

# Physical and Chemical Changes

## Points to Remember :

1. All changes are classified into two types
  - (i) Physical change
  - (ii) Chemical change.
2. **Physical Change**— A physical change is a temporary change in which no new substance is formed and chemical composition remains same. e.g. Melting of ice.
3. **Chemical Change**— A chemical change is a permanent change, in which a new substances are formed whose chemical composition and physical properties are different, e.g. Burning of a candle.
4. **Chemical Reaction**— Any chemical change in matter involving its transformation into one or more new substances is called a chemical reaction.
5. **Chemical Equations**— A chemical equation is the symbolic representation of a chemical reaction using the symbols and the formulae of the substances involved in the reaction.
6. The substances that react with one another are called reactants, and the new substances thus formed are called products.
7. A balanced chemical reaction is one in which the number of the atoms of each element on the
8. reactant side is equal to the number of atoms of that element on the product side.
9. The law of conservation of mass states that mass can neither be created nor be destroyed.
10. A chemical equation gives both qualitative and quantitative information about reactants and products.
11. The type of chemical reaction in which two substances combine to form a new substance is known as combination reaction.
12. The type of chemical reaction in which a substance breaks up on heating to form two or more simpler substances, which can be either elements or compounds, known as decomposition reaction.

## Exercise

### Question 1.

(a) **Define:**

- (i) a physical change
- (ii) a chemical change

(b) **Give two examples for each of the above two changes.**

**Answer:**

**(a) (i) Physical change :** A temporary change in which no new substance is formed, the composition of substance remains the same, though its state, shape and size may change.

**(ii) Chemical change :** A permanent change in which new substances are formed whose composition and properties are completely different from those of the original

substances.

**(b) Physical change:**

(i) Change of water into its vapours.

(ii) Heating of iron rod.

**Chemical change:**

(i) Burning of wood.

(ii) Breathing.

**Question 2.**

What are reversible and irreversible changes ? Give one example for each.

**Answer:**

1. **Reversible change** : When a change in a substance can be reversed by changing the conditions, it is said to be a reversible change.  
**Example** : Melting of ghee or wax.
2. **Irreversible change** : When a substance can not be brought back to its original state after a change, it is said to be an irreversible change.  
**Example** : Souring of milk.

**Question 3.**

Mention a change which is always

**Answer:**

1. **Desirable** : Changes that are useful to man are desirable changes, e.g. change of milk into curd.
2. **Undesirable** : Change that brings about destruction is an undesirable change, e.g. floods and epidemics are undesirable changes.
3. **Periodic** : Changes that are repeated at regular intervals of time are called periodic changes, e.g. change of day and night.

**Question 4.**

Is burning a physical change or a chemical change? Why?

**Answer:**

Burning is a chemical change as new substance is formed with new properties and it cannot be reversed.

**Question 5.**

A burning candle shows both physical and chemical changes. Explain ?

**Answer:**

A burning candle produces wax vapours which solidify and form wax again is physical change. At the same time wax on burning produces water vapours and carbon dioxide which escape into the atmosphere which are new substances with new properties. It is a chemical change.

Hence burning of candle shows both physical and chemical changes.

**Question 6.**

State three differences between evaporation and boiling

**Answer:**

<b>Evaporation</b>	<b>Boiling</b>
<ol style="list-style-type: none"><li>1. Evaporation is a slow process.</li><li>2. Evaporation takes place from the surface of the liquid.</li><li>3. Evaporation takes place at all temperature.</li></ol>	<ol style="list-style-type: none"><li>1. Boiling is a fast process.</li><li>2. Bgiling takes place from all parts of the liqui</li><li>3. Boiling takes place at a fixed temperature o heating.</li></ol>

**Question 7.**

State four differences between physical and chemical changes.

**Answer:**

Four differences are :

<b>Physical change</b>	<b>Chemical change</b>
<ol style="list-style-type: none"><li>1. No new substances with new properties are formed.</li><li>2. It can be reversed by simple physical methods.</li><li>3. It is temporary change.</li><li>4. Energy is neither needed nor produced.</li></ol>	<ol style="list-style-type: none"><li>1. New substances with new properties are formed.</li><li>2. Change cannot be reversed by simple physical methods.</li><li>3. It is permanent change.</li><li>4. Energy is either needed or evolved.</li></ol>

### Question 8.

What do you observe when :

