERT Exemplar]

(a) Physical changes which are reversible.

(b) Physical changes which are not reversible.

(c) Chemical changes.

(a) (i) Folding of paper, (ii) Melting of ice

(b) (i) Tearing of paper, (ii) Breaking of glass

(c) (i) Reaction between vinegar and baking soda, (ii) Burning of a match stick.

10. Give an example of a chemical reaction for each of the following situations :

(a) A change in colour is observed.

(b) A gas is evolved.

(c) Sound is produced. [NCERT Exemplar]

(a) Reaction between copper sulphate solution and iron metal.

(b) Reaction between baking soda and vinegar (carbon dioxide is evolved).

(c) Burning of crackers.

11. A student took a solution of copper sulphate in a beaker and put a clean iron nail into it and left it for about an hour.

(a) What changes do you expect ?

(b) Are these changes chemical in nature ?

(c) Write a word equation for the chemical change, if any. [NCERT Exemplar]

(a) (i) Colour of the solution of the beaker changes from blue to green.

(ii) A brown coloured deposit is found on the surface of the iron nail.

(b) The changes are chemical in nature as new substances, iron sulphate (green) and copper (brown) are formed.

(c) Copper sulphate + Iron → Iron sulphate + Copper

(blue) (green) (brown)

I. Long Answer Type Questions.

1. Which gas is released when vinegar and baking soda are mixed ? What happens when this gas is passed through lime water ?

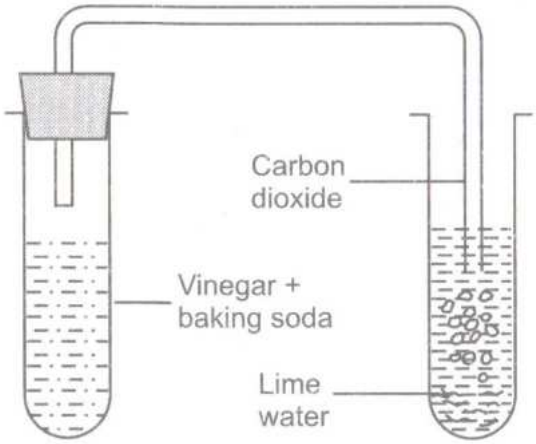
When baking soda and vinegar are mixed with each other then carbon dioxide gas ik released. When carbon dioxide is passed through lime water, then calcium carbonate is formed. Calcium carbonate makes lime water appear milky. The turning of lime water into milky solution is a standard test of carbon dioxide.

The following reactions take place :

(i) Vinegar + Baking soda → Carbon dioxide + other substances

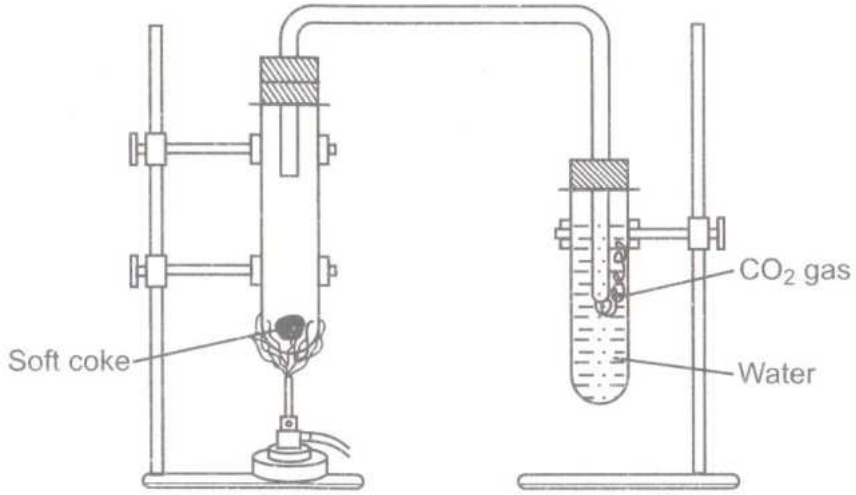
(ii) Carbon dioxide (CO_2) + lime water $Ca(OH)_2$

→ Calcium carbonate ($CaCO_3$) + water (H_20)



2. Explain that carbon dioxide is an acidic oxide with the help of an activity.

Burn a piece of soft coke in hard glass test tube and pass the gas produced in water.



