



CHAPTER:-1

STD:-10TH

SUB:-SCIENCE

1. Why should a magnesium ribbon be cleaned before burning in air?

ANS :- A magnesium ribbon needs to be cleaned before burning in air because it usually has a thin coating of **magnesium oxide (MgO)** on its surface.

Here's why that matters:

- **Magnesium reacts with oxygen in air** to form magnesium oxide.
- This oxide layer forms naturally when the metal is exposed to air and acts as a **protective barrier**.
- If you try to burn magnesium without cleaning it, the oxide layer **prevents proper contact between magnesium and oxygen**, making it harder to ignite and burn efficiently.

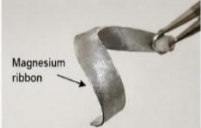
By cleaning (usually rubbing with sandpaper), you **remove the oxide layer**, exposing fresh magnesium metal. This allows it to **burn readily with a bright white flame**.

So in short:

👉 Cleaning removes the oxide coating, ensuring smooth and complete burning.


Why should a magnesium ribbon be cleaned before burning in air?

Because a thin layer of **magnesium oxide (MgO)** on its surface prevents it from burning readily and completely.



What happens if it is not cleaned?


Magnesium ribbon exposed to air develops a thin layer of **magnesium oxide (MgO)**.



Magnesium oxide (MgO) layer
Magnesium (Mg) metal

This oxide layer acts as a barrier and prevents magnesium from reacting properly with oxygen in air.


When not cleaned, magnesium is difficult to ignite and burns poorly.



Dull flame, smoke and blackish residue of MgO.


What happens when it is cleaned?

Cleaning with sandpaper removes the oxide layer and exposes fresh magnesium.



Cleaning with sandpaper

Clean magnesium ignites easily and burns with a bright white flame.



Bright white flame and white ash of MgO.

In short:
Cleaning removes the magnesium oxide coating, allowing magnesium to react freely with oxygen in air and burn readily with a bright white flame, forming magnesium oxide (MgO).

$$2\text{Mg (s)} + \text{O}_2 \text{(g)} \rightarrow 2\text{MgO (s)}$$

Magnesium Oxygen Magnesium oxide



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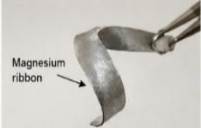
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Magnesium Oxygen Magnesium oxide

2. Write the balanced equation for the following chemical reactions.

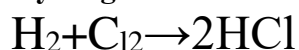
(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

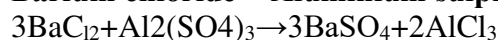
(iii) Sodium + Water → Sodium hydroxide + Hydrogen

ANS:- Here are the balanced chemical equations:

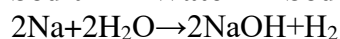
1. **Hydrogen + Chlorine → Hydrogen chloride**



2. **Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride**



3. **Sodium + Water → Sodium hydroxide + Hydrogen**

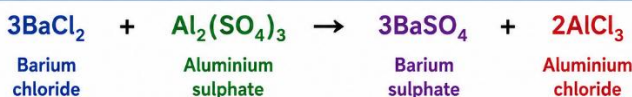


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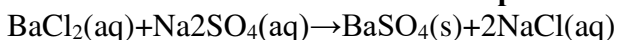


3. Write a balanced chemical equation with state symbols for the following reactions.

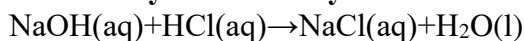
(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

1. ANS:- **Barium chloride + Sodium sulphate → Barium sulphate + Sodium chloride**

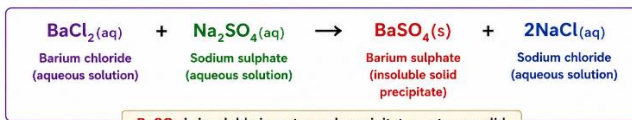


2. **Sodium hydroxide + Hydrochloric acid → Sodium chloride + Water**



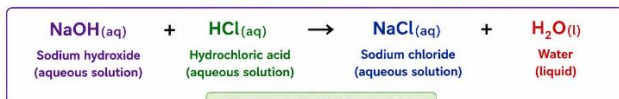
3. Write a balanced chemical equation with state symbols for the following reactions.

- (i) Solutions of **barium chloride** and **sodium sulphate** in water react to give insoluble **barium sulphate** and the solution of **sodium chloride**.



BaSO_4 is insoluble in water and precipitates out as a solid.

- (ii) **Sodium hydroxide** solution (in water) reacts with **hydrochloric acid** solution (in water) to produce **sodium chloride** solution and **water**.



This is a neutralization reaction.

4. A solution of a substance 'X' is used for whitewashing.

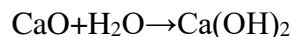
- (i) Name the substance 'X' and write its formula.

- (ii) Write the reaction of the substance 'X' named in (i) above with water.

ANS:- (i) The substance 'X' used for whitewashing is **quicklime (calcium oxide)**.



- (ii) Reaction of 'X' with water (forms slaked lime used in whitewashing):



A solution of a substance 'X' is used for whitewashing.

- (i) Name the substance 'X' and write its formula.

