

## Physical and Chemical Changes

### Points to Remember:

- All changes are classified into two types  
**(i) Physical change (ii) Chemical change.**
- **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.
- **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.
- **Chemical Reaction**— Any chemical change in matter involving its transformation into one or more new substances is called a chemical reaction.
- **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.
- The substances that react with one another are called reactants, and the new substances thus formed are called products.
- A balanced chemical reaction is one in which the number of the atoms of each element on the reactant side is equal to the number of atoms of that element on the product side.
- The law of conservation of mass states that mass can neither be created nor be destroyed.
- A chemical equation gives both qualitative and quantitative information about reactants and products.
- The type of chemical reaction in which two substances combine to form a new substance is known as combination reaction.
- 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.

### Activity 2

**Take a carrot and cut it into pieces.**

**Now answer the following questions:**

#### **Question 1.**

Is the change temporary?

**Answer:**

No.

#### **Question 2.**

Is the change reversible?

**Answer:**

No.

**Question 3.**

Why is cutting of carrot into pieces a physical change?

**Answer:**

Because there is no change in the property or chemical composition of the original substance i.e., carrot, and change is only in the state, size, shape, colour, texture or the smell of some or all of the substances that undergo physical change.

**Exercise**

**Question 1.**

Define:

(a) a physical change, (b) a chemical change.

**Answer:**

**(a) Physical Change:** A physical change is a temporary change in which no new substance is formed and the chemical composition of the original substance remains the same, even though its physical properties like colour, state, shape, size etc. might change.

**(b) Chemical Change:** A chemical change is permanent change in which new substances are formed whose chemical composition and physical and chemical properties are different from those of in original substance.

**Question 2.**

Classify the following as a physical or a chemical change.

- (a) Drying of wet clothes
- (b) Manufacture of salt from sea water
- (c) Butter getting rancid
- (d) Boiling of water
- (e) Burning of paper
- (f) Melting of wax
- (g) Burning of coal
- (h) Formation of clouds
- (i) Making of a sugar solution
- (j) Glowing of an electric bulb
- (k) Curdling of milk

**Answer:**

**Physical change**

- (a) Drying of wet clothes
- (b) Manufacture of salt from sea water
- (d) Boiling of water
- (f) Melting of wax
- (h) Formation of clouds
- (i) Making of a sugar solution

(j) Glowing of an electric bulb.

**Chemical change**

(c) Butter getting rancid

(e) Burning of paper

(g) Burning of coal

(k) Curdling of milk

**Question 3.**

**Fill in the blanks.**

**Answer:**

(a) The process of a liquid changing into a solid is called **freezing**.

(b) A change, which alters the composition of a substance, is known as a **chemical** change.

(c) There is no change in the **composition** of the substance during a physical change.

(d) The reaction in which energy is evolved is called **exothermic reaction**.

**Question 4.**

**Given reason:**

(a) Freezing of water to ice and evaporation of water are physical changes.

(b) Burning of a candle is both a physical and chemical change.

(e) Burning of paper is a chemical change.

(d) Cutting of a cloth piece is a physical change, though it cannot be reversed.

**Answer:**

**(a)** Freezing of water to ice and evaporation of water are physical change because water can be brought back to its original (liquid) form by

1. We can heat the ice to bring it back to water.
2. We can cool down the vapours to bring it back to water.

**(b)** When a candle is lighted, some of the solid wax first melts and turns into liquid, then it turns into vapours to produce a flame. New substances  $\text{CO}_2$  and  $\text{H}_2\text{O}$  vapours are formed along with the evolution of light and heat energy. This shows a chemical change. When some of the molten wax drops to the floor, it again solidifies. Which shows a physical change. Thus the melting of candle wax is a physical change and the production of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  represents chemical change.

**(c)** When a piece of paper is burnt a new substance ash is produced. Even when the burning is stopped, the ash cannot be changed back into paper. This shows that the formation of the ash from paper is a permanent and irreversible change.

**(d)** Because it does not change chemical composition of cloth and the change is only in the state, size, shape, colour, texture or the smell of some or all of the substances that undergo physical change.

### Question 5.

Give four difference between physical and chemical changes.

#### Answer:

The differences are Physical and Chemical Changes:

#### Physical change

1. In a physical change no new substance is formed and the chemical composition of substance remains same. There are changes only in physical properties and state.
2. Temporaity change which can be reversed by simple physical methods.
3. Weight of original substance doesn't change
4. Energy like heat, light etc. may or may not be absorbed or released

#### Chemical change

1. In a chemical change new substance with entirely different chemical composition and properties is formed.
2. Permanent change and irreversible
3. Weight of original substances may increase or decrease
4. Energy like heat, light etc. are given out or absorbed.