- 1. water is boiled**  
On boiling water changes into steam (gas) physical change.
- 2. a piece of paper is burnt**  
On burning piece of paper produces carbon dioxide and ash is left behind. Is a chemical change.
- 3. some ice cubes are kept in a glass tumbler**  
Ice cubes (solid) turn into water (liquid) only state changes (physical change).
- 4. solid ammonium chloride is heated**  
Solid ammonium chloride on heating changes into vapours (change of state) is physical change.
- 5. an iron nail is kept in tap water for few days**  
We observe reddish brown coating on the nail called rust (entirely new substance) is chemical change.
- 6. a spoon of sugar is heated in a pan**  
When a spoon of sugar is heated in a pan, black (charred sugar) (carbon) is seen. Is a chemical change.
- 7. lighted match stick is brought near the mouth of the test tube containing hydrogen gas.**  
We observe that hydrogen burns at the mouth of test tube with blue flame and pop sound is heard. It is chemical change.
- 8. quick lime is dissolved in water.**  
The following two observations will be observed  
(i) A hissing sound is observed.  
(ii) The mixture starts boiling and lime water is obtained.
- 9. little amount of curd is added to a bowl containing warm milk and kept for five hours.**  
When a little amount curd is added to a bowl containing warm milk and kept for five hours, a permanent change occurred.  
The milk will change to curd. On boiling water changes into steam (gas) physical change.

### Question 9.

Name a chemical change which takes place in presence of:

**Answer:**

**Heat:**

1. Burning of paper.
2. Cooking of food need heat.

**Light :**

1. Formation of food by plants i.e. photosynthesis need light.

2. Hydrogen and chlorine react in presence of light

### Electricity:

1. Water breaks into hydrogen and oxygen on passing electricity.
2. Sodium chloride solution breaks up into its components sodium and Chlorine on passing electric current through sodium chloride solution.

### Objective Type Questions

#### Question 1.

Fill in the blanks.

1. A new substance is always formed in a **chemical** change.
2. Melting of ice is a **physical** change.
3. When a candle burns, wax melts. Melting of wax is a **physical** change.
4. Chemical change occurs as a result of **rearrangement of atoms** between two substances.
5. Burning of a fuel is a **chemical** change.
6. Revolution of the earth around the sun is a **natural periodic** change.
7. Growing of a seedling into a plant is **chemical** change.

#### Question 2.

State whether the following are physical or chemical changes.

1. **glowing of a bulb** — physical change,
2. **burning of sugar** — chemical change,
3. **heating of water** — physical change,
4. **growing of a piglet into a pig** — chemical change,
5. **burning of wood** — chemical change,
6. **passing electric current through a heater rod** — physical change.
7. **water cycle in nature** — physical change,
8. **respiration in living beings** — chemical change,
9. **shaping a piece of glass** — physical change,
10. **lightning** — chemical change,
11. **(energy produced) dissolving sugar in water** — physical change,
12. **heating a mixture of iron filings and sulphur**—chemical change.
13. **mixing oil with water** — physical change.
14. **cutting wood into small pieces** — physical change,
15. **photosynthesis** — chemical change.
16. **Digestion of food** — chemical change.
17. **Melting of wax** — physical change.
18. **Boiling of an egg** — chemical change.
19. **Slaking of lime** — chemical change.

**Question 3.**

Match the following:

**Answer:**

**Question 4.**

Write true or false against the following statements :

1. Cutting of paper into pieces is a chemical change.  
**False**
2. Rusting of iron is a chemical change.  
**True**
3. Earthquake is a desirable change.  
**False**
4. Melting of ice is a physical change.  
**True**
5. Burning of sugar is a temporary change.  
**False**

**Multiple Choice Questions**

Tick (✓) the correct alternative from the choice given for the following statements :

**Question 1.**

A substance which can not sublime is

**Answer:**

1. iodine
2. camphor
3. **sugar**
4. dry ice

**Question 2.**

When you put some ice cubes in a glass, droplets of water are formed on the outerwall of the glass. This explains the phenomenon of

**Answer:**

1. melting
2. freezing
3. **condensation**
4. evaporation

**Question 3.**

Burning is a

**Answer:**

1. slow process
2. **fast process**
3. natural process
4. none of the above

**Question 4.**

Which one of the following is volatile in nature ?

**Answer:**

1. common salt
2. **petrol**
3. water
4. milk

**Question 5.**

An example of both physical and chemical change is

**Answer:**

1. **burning of candle**
2. melting of ice
3. cooking of food
4. blowing of bulb

**Question 6.**

The compound rust is a hydrated oxide of

**Answer:**

1. copper
2. aluminium
3. **iron**
4. gold

**Question 7.**

When sugar is heated, its colour changes into

**Answer:**

1. red
2. brown
3. **black**
4. grey

**Question 8.**

A pop sound is heard when a lighted match stick is brought near the mouth of a jar. This indicates the release of gas.