The substance 'X' used for whitewashing is **QUICKLIME (CALCIUM OXIDE)**.

Formula of calcium oxide:
CaO

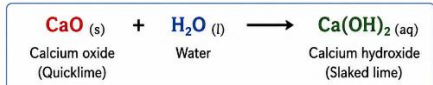


Quicklime
(Calcium oxide)



Whitewashing
(with slaked lime)

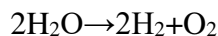
- (ii) Write the reaction of the substance 'X' named in (i) above with water.



Calcium oxide reacts with water to form calcium hydroxide, which is used for **whitewashing**.

5. Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

ANS:- In Activity 1.7 (electrolysis of water), the amount of gas collected in one test tube is double the amount collected in the other because **water breaks down into hydrogen and oxygen in the ratio 2 : 1**.



Two molecules of **hydrogen gas** are produced for every one molecule of **oxygen gas**.

- Therefore, the volume of hydrogen collected is **double** the volume of oxygen.

👉 The gas collected in larger amount is **hydrogen gas (H₂)**.

Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

In Activity 1.7, water is decomposed by electricity. It breaks down into **hydrogen** and **oxygen** gases.

The reaction is:
$$2\text{H}_2\text{O} (\text{l}) \rightarrow 2\text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$$

- Two molecules of **hydrogen gas (H₂)** are produced for every one molecule of **oxygen gas (O₂)**.
- Hence, the volume of **hydrogen gas** collected is **double** the volume of **oxygen gas**.

Conclusion The amount of gas collected in one test tube is double because water decomposes into **hydrogen** and **oxygen** gases in the ratio **2 : 1**.

The gas collected in larger amount is **HYDROGEN GAS (H₂)**.

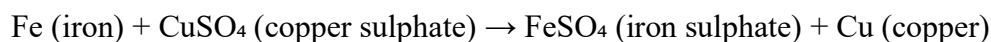
6. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

ANS:- When an iron nail is dipped into a copper sulphate solution, the colour changes because of a **displacement reaction** (a type of chemical reaction).

What happens?

- Copper sulphate solution is **blue** due to the presence of copper ions (Cu²⁺).
- Iron is more reactive than copper, so it **displaces copper** from the solution.

The reaction:



Why the colour changes:

- The blue copper sulphate solution turns **green** because **iron sulphate (FeSO₄)** is formed.
- A reddish-brown layer of copper metal deposits on the iron nail.

Key concept:

This is explained by the reactivity series — iron is above copper, so it can replace it from its compound.

So, the colour change occurs because a **new substance (iron sulphate)** forms while **copper is displaced and deposited**.

Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

When an iron nail is dipped in copper sulphate solution, a displacement reaction occurs. Iron is more reactive than copper, so it displaces copper from copper sulphate to form iron sulphate and copper.

Explanation

- Iron (Fe) is more reactive than copper (Cu).
- So, iron displaces copper from copper sulphate solution.

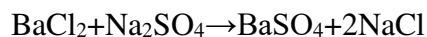
Reactivity series (part)

K Na Ca Mg Al Zn **Fe** Pb (H) **Cu** Hg Ag Au
 More reactive → Less reactive

Conclusion: The colour changes from blue to green because copper sulphate (blue) changes to iron sulphate (green) when iron displaces copper.

6. Give an example of a double displacement reaction other than the one given in Activity 1.10.

ANS:- An example of a **double displacement reaction** is:



Here:

- Barium chloride (BaCl₂) reacts with sodium sulphate (Na₂SO₄).
- The ions exchange places to form:
 - **Barium sulphate (BaSO₄)** — a white precipitate
 - **Sodium chloride (NaCl)**

This is called a double displacement reaction because the positive and negative ions of two compounds exchange places.

Example of a Double Displacement Reaction (Other than the one given in Activity 1.10)

In a **double displacement reaction**, the positive ions and negative ions of two compounds exchange places to form two new compounds.



What happens?

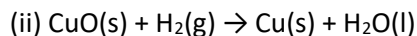
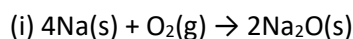
- When barium chloride solution is mixed with sodium sulphate solution, a white precipitate of barium sulphate is formed.
- Sodium chloride remains in the solution.

Key Points

- ◆ The ions exchange places.
- ◆ Ba^{2+} combines with SO_4^{2-} to form insoluble BaSO_4 (white ppt).
- ◆ Na^+ combines with Cl^- to form soluble NaCl .

Conclusion: This reaction is an example of a double displacement reaction.

7. Identify the substances that are oxidised and the substances that are reduced in the following reactions.



ANS:- (i) $4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$

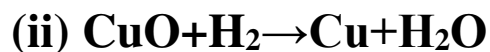
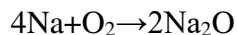
Sodium (Na) gains oxygen to form sodium oxide, so sodium is oxidised.

- Oxygen (O_2) combines with sodium, so oxygen is **reduced**.

Oxidation and Reduction:

- **Oxidised substance:** Sodium (Na)
- **Reduced substance:** Oxygen (O_2)

The reaction is shown below:



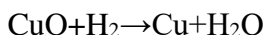
Hydrogen (H₂) gains oxygen to form water, so hydrogen is oxidised.

