

**Assignment No. -2**

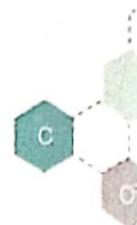
**Subject – Chemistry**

**Class – VIII**

**Chapter – Physical and Chemical Changes**

## 2

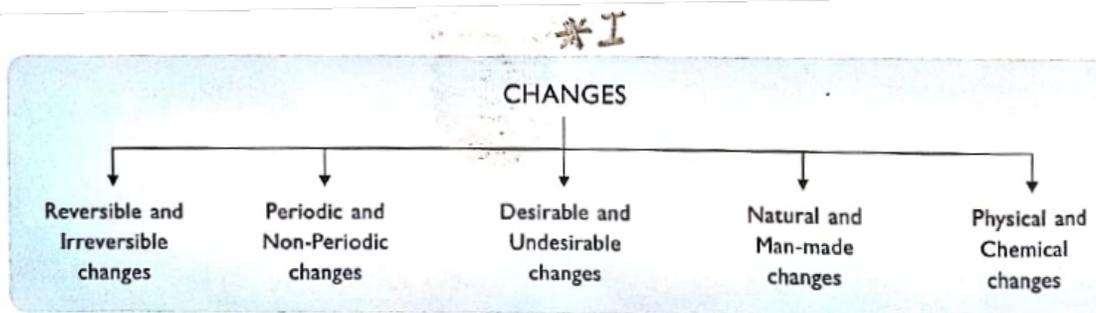
# PHYSICAL AND CHEMICAL CHANGES



### CHANGES

The world around us is forever changing. A change could be spread over a day to months or years. When you get up in the morning, it is quite pleasant. After few hours, the temperature rises and you don't want to venture out. Again after few more hours, the heat starts ebbing away but light starts fading and then comes nightfall. You see all these changes occur in a span of just 24 hours.

Similarly, with the passage of each month, you find changes in your surroundings, different flowers bloom at different times of the year, different fruits are available in different seasons, and so on. Change is an integral part of the nature, be it a physical phenomenon or a biological phenomenon. Let us classify changes into different categories and learn about them. Changes can be categorised as follows:



### PHYSICAL AND CHEMICAL CHANGES

All changes that we discussed earlier are not as important as this category because Chemistry which deals with composition of materials has a direct correlation with these changes.

## PHYSICAL CHANGE

It is a change which is not accompanied with any change in the chemical composition of a substance but affects only the physical properties of a substance. All physical phenomena occurring in nature fall in this category. Physical properties are those properties which can be perceived by our senses like colour, odour, etc.

### CHARACTERISTICS OF PHYSICAL CHANGES \* II

1. No new substances are formed during a physical change.

**Example-** If you break a chalk-stick into two pieces, the pieces have not undergone any chemical decomposition. They are still a chalk, though in smaller pieces.

2. Physical changes are generally reversible.

**Example-** Melting of wax; when you take some candle wax in a test tube and heat it, it melts and forms a liquid. As soon as you stop heating, it starts solidifying and after sometime forms a solid. Here the physical change is reversible.

3. A physical change cannot be represented by a chemical equation.
4. It is temporary in nature.
5. Chemical composition never gets changed.

## CHEMICAL CHANGES

When elements give or take electrons, they form ions. These ions are attracted towards each other and are held by force of attraction. The resulting substance is called a compound. The interaction of the two atoms is called **Chemical Bond** and the process through which this change of elements into compound takes place, is called a **chemical change**.

When Hydrogen gas combines with Oxygen gas, they form water which is a liquid. To live, we breathe in oxygen but water is not required for breathing. A chemical change produces substance with totally new set of properties, which are completely different from its combining elements.