**Answer:**

1. oxygen
2. **hydrogen**
3. nitrogen
4. water-vapour

**Question 9.**

When we add water to the following substances, which one will show a chemical change ?

**Answer:**

1. salt
2. sugar
3. oil
4. **quick lime**

**Additional Questions**

**Check Your Progress 1**

**Question 1.**

Is melting of ice a reversible change ?

**Answer:**

True

**Question 2.**

Change of seasons is a non-periodic change. True or false ?

**Answer:**

False. Change of seasons is a periodic change.

**Question 3.**

In a physical change no net energy change is involved. True or false ?

**Answer:**

True

**Question 4.**

New substances are formed in a chemical change. True or false ?

**Answer:**

True

## Check Your Progress 2

### Question 1.

Dissolving of a solid in liquid is a physical change. True or false ?

**Answer:**

**True**

### Question 2.

Is the process of digestion a physical change or chemical change ?

**Answer:**

**Chemical**

### Question 3.

During a physical change energy is either given out or absorbed by the system. True or false ?

**Answer:**

**True**

### Question 4.

In a chemical change, rearrangement of molecules and atoms involves some energy changes. True or false ?

**Answer:**

**True**

### Question 5.

Energy in the form of is absorbed during photosynthesis.

**Answer:**

Energy in the form of **sunlight** is absorbed during photosynthesis.

## Exercises

**A. Tick the most appropriate answer.**

### Question 1.

Melting of ice is a

**Answer:**

1. **reversible change,**
2. irreversible change,
3. chemical change,
4. none of these

**Question 2.**

Rising and setting of the sun at a given place is a

**Answer:**

1. **periodic change.**
2. undesirable change.
3. physical change.
4. reversible change.

**Question 3.**

Physical changes are

**Answer:**

1. permanent.
2. periodic,
3. **temporary**
4. irreversible.

**Question 4.**

Chemical changes involve

**Answer:**

1. change in shape.
2. change in size.
3. **change in molecular composition.**
4. none of these

**Question 5.**

Photosynthesis requires

**Answer:**

1.
  1. heat energy.
  2. wind energy,
  3. **sunlight.**
  4. sound energy.

**B. Fill in the blanks.**

**Questions & answers**

1. A change in which the substance can be brought back to its original state is called a **reversible** change.
2. Changes that occur in nature are called **Natural changes.**
3. An earthquake is a **non-periodic** change.

4. A new substance is formed in a **chemical** change.
5. Heat is **released** by a gas during the process of condensation.

**C. Match the columns.**

**Question**

- |  |                        |
|--|------------------------|
| 1. A change which cannot be easily reversed                    | a. man-made change     |
| 2. A change that repeats itself at regular intervals           | b. chemical change     |
| 3. A change that is made by humans                             | c. physical change     |
| 4. A change in which the original substance cannot be obtained | d. periodic change     |
| 5. A change where no new substance is formed                   | e. irreversible change |
|  | f. slow change         |

**Answer:**

- |  |                        |
|--|------------------------|
| 1. A change which cannot be easily reversed                    | e. irreversible change |
| 2. A change that repeats itself at regular intervals           | d. periodic change     |
| 3. A change that is made by humans                             | a. man-made change     |
| 4. A change in which the original substance cannot be obtained | b. chemical change     |
| 5. A change where no new substance is formed                   | c. physical change     |

**D. Write true or false for each statement. Rewrite the false statements correctly.**

**Question 1.**

Burning of paper and formation of curd are reversible changes.

**Answer:**

False. Burning of paper and formation of curd are irreversible changes.

**Question 2.**

A natural change can also be a desirable change.

**Answer:**

True

**Question 3.**

Deforestation is a man-made change.

**Answer:**

True

**Question 4.**

Decomposition of leaves is a fast change.

**Answer:**

False. Decomposition of leaves is a slow change.

**Question 5.**

Dissolving of solute in a solvent and rusting of iron are both physical changes.

**Answer:**

False. Dissolving of solute in a solvent is a physical change and rusting of iron is a chemical change.

**E. Give reasons for the following.**

**Question 1.**

Dissolving salt in water is a reversible change.

**Answer:**

Dissolving salt in water is a reversible change because salt and water can be again obtained by distillation process.