- Copper oxide (CuO) loses oxygen to form copper, so copper oxide is **reduced**.

Oxidation and Reduction:

- **Oxidised substance:** Hydrogen (H₂)
- **Reduced substance:** Copper oxide (CuO)

The reaction is shown below:



Identify the substances that are oxidised and the substances that are reduced in the following reactions.

(i) $4\text{Na}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{Na}_2\text{O}(\text{s})$

Sodium (Na) gains oxygen to form sodium oxide. **Oxidised**

Oxygen (O₂) combines with sodium. **Reduced**

Identification:

- ◆ **Oxidised substance:** Sodium (Na)
- ◆ **Reduced substance:** Oxygen (O₂)

Oxidation: Addition of oxygen / removal of hydrogen / loss of electrons.
Reduction: Removal of oxygen / addition of hydrogen / gain of electrons.

(ii) $\text{CuO}(\text{s}) + \text{H}_2(\text{g}) \rightarrow \text{Cu}(\text{s}) + \text{H}_2\text{O}(\text{l})$

Copper oxide (CuO) loses oxygen to form copper. **Reduced**

Hydrogen (H₂) gains oxygen to form water. **Oxidised**

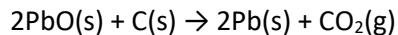
Identification:

- ◆ **Reduced substance:** Copper oxide (CuO)
- ◆ **Oxidised substance:** Hydrogen (H₂)

Oxidation: Addition of oxygen / removal of hydrogen / loss of electrons.
Reduction: Removal of oxygen / addition of hydrogen / gain of electrons.

EXERCISES

1. 1. Which of the statements about the reaction below are incorrect?



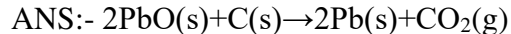
- (a) Lead is getting reduced.
- (b) Carbon is getting oxidised.
- (c) Carbon dioxide is getting oxidised.
- (d) Lead oxide is getting reduced.

(i) (a) and (b)

(ii) (a) and (c)

(iii) (a), (b) and (c)

(iv) all



- **PbO** → **Pb** : Oxygen is removed from lead oxide, so **lead oxide is reduced**.
- **C** → **CO₂** : Oxygen is added to carbon, so **carbon is oxidised**.

Now check the statements:

- (a) **Lead is getting reduced** → Incorrect
(Actually, lead oxide is reduced to lead.)
- (b) **Carbon dioxide is getting oxidised** → Incorrect
(Carbon dioxide is the product formed; carbon is oxidised.)
- (c) **Carbon is getting oxidised** → Correct
- (d) **Lead oxide is getting reduced** → Correct

Correct answer: (i) (a) and (b)



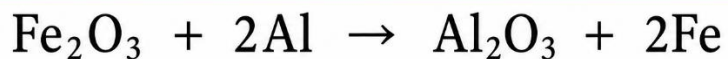
The above reaction is an example of a

- (a) combination reaction.
- (b) double displacement reaction.
- (c) decomposition reaction.
- (d) displacement reaction.


ANS:- $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

is a **displacement reaction** because aluminium displaces iron from iron oxide.

Correct answer: **(d) displacement reaction**



The above reaction is an example of a

(a)	combination reaction.
(b)	double displacement reaction.
(c)	decomposition reaction.
(d)	displacement reaction. 

Explanation: In this reaction, aluminium (Al) displaces iron (Fe) from iron oxide (Fe_2O_3) to form aluminium oxide (Al_2O_3) and iron (Fe). Hence, it is a **displacement reaction**.

3. What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

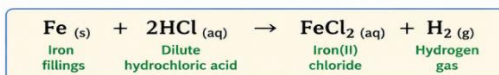
- (a) Hydrogen gas and iron chloride are produced.
- (b) Chlorine gas and iron hydroxide are produced.
- (c) No reaction takes place.
- (d) Iron salt and water are produced.

ANS:- When dilute hydrochloric acid reacts with iron filings:

$\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$ Iron reacts with hydrochloric acid to form **iron chloride** and **hydrogen gas**.

Correct answer: **(a) Hydrogen gas and iron chloride are produced.**

What happens when dilute hydrochloric acid is added to iron filings?
Tick the correct answer.



- | | | |
|------------|---|-------------------------------------|
| (a) | Hydrogen gas and iron chloride are produced. | <input checked="" type="checkbox"/> |
| (b) | Chlorine gas and iron hydroxide are produced. | <input type="checkbox"/> |
| (c) | No reaction takes place. | <input type="checkbox"/> |
| (d) | Iron salt and water are produced. | <input type="checkbox"/> |

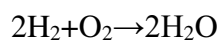
Explanation: Iron reacts with dilute hydrochloric acid to form iron(II) chloride (a salt) and hydrogen gas.

Equation: $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\uparrow$
This is a single displacement reaction.

4. What is a balanced chemical equation? Why should chemical equations be balanced?

ANS:- A **balanced chemical equation** is a chemical equation in which the number of atoms of each element is the same on both the reactant side and the product side.