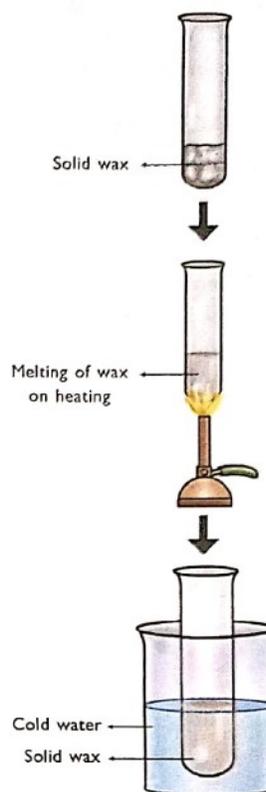


Fig. 2.1 – Physical change

Thus, chemical change can be defined as- "A change which alters the properties of a substance and produces a new substance with entirely new properties."

### CHARACTERISTICS OF CHEMICAL CHANGES \*III

1. When a chemical change occurs, new substances with entirely new set of properties are formed.

#### Example from day to day life-

When milk changes to curd, it acquires new properties like it tastes sour, it turned semisolid, it cannot be warmed like milk. Hence, curdling of milk is a chemical change.

2. A chemical change cannot be easily reversed.

The activity which you performed just now cannot be reversed i.e. you cannot put back the molecules of Carbon dioxide ( $\text{CO}_2$ ) in Calcium carbonate ( $\text{CaCO}_3$ ).

The change can be represented as-

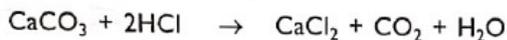


Fig. 2.2 - Curd

### • ACTIVITY



#### To observe the occurrence of a chemical change.

Take a clean and dry test tube and hold it with test tube holder. Put solid Calcium Carbonate in it and add dil. HCl about 2-5 ml in the test tube. You will observe that lot of foaming takes place in the test tube and some fumes are seen coming out of the test tube. In chemical language we say that a gas has evolved with effervescence (foaming). Pass the gas through lime water using delivery tube, till lime water turns milky.

Thus, we can conclude that on adding dilute HCl (hydrochloric acid) to Calcium Carbonate, new gas Carbon dioxide was formed. Hence, it was a chemical change.

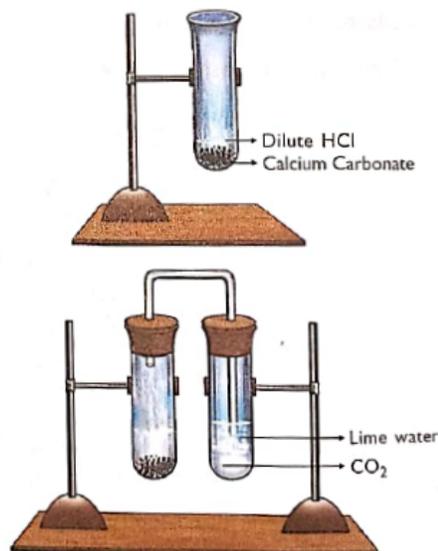


Fig. 2.3 - Occurrence of a chemical change

- The number of atoms before and after chemical change remains same.  
The chemical change which occurred on adding  $2\text{HCl}$  to  $\text{CaCO}_3$  involves a total of  $2\text{H}$  atoms +  $2\text{Cl}$  atoms +  $1\text{Ca}$  atom +  $1\text{C}$  atom and  $3\text{O}$  atoms =  $9$  atoms.  
The new substances formed are  $\text{CaCl}_2$ ,  $\text{H}_2\text{O}$  and  $\text{CO}_2$  which is equal to  $1\text{Ca}$  atom,  $2\text{Cl}$  atoms,  $2\text{H}$  atoms,  $1\text{C}$  atom and  $3\text{O}$  atoms =  $9$  atoms.
- Heat may be absorbed or evolved during a chemical change.

## CHEMICAL CHANGES AND RE-ARRANGEMENT OF ATOMS

During a chemical change, atoms re-arrange themselves to form new substances. They do so in two ways-

- Combination-** In the formation of water from hydrogen and oxygen, atoms of hydrogen combine with atoms of oxygen to form water.
- Decomposition-** Water on using suitable method can be made to break down or decompose into oxygen and hydrogen.