**Question 2.**

Ripening of fruits is a desirable change.

**Answer:**

Ripening of fruits is a desirable change because this change is beneficial for the mankind and we desire to happen.

**Question 3.**

Melting of solid (wax) is a physical change.

**Answer:**

Melting of solid wax is a physical change because no new substance is formed during this change.

**Question 4.**

Chemical changes are accompanied by changes in energy.

**Answer:**

In a chemical change, molecules and atoms rearrange themselves to form new

substances. This rearrangement involves some energy changes. It can either be absorption or evolution of energy.

**Question 5.**

Photosynthesis cannot take place at night.

**Answer:**

Photosynthesis requires sunlight which is not available at night time. Therefore the process stops at night.

**F. Write short answers.**

**Question 1.**

Name two reversible changes.

**Answer:**

Melting of ice.

Dissolving of salt in water.

**Question 2.**

Give two examples of periodic changes.

**Answer:**

Swinging of a pendulum

(ii) Rising and setting of the sun.

**Question 3.**

Give an example of desirable change which can also be undesirable.

**Answer:**

Using a car to cover a long distance is a desirable change but car emissions can lead to air pollution which is undesirable.

**Question 4.**

What are man-made changes ?

**Answer:**

Man-made changes are those that occur because of human activities e.g. changing the direction of flow of a river by building a dam.

**Question 5.**

Sublimation is classified as a physical change. Why ?

**Answer:**

Physical changes are those in which no new substance is formed. In sublimation there is direct conversion of solid into gas and vice versa. Thus the substance remains the same.

**G. Answer in detail.**

**Question 1.**

Classify the following changes as physical or chemical.

**Answer:**

1. **boiling** — Physical
2. **curdling of milk** — Chemical
3. **photosynthesis in plants** — Chemical
4. **melting of a solid (wax)** — Physical

**Question 2.**

A physical change is temporary. Explain.

**Answer:**

A physical change is defined as a change in which no new substance is formed. A physical change is temporary because this change can be easily reversed by reversing the conditions. For example when ice is melted, it gets converted into water by absorbing heat. Water so formed can be easily converted to ice by cooling thus heat is released. Thus physical change is temporary.

**Question 3.**

State the differences between a physical change and a chemical change.

**Answer:**

Property	Physical change	Chemical Change
Formation of new substance	There are no new substances formed in a physical change.	New substances with different properties are formed in a chemical changes.
Nature of change.	It is usually easy to reverse the process, thereby regain -ing the original substance.	It is usually irreversible.
Energy	Generally energy is neither absorbed nor evolved.	Considerable heat energy is either absorbed or evolved when a chemical change takes place.
Mass	There is no change in the mass of the substance after a physical change.	Mass of a substance changes after a chemical change.





**Across**

- 1. Energy in the form of sunlight is absorbed by the green plants in this process.
- 4. The reddish-brown substance formed over iron in the presence of oxygen and moisture.
- 5. This change is permanent and irreversible.
- 6. The process in which a solid directly changes into gaseous state.

**Down**

- 1 . It is the change that takes place in case of swinging pendulum of a clock. –
- 2. Occurrence of this is a non-periodic change as well as a natural change.
- 3. It is a physical change.

**Answer:**

<sup>1</sup> P	H	O	T	O	<sup>2</sup> S	Y	N	T	H	<sup>3</sup> E	S	I	S	
E					T					V				
<sup>4</sup> R	U	S	T		O					A				
I					R					P				
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D					S			<sup>5</sup> B	U	R	N	I	N	G
I										A				
C			<sup>6</sup> S	U	B	L	I	M	A	T	I	O	N	
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**Question 2.**

Make a list of different types of changes with example.

**Answer:**

Different types of changes are as under :

- 1. Reversible Change e.g. Melting of ice.
- 2. Irreversible Change e.g. Burning of paper.
- 3. Periodic Change e.g. Swinging of pendulum.
- 4. Non-Periodic Change e.g. Occurrence of floods.
- 5. Desirable Change e.g. Ripening of fruits.
- 6. Undesirable Change e.g. Rusting of Iron.
- 7. Natural Change e.g. Changing of Seasons
- 8. Man-Made Change e.g. Changing the direction of flow of a river by dams.
- 9. Slow Change e.g. Growth of a plant
- 10. Fast Change e.g. Occurrence of lightning during thunderstorm.
- 11. Physical Change e.g. transformation of ice.
- 12.. Chemical Change e.g. curdling of milk.