Example:



Here:

- Hydrogen atoms = 4 on both sides
- Oxygen atoms = 2 on both sides

Why should chemical equations be balanced?

Chemical equations should be balanced because of the **law of conservation of mass**. Matter cannot be created or destroyed in a chemical reaction, so the total number of atoms must remain equal on both sides of the equation

4. What is a balanced chemical equation?

A balanced chemical equation is a chemical equation in which the **number of atoms** of each element is the **same on both the reactant side and the product side**.

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

<p>Reactant side</p> <p>Hydrogen atoms = 4 } Oxygen atoms = 2 }</p>		<p>Product side</p> <p>Hydrogen atoms = 4 } Oxygen atoms = 2 }</p>
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Why should chemical equations be balanced?

Chemical equations should be balanced because of the **law of conservation of mass**. Matter cannot be created or destroyed in a chemical reaction, so the **total number of atoms** must remain equal on both sides of the equation.

5. Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

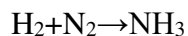
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

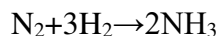
(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

ANS:- (a) Hydrogen gas combines with nitrogen to form ammonia

Unbalanced equation:

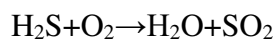


Balanced equation:

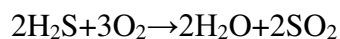


(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide

Unbalanced equation:

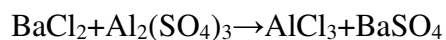


Balanced equation:

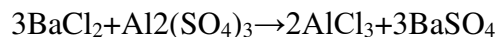


(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and barium sulphate

Unbalanced equation:

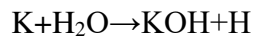


Balanced equation:

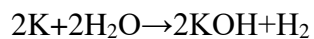


(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas

Unbalanced equation:



Balanced equation:



Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

Unbalanced equation:	$\text{H}_2 + \text{N}_2 \rightarrow \text{NH}_3$
Balanced equation:	$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$

(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

Unbalanced equation:	$\text{H}_2\text{S} + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{SO}_2$
Balanced equation:	$2\text{H}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{SO}_2$

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

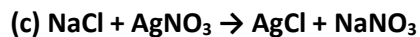
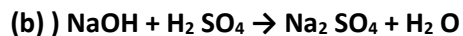
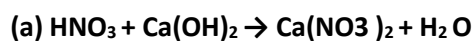
Unbalanced equation:	$\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow \text{AlCl}_3 + \text{BaSO}_4$
Balanced equation:	$3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 2\text{AlCl}_3 + 3\text{BaSO}_4$

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Unbalanced equation:	$\text{K} + \text{H}_2\text{O} \rightarrow \text{KOH} + \text{H}_2$
Balanced equation:	$2\text{K} + 2\text{H}_2\text{O} \rightarrow 2\text{KOH} + \text{H}_2$

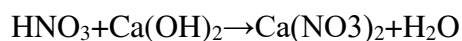
Note: In balanced chemical equations, the number of atoms of each element is the same on both the reactant side and the product side.

6. Balance the following chemical equations.

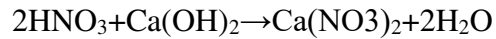


ANS:- (a) Balance the equation

Unbalanced:

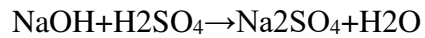


Balanced:

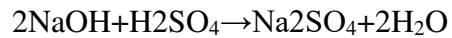


(b) Balance the equation

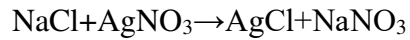
Unbalanced:



Balanced:



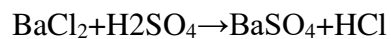
(c) Balance the equation



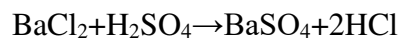
This equation is already balanced.

(d) Balance the equation

Unbalanced:

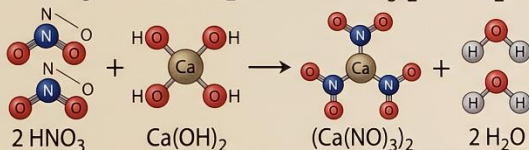
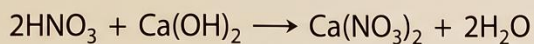


Balanced:



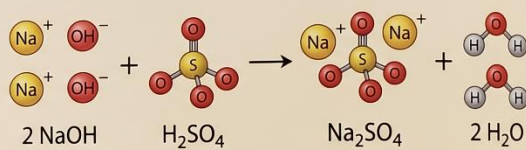
BALANCED CHEMICAL EQUATIONS (Answers to Question 6)

(a) Nitric Acid + Calcium Hydroxide



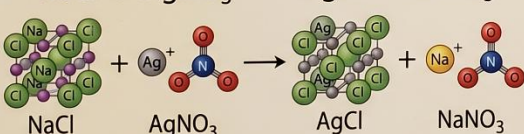
H=4, N=2, O=8, Ca=1 | H=4, N=2, O=8, Ca=1