Then add blue litmus solution (to test the formation of acid) to the test-tube in which carbon dioxide gas is dissolved. The colour of the solution turns red. The following chemical reactions are going on during this experiment.

(i) $C + 0_2 \rightarrow CO_2$

(Carbon dioxide)

(ii) $CO_2 + H_2O \rightarrow H_2C0_3$

(Carbonic acid)

3. What is rusting ? How do we prevent it?

If we leave a piece of iron in the open for some time, it acquires a coating of brownish substances. This substance is called rust and the process of its formation is called rusting. This is the change that effects iron articles and slowly destroys them. Since iron is used in making bridges, ships, cars, truck bodies and many other articles. The monetary loss due to rusting is huge.

For rusting the presence of both oxygen and water (or water vapour) is essential.

Infact, if the moisture content in air is high which means if it is more humid, rusting becomes faster.

Methods of preventing rust formation: Rusting of an iron object can be prevented or reduced by not allowing air and moisture to come in contact with the surface of iron objects. Following are the methods of prevention form rusting.

(i) Putting oil or paint over the surface of iron implements.

(ii) Galvanization: In this method, surface of iron is covered with a layer of more active metal like zinc. Zinc metal looses electrons in preference to iron and hence, prevents the rusting of iron.

(iii) By tin-plating.

(iv) Use of anti-rust solutions: Alkaline chromate and alkaline phosphate solution act as anti-rust solutions. When iron objects are dipped into a boiling and strongly alkaline solution of sodium phosphate, a protective insoluble film of iron phosphate is formed on them. This film protects the article form rusting.

4. A chemical change may occur by one of the following changes:

(a) Evolution of gas (b) Change of colour

(c) Formation of precipitate (d) Absorption or evolution of heat and light

(e) Change of smell

Give an example of each case.

(a) Solid calcium carbonate on heating gives carbon dioxide gas. If this gas is passed through lime water, it turns milky.

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

(b) When white lead nitrate $Pb(NO_3)_2$ is heated, reddish coloured nitrogen dioxide (NO_2) is evolved and yellow coloured lead monoxide (PbO) is left behind.

$$2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + 0_2$$

(c) When colourless solutions of silver nitrate ($AgNO_3$) and sodium bromide (NaBr) are mixed, yellow coloured silver bromide (AgBr) gets precipitated. $AgNO_3$ (aq) + NaBr (aq) → AgBr + NaNO3 (aq)

(d) When water is added to quick lime (CaO), heat energy is evolved with the formation of calcium hydroxide, $Ca(OH)_2$.

$CaO + H_2O \rightarrow Ca(OH)_2 +$ Heat

(e) When cooked food containing oils and fats is kept in the open for long, pleasant smell changes into foul smell and the food gets spoiled.

II. Long Answer Type Questions.

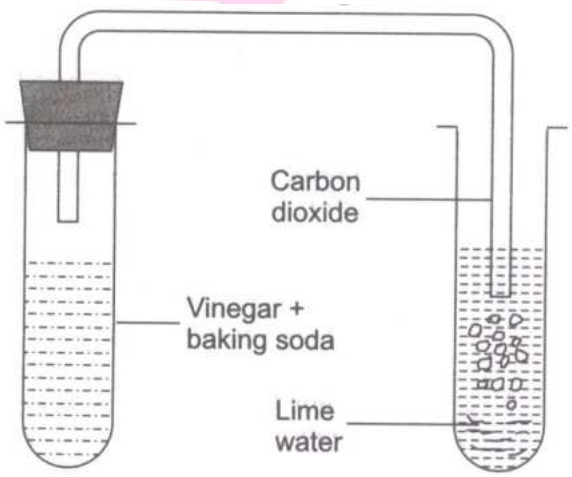
1. Which gas is released when vinegar and baking soda are mixed? What happens when this gas is passed through lime water?

When baking soda and vinegar are mixed with each other then carbon dioxide gas is released. When carbon dioxide is passed through lime water, then calcium carbonate is formed. Calcium carbonate makes lime water appear milky. The turning of lime water into milky solution is a standard test of carbon dioxide.