According to the law of conservation of mass, matter can neither be created nor destroyed. So, the total quantity of matter before and after the change remains the same. From this, it can be concluded that any new substances formed in a chemical change is due to the re-arrangement of the atoms of original substances; the number of atoms of each kind remaining the same before and after the chemical change.

## DIFFERENCES BETWEEN PHYSICAL AND CHEMICAL CHANGES LEARN

Physical changes	Chemical changes
1. No new substance is formed.	1. New substances with new properties are produced.
2. It is a temporary change and can be reversed.	2. It is a permanent change and cannot be reversed.
3. There is no net absorption or release of energy. Examples- Melting of ice, breaking of glass, glowing of an electric bulb.	3. There is always absorption or release of energy. Examples- Cooking of food, curdling of milk, ripening of fruits, rusting of iron, respiration.
4. There is no change in the mass of the substance.	4. The mass of the substance may get changed but total mass of reactants and products remains the same.

### Physical Changes



A change that can be reversed back like ice melts and changes to water. Water again can turn to ice.

### Chemical Changes



A change that cannot be reversed back like milk can change to curd but curd cannot turn to milk.



A physical change can be reversed.  
In physical change, the chemical composition of a substance remains same.  
Like - Melting of wax.



A chemical change can not be reversed.  
In chemical change, the chemical composition of a substance changes.  
Like - Burning of candle wax.

### Lesson At A Glance



*Learn.*

- A change in which no new substances are formed and which can be reversed by reversing the conditions is called a physical change.
- A change in which new substances are formed and which cannot be reversed by reversing the conditions is called a chemical change.
- Chemical changes are represented by chemical equations.
- Any new substance formed during a chemical change is due to the re-arrangement of atoms of the original substances.

## Keywords

*learn.*

- Physical change** - A change in which no new substances are formed.
- Chemical change** - A change in which new substances are formed.
- Products** - Substances which are formed during a chemical reaction.
- Reactants** - Substances which react in a chemical reaction.

## Exercises

**D. Classify the following changes as physical or chemical:** *Mark it in book only.*

1. Burning of wood
2. Tearing of paper
3. Butter turning rancid
4. Melting of wax
5. Burning of candle
6. Growing of a tree
7. Bursting of pipes in winter
8. Digestion of food
9. Curdling of milk
10. Switching on a lamp

**E: Answer in short:**

1. What all things must be known to us to write a correct molecular formula?
- ✓ 2. What is a physical change? Give one example.

- ✓ 3. What is a chemical change? Give one example.

**F. Answer in detail:**

- ✓ 1. State the differences between physical and chemical change.
2. Write in detail about a situation in which physical and chemical changes take place simultaneously.
4. Giving a suitable example, discuss the re-arrangement of atoms in a chemical change.

# EXPLANATION

## **\*1 Types of Changes**

- i) **Reversible Change** – A change that can be reversed is called reversible change. For e.g. melting of wax
- ii) **Irreversible Change** – A change that cannot be reversed is called irreversible change. For e.g. curdling of milk.
- iii) **Periodic Change** – A change which occurs after a regular interval of time. For e.g. occurrence of day and night.
- iv) **Non-Periodic Change** – A change which is not repeated after a regular interval of time. For e.g. thunder and lightning
- v) **Desirable Change** - A useful change which is good for us is called desirable change. For e.g. ripening of fruits.
- vi) **Undesirable Change**- A harmful change which is not required or not good for us is called undesirable change. For e.g. earthquake.

- vii) **Natural Change** – A change that occurs naturally. For e.g. rising of sun.
- viii) **Man made change** – A change which occurs due to the action of human activities is called man made change. For e.g construction of bridge.
- ix) **Physical Change** – A change in which no new substances are formed and which can be reversed by reversing the conditions is called a physical change. For e.g. Glowing of bulb.
- x) **Chemical Change** – A change in which new substances are formed and which cannot be reversed by reversing the conditions is called chemical change. For e.g. Cooking of food.