(b) Sodium Hydroxide + Sulfuric Acid



Na=2, O=6, H=4, S=1 | Na=2, S=1, O=6, H=4

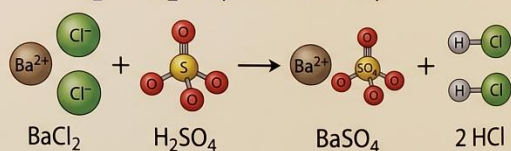
(c) Sodium Chloride + Silver Nitrate



*This equation was already balanced

Na=1, Cl=1, Ag=1, N=1, O=3 | Ag=1, Cl=1, Na=1, N=1, O=3

(d) Barium Chloride + Sulfuric Acid



Ba=1, Cl=2, H=2, S=1, O=4 | Ba=1, S=1, O=4, H=2, Cl=2

7. Write the balanced chemical equations for the following reactions.

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

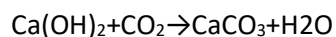
(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

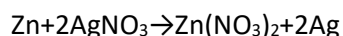
(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

ANS:- Here are the balanced chemical equations:

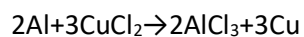
(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water



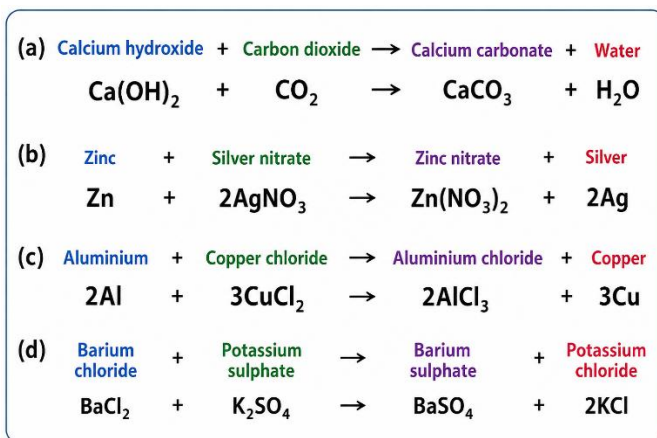
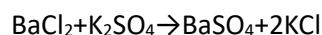
(b) Zinc + Silver nitrate → Zinc nitrate + Silver



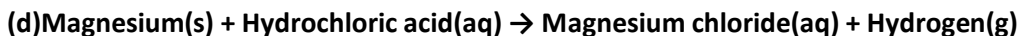
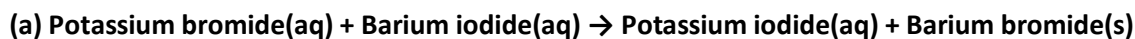
(c) Aluminium + Copper chloride → Aluminium chloride + Copper



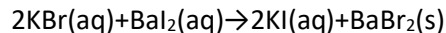
(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride



8. Write the balanced chemical equation for the following and identify the type of reaction in each case.

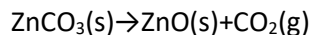


ANS:- (a) Potassium bromide + Barium iodide → Potassium iodide + Barium bromide



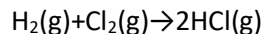
Type of reaction: Double displacement reaction

(b) Zinc carbonate → Zinc oxide + Carbon dioxide



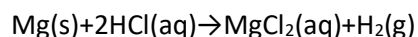
Type of reaction: Decomposition reaction

(c) Hydrogen + Chlorine → Hydrogen chloride



Type of reaction: Combination reaction

(d) Magnesium + Hydrochloric acid → Magnesium chloride + Hydrogen



Type of reaction: Displacement reaction

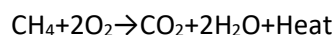
8. Write the balanced chemical equation for the following and identify the type of reaction in each case.		
(a)	Potassium bromide(aq) + Barium iodide(aq) → Potassium iodide(aq) + Barium bromide(s) $2\text{KBr}(\text{aq}) + \text{BaI}_2(\text{aq}) \rightarrow 2\text{KI}(\text{aq}) + \text{BaBr}_2(\text{s})$	Type of reaction: Double displacement reaction
(b)	Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g) $\text{ZnCO}_3(\text{s}) \rightarrow \text{ZnO}(\text{s}) + \text{CO}_2(\text{g})$	Type of reaction: Decomposition reaction
(c)	Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$	Type of reaction: Combination reaction
(d)	Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen(g) $\text{Mg}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2(\text{g})$	Type of reaction: Displacement reaction

9. What does one mean by exothermic and endothermic reactions? Give examples.

ANS:- Exothermic Reactions

The chemical reactions in which heat is released to the surroundings are called **exothermic reactions**.

Example:

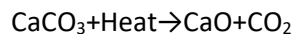


(Burning of methane releases heat.)

Endothermic Reactions

The chemical reactions in which heat is absorbed from the surroundings are called **endothermic reactions**.

Example:



(Heating calcium carbonate absorbs heat.)

9. What does one mean by exothermic and endothermic reactions? Give examples.


EXOTHERMIC REACTIONS

The chemical reactions in which heat is **released** to the surroundings are called **exothermic reactions**.

Example:

CH_4	+	2O_2	\rightarrow	CO_2	+	$2\text{H}_2\text{O}$	+	Heat
Methane		Oxygen		Carbon dioxide		Water		

(Burning of methane releases heat.)



