

1. Tick the correct answer.

A. Which of the following bears a diatomic molecule?

✓ Nitrogen (N<sub>2</sub>)

Nitrogen exists in nature as a diatomic molecule (two atoms joined together).

B. Which of the following is a chemical change?

✓ Burning of coal

Burning is a chemical change because a new substance (carbon dioxide) is formed, and the process is irreversible.

C. Which of the following is an exothermic reaction?

✓  $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$

This is exothermic because heat energy is released during the reaction.

D. When a piece of granulated zinc was added into dilute HCl, what gas was produced?

✓ Hydrogen (H<sub>2</sub>)

Reaction:  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\uparrow$

E. What does the symbol ( $\rightleftharpoons$ ) represent?

✓ Reversible reaction

It shows that the reaction can proceed both forward and backward.

F. What gas will be produced if KClO<sub>3</sub> is heated?

✓ Oxygen (O<sub>2</sub>)

Reaction:  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2\uparrow$

G. If limestone (CaCO<sub>3</sub>) is heated, what will be the products?

✓  $\text{CaO} + \text{CO}_2$

Reaction:  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2\uparrow$

## 2. Answer in these questions

### a. What are physical and chemical changes? Explain with examples.

A **physical change** is a change in which only the physical properties such as shape, size, state, or appearance of a substance are changed and no new substance is formed. For example, melting of ice, boiling of water, and breaking of glass are physical changes.

A **chemical change** is a change in which the original substance is converted into a new substance with different properties. Such changes are usually irreversible. For example, burning of paper, rusting of iron, and digestion of food are chemical changes.

### b. What is chemical reaction? What are the ways to write chemical reactions?

A **chemical reaction** is a process in which one or more substances, called reactants, undergo chemical changes to form new substances, called products.

Chemical reactions can be written in two ways:

**Word equation** - in which the names of substances are written in words.

**Symbolic equation** - in which the chemical symbols and formulae are used to represent the reaction.

### c. What do you mean by word equation and symbolic equation? Give two examples of each.

A **word equation** is the representation of a chemical reaction in words, showing the names of reactants and products.

Example 1: Hydrogen + Oxygen  $\rightarrow$  Water

Example 2: Carbon + Oxygen  $\rightarrow$  Carbon dioxide

A **symbolic equation** is the representation of a chemical reaction using chemical symbols and formulae of the substances. Example 1:  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

Example 2:  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

### d. What do you understand by diatomic elements? Give examples.

The elements whose molecules consist of two atoms of the same element joined together are called **diatomic elements**. These atoms always exist in pairs under normal conditions.

Examples: Hydrogen ( $\text{H}_2$ ), Oxygen ( $\text{O}_2$ ), Nitrogen ( $\text{N}_2$ ), Chlorine ( $\text{Cl}_2$ ), Fluorine ( $\text{F}_2$ ), Bromine ( $\text{Br}_2$ ), and Iodine ( $\text{I}_2$ ).

**e. Define a balanced and an unbalanced equation with an example of each.**

A **balanced chemical equation** is a chemical equation in which the number of atoms of each element is equal on both sides of the equation.

Example:  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

An **unbalanced chemical equation** is a chemical equation in which the number of atoms of elements is not equal on both sides.

Example:  $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$

**f. Explain the terms reactant and product with examples.**

The substances which take part in a chemical reaction and undergo changes are called **reactants**. The new substances formed as a result of the reaction are called **products**.

Example: In the reaction  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ , hydrogen and oxygen are reactants, while water is the product.

**g. Define reversible and irreversible reactions with an example of each.**

A **reversible reaction** is a reaction in which the products can be converted back into the reactants under suitable conditions.

Example:  $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$

An **irreversible reaction** is a reaction in which the products cannot be changed back into the reactants.

Example: Burning of paper.

**h. Two different chemical reactions are taking place in two beakers. If touched, the first beaker feels hot, whereas the second one feels cold. What kinds of reactions are taking place? Define them.**

The reaction in the first beaker is an **exothermic reaction** because heat is released during the reaction.