The following reactions take place:

(i) Vinegar + Baking soda → Carbon dioxide + other substances

(ii) Carbon dioxide (CO_2) + lime water $Ca(OH)_2$ → Calcium carbonate ($CaCO_3$) + water (H_20)



2. In addition to formation of new products what changes do the chemical changes accompany?

In addition to new products the following may accompany a chemical change:

(i) Heat, light or any other radiation may be given off or absorbed.

(ii) Sound may be produced.

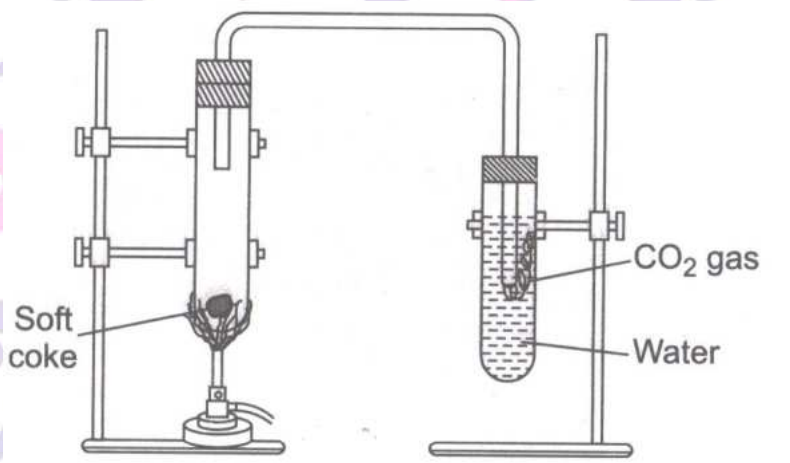
(iii) A change in smell may take place.

(iv) A colour change may take place.

(v) A gas may be formed.

3. Explain that carbon dioxide is an acidic oxide with the help of an activity.

Burn a piece of soft coke in hard glass test tube and pass the gas produced in water.



Then add blue litmus solution (to test the formation of acid) to the test tube in which carbon dioxide gas is dissolved. The colour of the solution turns red. The following chemical reactions are going on during this experiment

(i) $C + 0_2 \rightarrow CO_2$

(Carbon dioxide)

(ii) $CO_2 + H_2O \rightarrow H_2CO_3$

(Carbonic acid)

4. Explain that sulphur dioxide is an acidic gas.

If we heat a small amount of powdered sulphur in a hard glass test tube and pass the gas produced through water, the solution so formed also turns the blue litmus red.

$S + 0_2 \rightarrow SO_2$

(Sulphur dioxide)

$SO_2 + H_2O \rightarrow H_2S0_3$ (Sulphurous acid)

5. What is rusting? How do we prevent rusting?

The process of formation of a brownish layer (rust) on the upper surface of an iron article when they are exposed to moist air is called rusting.

Methods of Prevention of Rusting:

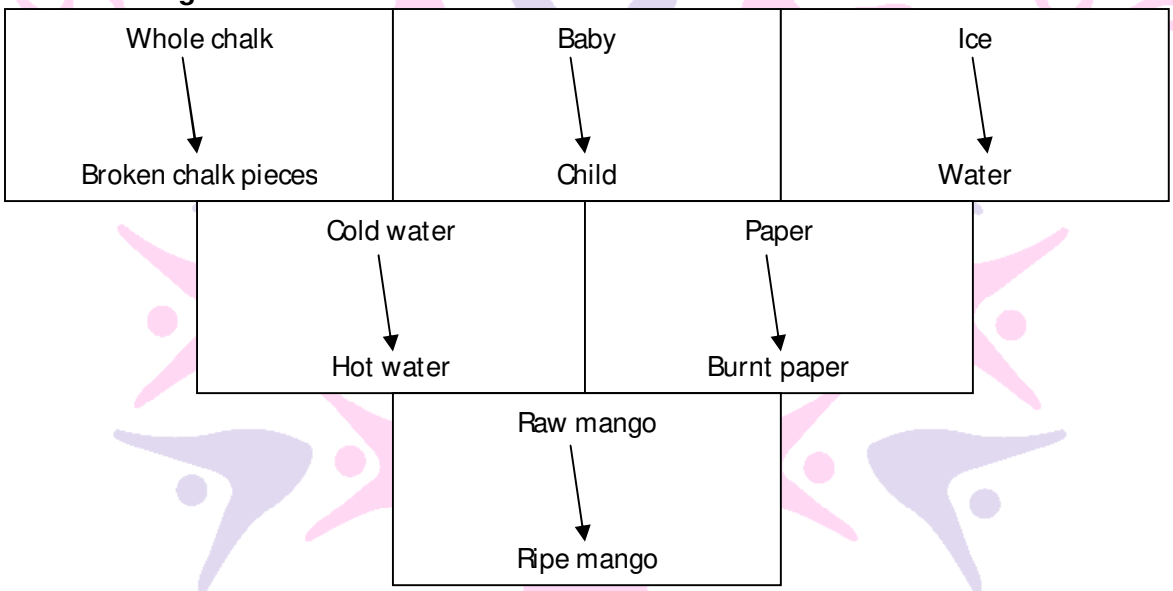
(i) Putting oil or paint over the surface of iron articles.