Heat released to surroundings

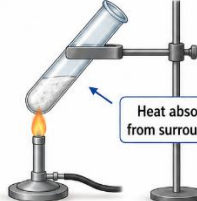
ENDOTHERMIC REACTIONS

The chemical reactions in which heat is **absorbed** from the surroundings are called **endothermic reactions**.

Example:

CaCO_3	+	Heat	\rightarrow	CaO	+	CO_2
Calcium carbonate				Calcium oxide		Carbon dioxide

(Heating calcium carbonate absorbs heat.)



Heat absorbed from surroundings

10. Why is respiration considered an exothermic reaction? Explain.

ANS:- Respiration is considered an exothermic reaction because energy is released in the form of heat during the process.

In respiration, glucose combines with oxygen to produce carbon dioxide, water, and energy.



The energy released helps our body perform various activities. Since heat energy is given out, respiration is called an **exothermic reaction**.

10. Why is respiration considered an exothermic reaction? Explain.

Respiration is considered an **exothermic reaction** because energy is released in the form of **heat** during the process.

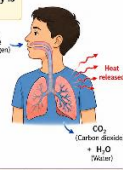
Explanation: In respiration, glucose combines with oxygen to produce carbon dioxide, water, and energy.

$\text{C}_6\text{H}_{12}\text{O}_6$	+	6O_2	\rightarrow	6CO_2	+	$6\text{H}_2\text{O}$	+	Energy (Heat)
Glucose		Oxygen		Carbon dioxide		Water		Energy released as heat

The energy released helps our body perform various activities. Since heat energy is given out, respiration is called an **exothermic reaction**.

Key Points

- Glucose is broken down in the presence of oxygen.
- Energy is released in the form of heat.
- Heat is given out to the surroundings.
- Therefore, respiration is an exothermic reaction.



Exothermic reaction releases heat energy.

11. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

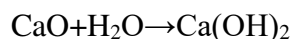
ANS:- Decomposition reactions are called the opposite of combination reactions because:

- In a **combination reaction**, two or more substances combine to form a single product.

- In a **decomposition reaction**, a single substance breaks down into two or more simpler substances.

Thus, the processes are opposite to each other.

Example of Combination Reaction



(Calcium oxide + Water \rightarrow Calcium hydroxide)

Example of Decomposition Reaction



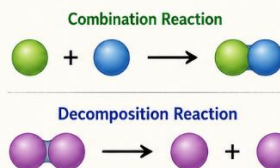
(Calcium carbonate \rightarrow Calcium oxide + Carbon dioxide)

11. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

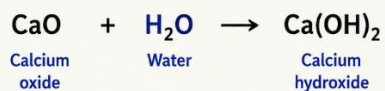
Decomposition reactions are called the **opposite** of **combination reactions** because:

- In a **combination reaction**, two or more substances combine to form a **single product**.
- In a **decomposition reaction**, a single substance breaks down into two or more **simpler substances**.

Thus, the processes are opposite to each other.

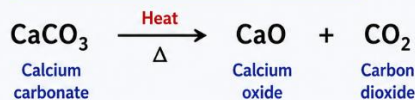


Example of Combination Reaction



Two substances **combine** to form a **single product**.

Example of Decomposition Reaction



A single substance **breaks down** into simpler substances.

Combination and decomposition reactions are **opposite** to each other.

12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

ANS:- (a) **Decomposition reaction by Heat (Thermal decomposition)**



(b) Decomposition reaction by Light (Photolytic decomposition)



(c) Decomposition reaction by Electricity (Electrolytic decomposition)




12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

(a) **Decomposition reaction by Heat** (Thermal decomposition)
When a compound is heated, it breaks down into simpler substances.

$$\text{CaCO}_3 \xrightarrow{\text{Heat}} \text{CaO} + \text{CO}_2$$

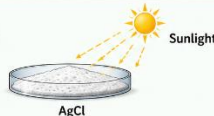
Calcium carbonate Calcium oxide Carbon dioxide



(b) **Decomposition reaction by Light** (Photolytic decomposition)
When a compound is exposed to light, it breaks down into simpler substances.

$$2\text{AgCl} \xrightarrow{\text{Sunlight}} 2\text{Ag} + \text{Cl}_2$$

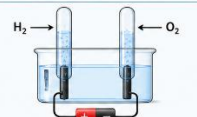
Silver chloride Silver Chlorine gas



(c) **Decomposition reaction by Electricity** (Electrolytic decomposition)
When electricity is passed through a compound, it breaks down into simpler substances.

$$2\text{H}_2\text{O} \xrightarrow{\text{Electricity}} 2\text{H}_2 + \text{O}_2$$

Water Hydrogen gas Oxygen gas



★ In all these reactions, one compound breaks down into two or more simpler substances when energy is supplied in the form of heat, light or electricity.

12. What is the difference between displacement and double displacement reactions?
Write equations for these reactions.

ANS:- Difference between Displacement and Double Displacement Reactions

Displacement Reaction

One element replaces another element from a compound.

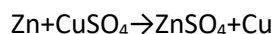
Involves one element and one compound.

Double Displacement Reaction

Two compounds exchange their ions to form new compounds.