## **\*II – Characteristics of Physical Changes**

- i) No new substances are formed during a physical change.
- ii) Physical changes are generally reversible.
- iii) A physical change cannot be represented by a chemical equation.
- iv) It is temporary in nature.
- v) Chemical composition do not change.

### **\*III – Characteristics of Chemical Changes**

- i) New substances with entirely new properties are formed during a chemical change.
- ii) A chemical change cannot be easily reversed
- iii) There is always absorption or release of energy during a chemical change.
- iv) It is a permanent change.
- v) A chemical change can be represented by a chemical equation.

### **Question and Answers (To be written in the notebooks)**

**Question 1:** What all things should be known to us to write a correct molecular formula?

**Answer 1:** To write a correct molecular formula we must know –

- i) The symbols of atoms and ions present in that compound.
- ii) The valencies of ions and radicals found in that compound.

**Question 2:** Write in detail about a situation in which physical and chemical changes take place simultaneously.

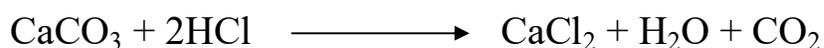
**Answer 2:** Physical and chemical changes occur simultaneously during burning of candle.

When a candle is ignited, first the wax melts i.e. changes from solid to molten wax, when it absorbs heat energy, and then on further heating it changes into wax vapours. This is a physical change.

Then these wax vapours burn with a bright flame to form Carbon-di-oxide gas and water vapour. This is a chemical change as it cannot be reversed back.

**Question 3:** Giving a suitable example, discuss the re-arrangement of atoms in a chemical change.

**Answer 3:** During a chemical change, atoms re-arrange themselves to form new substances. Example – When Calcium Carbonate reacts with dilute hydrochloric acid, the new substances formed are Calcium Chloride, water and Carbon-di-oxide gas.



In the above reaction, the new substances are formed due to the re-arrangement of the atoms of original substances. Therefore, the number of atoms of each kind remains the same before and after the chemical change.

Reactants –  $\text{CaCO}_3$  and  $2\text{HCl}$  involves a total of 2 H atoms + 2Cl atoms + 1Ca atom + 1C atom and 3O atoms = 9 atoms.

Products -  $\text{CaCl}_2$ ,  $\text{H}_2\text{O}$  and  $\text{CO}_2$  involves a total of 1Ca atom + 2Cl atoms + 2H atoms + 1C atom and 3O atoms = 9 atoms.

# WORKSHEET

**Answer the following questions (To be written in notebooks)**

**Question 1**      What is a physical change? Give three examples.

**Question 2**      What is a chemical change? Give three examples.

**Question 3**      State the differences between physical and chemical change.

**Question 4**      Give two examples of each of the following changes

- (i) Reversible Change
- (ii) Irreversible Change.
- (iii) Periodic Change.
- (iv) Non-periodic Change.
- (v) Desirable Change.
- (vi) Undesirable Change
- (vii) Natural Change
- (viii) Man made Change
- (ix) Slow Change
- (x) Fast Change

**Question 5** Fill in the blank spaces :

- (i) The force of attraction between the atoms or ions in a chemical compound is called \_\_\_\_\_.
- (ii) According to the law of conservation of mass, matter can neither be \_\_\_\_\_ nor be \_\_\_\_\_.
- (iii) New substances formed during a chemical change is due to the \_\_\_\_\_ of the atoms of original substances.
- (iv) A change that repeats itself after a regular interval of time is called \_\_\_\_\_.
- (v) A \_\_\_\_\_ change can be represented by a chemical equation.

**Question 6** Give reasons. Why?

- (i) Breaking of glass is a physical change though it is irreversible.
- (ii) Mixing of cement with water is an irreversible change.
- (iii) Digestion of food is a chemical change.

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