## ADDITIONAL QUESTIONS

### Check Your Progress 1

1. Is melting of ice a reversible change ?  
**True**
2. Change of seasons is a non-periodic change. True or false ?  
**False.** Change of seasons is a periodic change.
3. In a physical change no net energy change is involved. True or false ?  
**True**
4. New substances are formed in a chemical change. True or false ?  
**True**

### Check Your Progress 2

1. Dissolving of a solid in liquid is a physical change. True or false ?  
**True**
2. Is the process of digestion a physical change or chemical change ?  
**Chemical**
3. During a physical change energy is either given out or absorbed by the system.  
True or false ?  
**True**

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

**True**

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

## EXERCISES

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

**1. Melting of ice is a**

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

**2. Rising and setting of the sun at a given place is a**

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

**3. Physical changes are**

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

**4. Chemical changes involve**

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

**5. Photosynthesis requires**

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

**B. Fill in the blanks.**

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.**

- |  |                        |
|--|------------------------|
| 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         |

**Ans.**

- |  |                        |
|--|------------------------|
| 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.**

1. Burning of paper and formation of curd are reversible changes.  
**False.** Burning of paper and formation of curd are irreversible changes.
2. A natural change can also be a desirable change.  
**True**
3. Deforestation is a man-made change.  
**True**

4. Decomposition of leaves is a fast change.  
**False.** Decomposition of leaves is a slow change.
5. Dissolving of solute in a solvent and rusting of iron are both physical changes.  
**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:**

- (i) Melting of ice.
- (ii) Dissolving of salt in water.

**Question 2.**

Give two examples of periodic changes.

**Answer:**

- (i) 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.

- a. boiling
- b. curdling of milk
- c. photosynthesis in plants
- d. melting of a solid (wax)

**Answer:**

- a. boiling — Physical
- b. curdling of milk — Chemical
- c. photosynthesis in plants — Chemical
- d. 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 change.
Nature of change	It is usually easy to reverse the process, thereby regaining 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.

**Question 4.**

State the various conditions that favour the process of evaporation.

**Answer:**

The various conditions that favour the process of evaporation are discussed as under:

1. **Concentration of water vapour in air: (humidity level):** If the water vapour concentration is high in air the evaporation process gets slowed down.
2. **Pressure:** Evaporation takes place faster when pressure is less and vice versa.
3. **Surface Area:** If the surface area is large then evaporation takes place faster.
4. **Temperature:** On increasing the temperature, the rate of evaporation increases.
5. **Rate of flow of air:** If air is moving over the place all the time, then the concentration of water vapour decreases in the surroundings, thus increasing evaporation rate.

**Question 5.**

How do you say that the process of digestion is a chemical change ?

**Answer:**

During digestion new substances are formed which cannot be converted back to the

same food which we have eaten. Besides energy is also released. These factors prove that digestion is a chemical change.

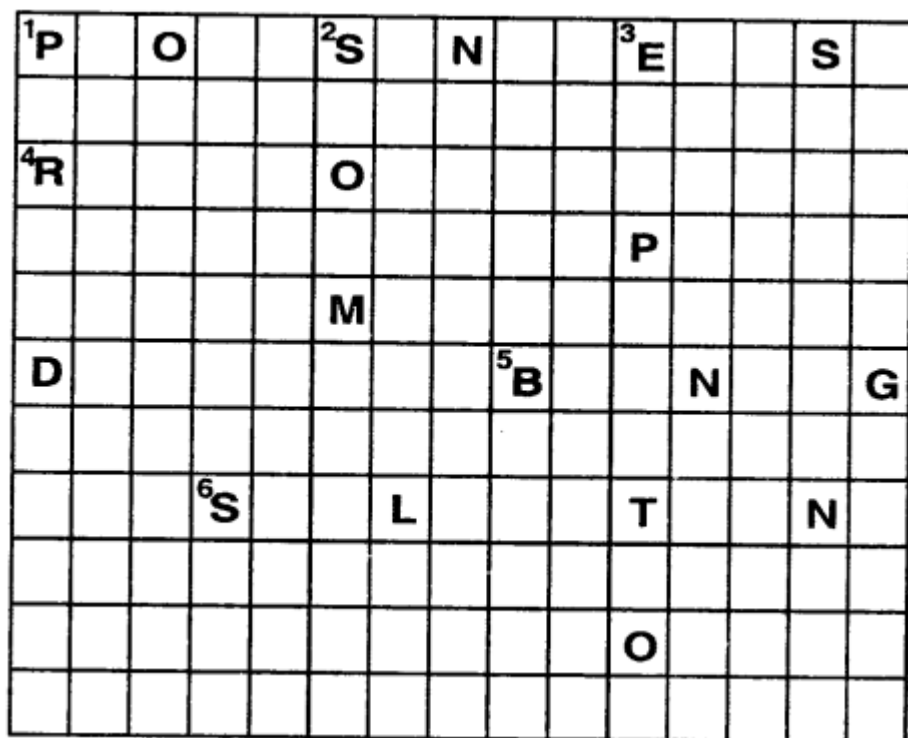
### Question 6.

What role does energy play in initiating a chemical change ?

### Answer:

In a chemical change molecules and atoms rearrange themselves to form new substances. This process involves some energy changes. In some changes energy is absorbed  
e. g. burning of a substance and- in some cases energy is evolved e.g. photosynthesis.

H.1. Solve this crossword by using the clues that follow.



### 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				
O					M					O				
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	
										I				
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										N				

**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.