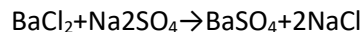
Involves two compounds.

Example of Displacement Reaction



(Zinc displaces copper from copper sulphate.)

Example of Double Displacement Reaction



(Barium chloride and sodium sulphate exchange ions.)

13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Basis of Comparison	Displacement Reaction	Double Displacement Reaction
Definition	One element replaces another element from a compound.	Two compounds exchange their ions to form new compounds.
Involves	One element and one compound.	Two compounds.
General form	$A + BC \rightarrow AC + B$	$AB + CD \rightarrow AD + CB$
Explanation	Element A displaces (takes the place of) element B from the compound BC.	Ions of two compounds interchange to form two new compounds.

Example of Displacement Reaction

$$\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$$

Zinc Copper sulphate Zinc sulphate Copper

Zinc displaces copper from copper sulphate.

Example of Double Displacement Reaction

$$\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$$

Barium chloride Sodium sulphate Barium sulphate Sodium chloride

Barium chloride and sodium sulphate exchange ions to form barium sulphate and sodium chloride.

13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

ANS:-

Displacement Reaction

In this reaction, one element replaces another element from a compound.

It involves only one compound and one element.

General form: $A + BC \rightarrow AC + B$

Double Displacement Reaction

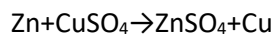
In this reaction, two compounds exchange their ions to form new compounds.

It involves two compounds.

General form: $AB + CD \rightarrow AD + CB$

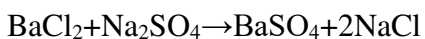
Example of Displacement Reaction

Zinc displaces copper from copper sulphate solution:



Example of Double Displacement Reaction

Barium chloride reacts with sodium sulphate:



13. What is the difference between displacement and double displacement reactions?

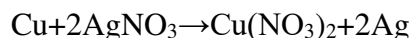
Write equations for these reactions.

DISPLACEMENT REACTION	DOUBLE DISPLACEMENT REACTION
<ul style="list-style-type: none"> In this reaction, one element replaces another element from a compound. 	<ul style="list-style-type: none"> In this reaction, two compounds exchange their ions to form new compounds.
<ul style="list-style-type: none"> It involves only one compound and one element. 	<ul style="list-style-type: none"> It involves two compounds.
<ul style="list-style-type: none"> General form: $A + BC \rightarrow AC + B$	<ul style="list-style-type: none"> General form: $AB + CD \rightarrow AD + CB$
<p>EXAMPLE OF DISPLACEMENT REACTION</p> <p>Zinc displaces copper from copper sulphate solution.</p> $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$ <p style="text-align: center;"> ↓ Zinc ↓ Copper sulphate ↓ Zinc sulphate ↓ Copper </p>	<p>EXAMPLE OF DOUBLE DISPLACEMENT REACTION</p> <p>Barium chloride reacts with sodium sulphate.</p> $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$ <p style="text-align: center;"> ↓ Barium chloride ↓ Sodium sulphate ↓ Barium sulphate (white precipitate) ↓ Sodium chloride </p>

14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

ANS:- Copper displaces silver from silver nitrate solution because copper is more reactive than silver.

Chemical Reaction



- Copper (Cu) displaces silver (Ag) from silver nitrate.
- Silver is obtained as a metal.

14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

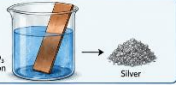
In refining of silver, copper metal displaces silver from silver nitrate solution because copper is more reactive than silver.

CHEMICAL REACTION

$$\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$$

↓ Copper (Displacing metal)
 ↓ Silver nitrate (Solution)
 ↓ Copper(II) nitrate (Solution)
 ↓ Silver (Recovered metal)

Explanation :
Copper being more reactive than silver, displaces silver from silver nitrate solution and gets converted into copper(II) nitrate. Silver is obtained as a metal.



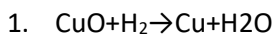
Thus, the reaction involved in the refining of silver is: $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$

15. What do you mean by a precipitation reaction? Explain by giving examples.

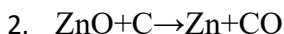
ANS:- A **precipitation reaction** is a reaction in which two aqueous solutions react to form an insoluble solid called a **precipitate**.

Reduction is the process in which a substance **loses oxygen** or **gains hydrogen**.

Examples



Here, copper oxide loses oxygen and is reduced to copper.



Here, zinc oxide loses oxygen and is reduced to zinc.

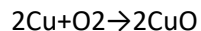
16. Explain the following in terms of gain or loss of oxygen with two examples each.			
(a) Oxidation		Oxidation is the process in which a substance gains oxygen or loses hydrogen .	
Examples	Chemical Equation	Explanation	
1.	$2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ <p style="text-align: center;"> ↓ Copper ↓ Oxygen ↓ Copper oxide </p>	Copper gains oxygen to form copper oxide.	
2.	$4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$ <p style="text-align: center;"> ↓ Iron ↓ Oxygen ↓ Iron oxide </p>	Iron gains oxygen to form iron oxide.	
(b) Reduction		Reduction is the process in which a substance loses oxygen or gains hydrogen .	
Examples	Chemical Equation	Explanation	
1.	$\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ <p style="text-align: center;"> ↓ Copper oxide ↓ Hydrogen ↓ Copper ↓ Water </p>	Copper oxide loses oxygen and is reduced to copper.	
2.	$\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$ <p style="text-align: center;"> ↓ Zinc oxide ↓ Carbon ↓ Zinc ↓ Carbon monoxide </p>	Zinc oxide loses oxygen and is reduced to zinc.	
<p> > Oxidation = Gain of oxygen or Loss of hydrogen > Reduction = Loss of oxygen or Gain of hydrogen </p>			

17. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

ANS:- The shiny brown coloured element 'X' is **Copper (Cu)**.