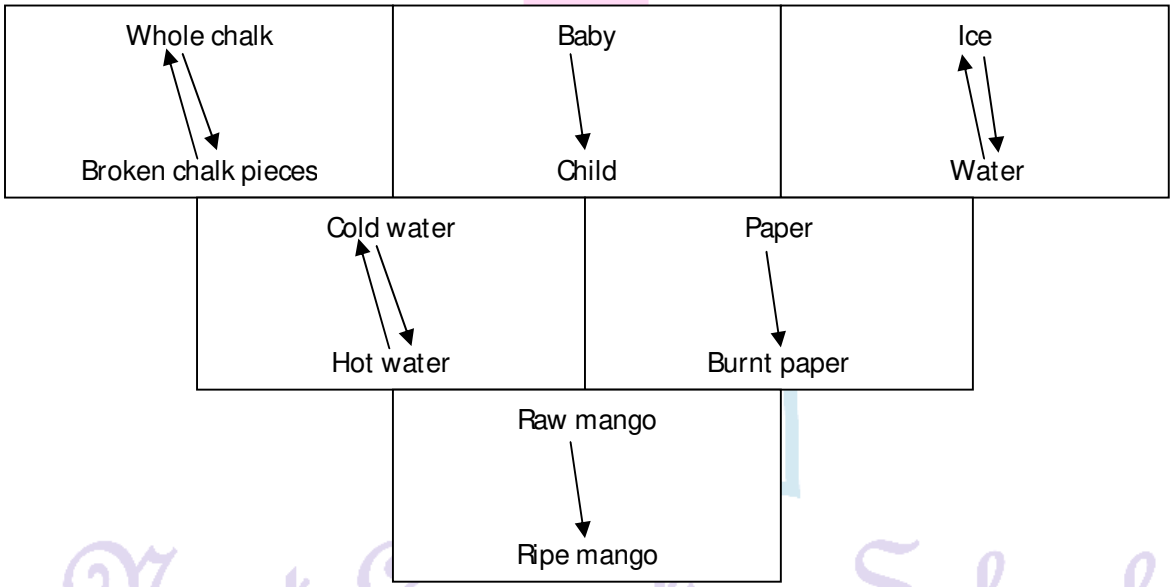
(ii) By the process of galvanisation.

(iii) By electroplating.

(iv) By using anti rust solutions.

6. Select the chemical or physical changes which are reversible by putting reverse arrow in the following boxes:





7. What is ozone layer? Why is it called nature shield?

There is a thick layer of ozone in the atmosphere. It is called ozone layer. It protects us from harmful effects of ultra violet radiation coming from Sun. Ozone absorbs these radiations

and break down to oxygen. Oxygen is different from ozone. The breaking down of ozone into oxygen is a chemical change.

If ultra violet radiations were not absorbed by ozone, it would reach the earth's surface and cause harm to us and other life forms. It protects us from radiations, so it is called natural shield against radiation.

III. Long Answer Type Questions.

1. Give two examples for each of the following cases: **[NCERT Exemplar]**

(a) Physical changes which are reversible.

(b) Physical changes which are not reversible.

(c) Chemical changes.