The reaction in the second beaker is an **endothermic reaction** because heat is absorbed during the reaction.

**i. A chef is cooking food by burning gas in a stove. Can you find exothermic and endothermic reactions?**

Yes. The burning of gas in the stove is an **exothermic reaction** because it produces heat. The cooking of food by absorbing this heat is an **endothermic reaction**.

j. Our daily life would have been almost impossible if there were no chemical reactions. Justify this statement.

Our daily life depends on chemical reactions. Important life processes such as respiration, digestion of food, and photosynthesis are all chemical reactions. The burning of fuels to obtain energy and the preparation of food also involve chemical changes. Without chemical reactions, life would not exist, and survival would be impossible.

### 3. Differentiate between

#### a. Physical change and Chemical change

##### Physical Change

1. No new substance is formed.
2. It is usually reversible.
3. Only physical properties such as shape, size, and state change.
4. Example: Melting of ice, breaking glass.

##### Chemical Change

1. A new substance is formed.
  2. It is usually irreversible.
  3. Both physical and chemical properties of the substance change.
  4. Example: Rusting of iron, burning of paper.
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#### b. Balanced and Unbalanced chemical equation

##### Balanced Chemical Equation

1. The number of atoms of each element is equal on both sides of the equation.
2. It obeys the law of conservation of mass.
3. It represents the actual chemical reaction correctly.
4. Example:  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

##### Unbalanced Chemical Equation

1. The number of atoms of each element is not equal on both sides.
  2. It does not obey the law of conservation of mass.
  3. It does not represent the actual reaction correctly.
  4. Example:  $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
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#### c. Chemical reaction and Chemical equation

##### Chemical Reaction

1. It is the actual process in which reactants change into products.
2. It cannot be seen directly, but its effects can be observed.
3. It takes place naturally or under given conditions.
4. Example: Burning of fuel, rusting of iron.

##### Chemical Equation

1. It is the symbolic or word representation of a chemical reaction.
2. It can be written and studied in symbols or words.
3. It is written by using reactants and products with arrow signs.
4. Example:  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

#### 4. Give reasons

**a. Making ornament from gold is a physical change.**

Because gold is only melted and given shape, but no new substance is formed.

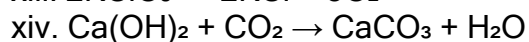
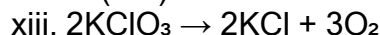
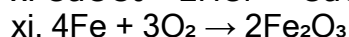
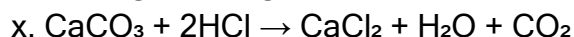
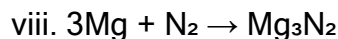
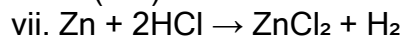
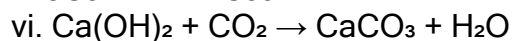
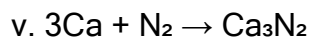
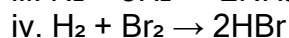
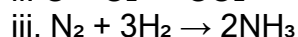
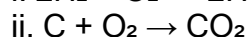
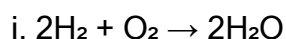
**b. Melting of ice is an example of physical change.**

Because only the physical state of water changes from solid to liquid, but the chemical composition remains the same.

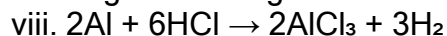
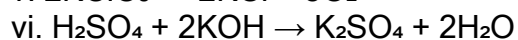
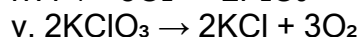
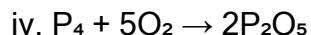
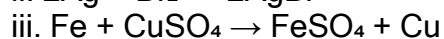
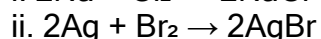
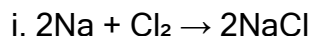
**c. Growth of child into adult is a chemical change.**

Because new substances like proteins, tissues, and hormones are formed inside the body, and the change is irreversible.

#### 5. Balanced chemical equations



#### 6. Balance the following skeletal equations



## 7. Complete and balance