When copper is heated in air, it reacts with oxygen and forms a black coloured compound called **Copper(II) oxide (CuO)**.

Chemical Equation



Element 'X' = Copper (Cu)

- **Black coloured compound formed** = Copper(II) oxide (CuO)

17. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Answer:
The shiny brown coloured element 'X' is **Copper (Cu)**.
When copper is heated in air, it reacts with oxygen and forms a black coloured compound called **Copper(II) oxide (CuO)**.

Chemical Equation:

$$2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$$
 Copper (shiny brown) + Oxygen (from air) → Copper(II) oxide (black)

- Element 'X' = Copper (Cu)
- Black coloured compound formed = Copper(II) oxide (CuO)

Thus, when copper is heated in air, it becomes black due to the formation of copper(II) oxide.

18. Why do we apply paint on iron articles?

ANS:- Paint is applied on iron articles to prevent **rusting**.

When iron comes in contact with air and moisture, it reacts with oxygen and forms rust (iron oxide). Paint forms a protective layer on the surface of iron and prevents contact with air and water.

Thus, painting protects iron articles from corrosion and increases their life.

18. Why do we apply paint on iron articles?

We apply paint on iron articles to **prevent rusting**.

EXPLANATION:

- When iron comes in contact with air and moisture, it reacts with oxygen and forms **rust (iron oxide)**.
- Paint forms a protective layer on the surface of iron and prevents contact with air and water.

EXAMPLS
Painted iron objects do not rust easily and last longer.

CONCLUSION
Painting protects iron articles from **rusting (corrosion)** and increases their life.

19. Oil and fat containing food items are flushed with nitrogen. Why?

ANS:- Oil and fat containing food items are flushed with nitrogen to prevent **oxidation**.

When oils and fats react with oxygen present in air, they become rancid and develop an unpleasant smell and taste. Nitrogen is an unreactive gas, so it prevents contact of food with oxygen and keeps the food fresh for a longer time.

19. Oil and fat containing food items are flushed with nitrogen. Why?

Answer:
Oil and fat containing food items are flushed with nitrogen to prevent oxidation.

Explanation:

- When oils and fats react with oxygen present in air, they get **oxidised**. This causes rancidity and develops an unpleasant smell and taste.
- Nitrogen is an unreactive gas, so it prevents contact of food with oxygen.
- Thus, it keeps the food fresh for a longer time.

How nitrogen flushing works?

1. Air is removed from the packet.
2. Nitrogen gas is filled in the packet.
3. Packet is sealed. Food stays fresh for a longer time.

Why nitrogen?

- Nitrogen (N₂) is an unreactive gas.
- It does not support oxidation (rancidity).
- It prevents oils and fats from spoiling.
- Hence, food remains fresh, tasty and safe for longer.

Examples of nitrogen flushed food items: Potato chips, Namkeen, Biscuits, Nuts, Edible oils.

Therefore, oil and fat containing food items are flushed with nitrogen to prevent oxidation (rancidity) and keep them fresh for a longer time.

20. Explain the following terms with one example each.

(a) Corrosion

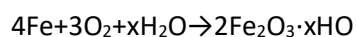
(b) Rancidity

ANS:- (a) Corrosion

Corrosion is the slow eating away or damage of a metal due to reaction with air, moisture or chemicals.

Example

Iron reacts with air and moisture to form rust.



(Rusting of iron)

(b) Rancidity

Rancidity is the process in which oils and fats get oxidised and develop an unpleasant smell and taste.

Example

Food items like chips or fried food become rancid when left open for a long time due to contact with air.

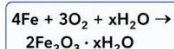
20. Explain the following terms with one example each.

(a) Corrosion

Corrosion is the slow eating away or damage of a metal due to reaction with air, moisture or chemicals.

Example :

Iron reacts with air and moisture to form rust.



(Rusting of iron)

Iron nail (before corrosion)



Iron nail (after corrosion)



Key points

- Corrosion is a gradual process.
- It weakens and damages metals.
- **Example:** Rusting of iron.

(b) Rancidity

Rancidity is the process in which oils and fats get oxidised and develop an unpleasant smell and taste.

Example :

Food items like chips or fried food become rancid when left open for a long time due to contact with air.

Fresh chips



Good smell and taste

After some time (exposed to air)

Rancid chips



Unpleasant smell and taste

Key points

- Oils and fats react with oxygen in air.
- This oxidation causes rancidity.
- It makes the food unfit to eat.
- **Example:** Rancidity in chips or fried food.