(a) (i) Folding of paper (ii) Melting of ice

(b) (i) Tearing of paper (ii) Breaking of glass

(c) (i) Reaction between vinegar and baking soda (ii) Burning of a matchstick

2. Give an example of a chemical reaction for each of the following situations: **[NCERT Exemplar]**

(a) A change in colour is observed.

(b) A gas is evolved.

(c) Sound is produced.

(d) Formation of precipitate.

(e) Change of state from liquid to gas.

(f) Change of state from gas to liquid.

(a) Reaction between copper sulphate solution and zinc metal. The blue colour of the copper sulphate solution fades away and a red brown metallic copper is formed.

(b) Reaction between baking soda and vinegar. Baking soda on reaction with vinegar produces carbon dioxide.

(c) Burning of crackers.

(d) Reaction of silver nitrate and potassium chloride. A precipitate of silver chloride is formed.

(e) When water is heated above boiling point, it converts into vapours.

(f) Water droplets appear on the outside of a bottle containing cold water.

3. If you leave a piece of iron in the open for a few days, it acquires a film of brownish substance, called rust. [NCERT Exemplar]

(a) Do you think rust is different from iron?

(b) Can you change rust back into iron by some simple methods?

(c) Do you think formation of rust from iron is a chemical change?

(d) Give two other examples of a similar type of change.

(a) Yes, rust is chemically different from iron.

(b) No

(c) Yes, it is a chemical change.

(d) (i) Setting of curd from milk.

(ii) Burning of magnesium ribbon to form magnesium oxide.

4. A student took a solution of copper sulphate in a beaker and put a clean iron nail into it and left it for about an hour. [NCERT Exemplar]

(a) What changes do you expect?

(b) Are these changes chemical in nature?

(c) Write a word equation for the chemical change, if any.

(a) (i) Colour of the solution in the beaker changes from blue to green.

(ii) A brown coloured deposit is found on the surface of the iron nail.

(b) The changes are chemical in nature as new substances, iron sulphate (green) and copper (brown) are formed.

(c) Copper sulphate + Iron → Iron sulphate + Copper
(Blue) (Green) (Brown)

5. Describe how crystals of copper sulphate are prepared. [NCERT]

(i) Take a cupful of water in a beaker and add a few drops of dilute sulphuric acid.

(ii) Heat the water.

(iii) When it starts boiling, add copper sulphate powder slowly while stirring continuously.

(iv) Continue adding copper sulphate powder till no more powder can be dissolved.

(v) Filter the solution.

(vi) Allow it to cool. Do not disturb the solution when it is cooling.

(vii) Crystals of copper sulphate will be seen at the bottom of the beaker.

6. Distinguish between the following.

(a) Physical change and Chemical change

(b) Exothermic reaction and Endothermic reaction

(a)

S.No	Physical change	Chemical change
(i)	A change in which only physical properties of any substance get changed.	A change in which composition and chemical properties of the substance get changed.
(ii)	No new substance is formed.	New substances are formed.
(iii)	For example, dissolution of sugar in water.	For example, burning of a candle.

(b)

S.No	Exothermic reaction	Endothermic reaction
(i)	It is a reaction in which heat energy is released.	It is a reaction which requires energy to take place.
(ii)	It is a spontaneous reaction.	It is a non-spontaneous reaction.

I. High Order Thinking Skills (HOTS) Question

1. A magnesium strip is burnt. The ash obtained is dissolved in water. What kind of changes are these? Write word equations for these.

These are chemical changes:

Magnesium + Oxygen → Magnesium oxide

Magnesium oxide + Water → Magnesium hydroxide

II. High Order Thinking Skills (HOTS) Question

1. A magnesium strip is burnt. The ash obtained is dissolved in water. What kind of change as these? Write word equation for these.

These are chemical changes.

Magnesium + Oxygen → Magnesium oxide

Magnesium oxide + Water → Magnesium hydroxide

2. Why do iron articles rust faster in Mumbai than in Delhi?

Since Mumbai is a coastal region, the moisture content in the air is more as compared to that in Delhi. Therefore, iron articles rust faster.

I. Value Based Question

1. Sonu's mother served a glass of hot milk before going to school. As Sonnu was in hurry he forgot to drink the same. Unfortunately, his mother also had gone out. When they came back home, Sonu noticed the changes arose in the milk, which was no more milk, but set into a thick substance known as curd.

Based on his situation answer the following questions.

i. What is this process of setting milk into curd known as? Is this a physical / chemical change?

ii. Is this change harmful?

iii. How does it happen?

iv. Which value Sonu exhibit here?

i. Curding of milk, chemical change.

ii. This change is done by Lactobacillus bacteria and it is beneficial / useful for us.

iii. By converting lactose sugar into lactic acid.

iv. Irresponsibility, carelessness.

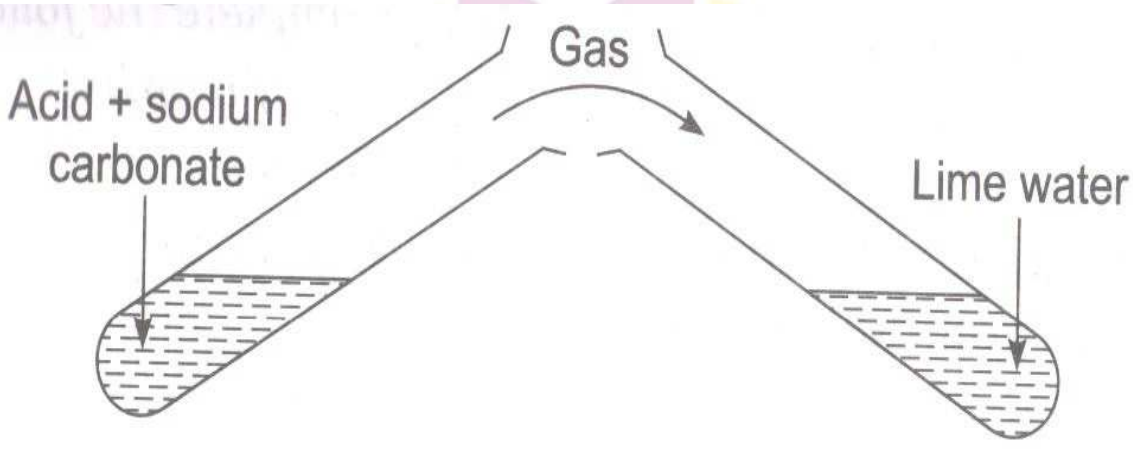
I. Skill Based Questions

1. Observe the following figure and answer the following questions.

i. What does this figure show?

ii. Write the effect of the gas on lime water.

iii. Write the chemical equation of the reaction.



(i) This figure shows the action of an acid over sodium carbonate.

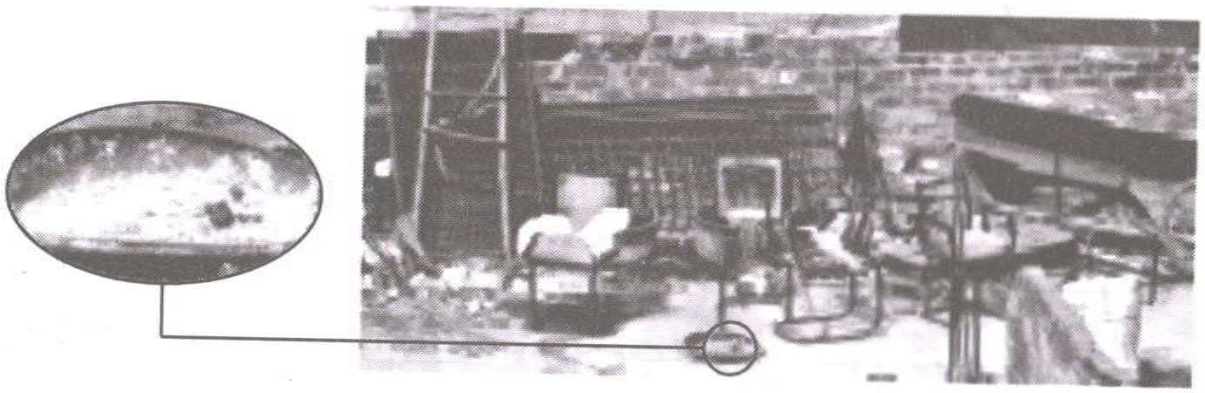
(ii) The gas is carbon dioxide.

(iii) The lime water becomes milky.

(iv) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

lime water milky

2. Observe the diagram given below and suggest a suitable title for the diagram. Can we prevent the process depicted in the Fig. 6.8?



(i) Rusting of iron.

(ii) Rusting of iron can be prevented:

(a) by applying paint or greese on the surface of iron.

(b) by depositing a layer of metal like chromium or zinc on iron.

3. Observe the figure and answer the questions given below:

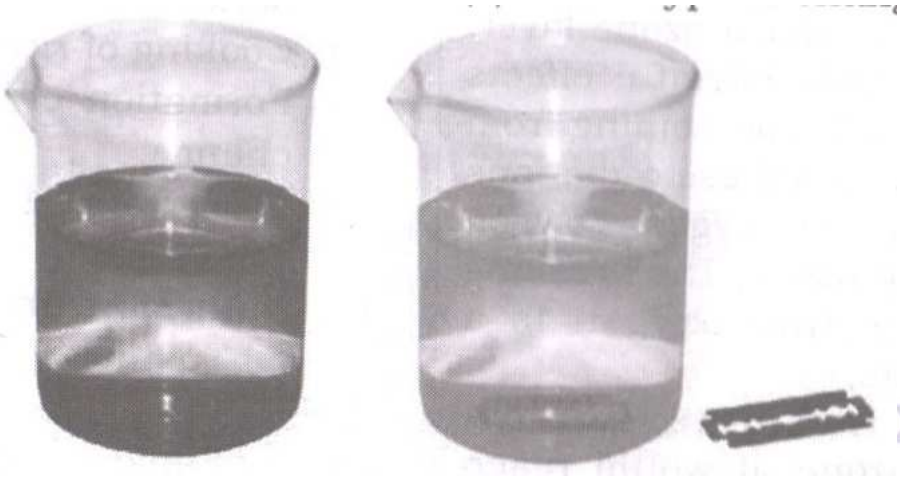
(i) What is the colour of copper sulphate solution?

(ii) What change do you observe?

(iii) What is the colour of the blade after reaction?

(iv) Write the equation of the reaction.

(v) What type of change is this?



(i) Blue

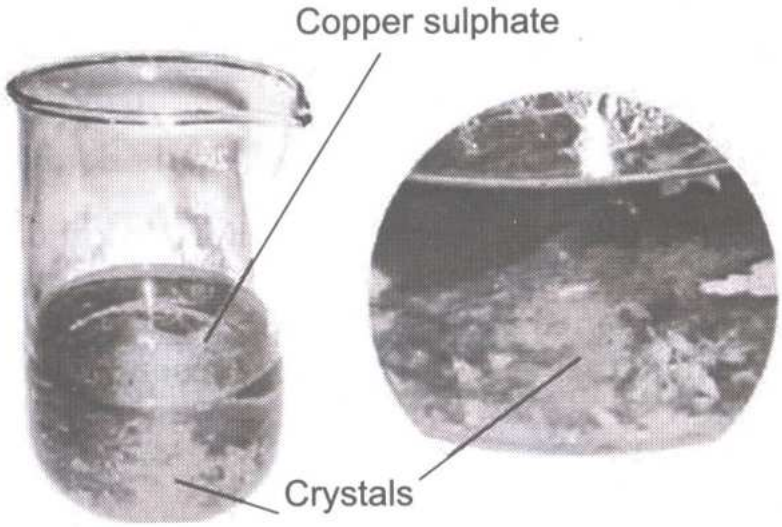
(ii) Blue colour of the solution changes into green.

(iii) Blade becomes brownish.

(iv) $CuSO_4 + Fe \rightarrow FeSO_4 + Cu$

(v) This is a chemical change.

4. Draw a diagram to show the formation of crystals. Name the process also.



This process is called crystallisation.

5. Draw a diagram of burning of magnesium ribbon and answer the following questions.

(i) What is the colour of the flame?

(ii) What is colour of the ash?

(iii) Name the ash?

(iv) Mix the ash in water, what is the nature of its aqueous solution?

(i) The colour of the flame is white.

(ii) The colour of ash is also white.

(iii) The ash is of magnesium oxide.

(iv) The aqueous solution of magnesium oxide ash is basic in nature.