



## IMPORTANT QUESTIONS

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

**Answer:** Magnesium is a highly reactive metal. When exposed to moist air, it forms a protective, dull layer of basic magnesium carbonate  $[\text{MgCO}_3\text{-Mg(OH)}_2]$  on its surface. This layer prevents it from reacting easily with oxygen.

Cleaning it with sandpaper removes this layer so it can burn cleanly with a brilliant white flame.

2. Write the balanced chemical equation for the following and identify the type of reaction: Heating of solid Ferrous Sulphate crystals.

**Answer: Equation:**  $2\text{FeSO}_4(\text{s}) \xrightarrow{\text{Heat}} \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$

**Type of Reaction:** Thermal Decomposition reaction.

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

**Answer:** During respiration, glucose obtained from digested food undergoes slow oxidation inside cellular units. This metabolic breakdown process releases carbon dioxide, water, and substantial energy in the form of ATP to support physical bodily functions, making it an exothermic reaction.

**Equation:**  $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) + 6\text{O}_2(\text{g}) \rightarrow 6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) + \text{Energy}$

4. Why do we apply paint on iron articles?

**Answer:** Iron objects readily undergo corrosion (rusting) when exposed to atmospheric moisture and simultaneously. Applying a protective layer of paint seals the iron surface, cutting off contact with air thereby preventing rust formulation.

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

**Answer:** Iron is more reactive than copper according to the metal reactivity series. When placed in copper sulphate solution, iron displaces copper ions to form a light-green ferrous sulphate solution while elemental copper deposits on the nail.

**Equation:**  $\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq})[\text{Blue}] \rightarrow \text{FeSO}_4(\text{aq})[\text{Light Green}] + \text{Cu}(\text{s})$



## IMPORTANT QUESTIONS

6. What is a precipitation reaction? Explain giving a balanced chemical equation.

**Answer:** Any chemical reaction occurring in aqueous solutions where an exchange of ions results in the formation of an insoluble solid residue (precipitate) is called a precipitation reaction.

**Equation:**  $\text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$  (White ppt) +  $2\text{NaCl}(\text{aq})$

7. What is the difference between a displacement and a double displacement reaction?

**Answer:**

- **Displacement Reaction:** A single more reactive metal displaces a less reactive element from its salt solution (e.g.,  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$ ).
- **Double Displacement Reaction:** Two ionic compounds react in solution by exchanging their respective ion partners to form two completely new compounds (e.g.,  $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$ ).

8. Balance the following chemical equation:  $\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{H}_2\text{O}$

**Answer:** Balanced chemical equation with state symbols:

$2\text{HNO}_3(\text{aq}) + \text{Ca}(\text{OH})_2(\text{aq}) \rightarrow \text{Ca}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

9. Define the terms: (a) Oxidation, (b) Reduction in terms of gain or loss of oxygen

**Answer:**

(a) **Oxidation:** The chemical gain of oxygen atoms by a substance during a reaction (e.g.,  $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ ).

(b) **Reduction:** The chemical loss of oxygen atoms by a substance during a reaction (e.g.,  $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ ).

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

**Answer:** A balanced chemical equation is an equation where the total number of atoms of each element is exactly equal on both the reactant side and the product side. Equations must be balanced to satisfy the Law of Conservation



## IMPORTANT QUESTIONS

of Mass, which states that mass can neither be created nor destroyed in a chemical reaction.

11. A shiny brown colored element 'X' on heating in air becomes black in color. Name the element 'X' and the black colored compound formed. Write a balanced chemical equation for the same.

**Answer:**

1. The shiny brown colored element X is Copper metal (Cu).
2. The black colored compound formed upon heating is Copper (II) Oxide (CuO).
3. Balanced Equation:  $2\text{Cu(s)}[\text{Brown}] + \text{O}_2(\text{g}) \xrightarrow{\text{Heat}} 2\text{CuO(s)}[\text{Black}]$

12. Classify the following reactions into different types:

- (a)  $2\text{KClO}_3(\text{s}) \xrightarrow{\text{Heat}} 2\text{KCl(s)} + 3\text{O}_2(\text{g})$
- (b)  $\text{CaO(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2(\text{aq}) + \text{Heat}$
- (c)  $\text{Zn(s)} + \text{CuSO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu(s)}$

**Answer:**

- (a): Thermal Decomposition Reaction (A single reactant breaks down into multiple simpler products under heat).
- (b): Combination Reaction / Exothermic Reaction (Two individual reactants merge to create a single product while releasing heat energy).
- (c): Displacement Reaction (More reactive zinc displaces less reactive copper ions from solution).

13. Identify the substance oxidized, substance reduced, oxidizing agent, and reducing agent in the following reaction:



**Answer:** • Substance Oxidized: HCl (loses hydrogen to form Cl<sub>2</sub>).

• Substance Reduced: MnO<sub>2</sub> (loses oxygen to form MnCl<sub>2</sub>).

• Oxidizing Agent: MnO<sub>2</sub> (provides oxygen for oxidation / undergoes reduction).

• Reducing Agent: HCl (removes oxygen / undergoes oxidation).

14. Give characteristic chemical confirmation tests for the following gases:

- (a) Hydrogen (b) Carbon Dioxide (c) Oxygen.



## IMPORTANT QUESTIONS

**Answer:**

- (a) Hydrogen (H<sub>2</sub>): Bring a burning matchstick near the mouth of the gas collection tube; it combusts violently with a distinct "pop" sound.
- (b) Carbon Dioxide (CO<sub>2</sub>): Pass the gas into lime water. The lime water turns milky due to insoluble calcium carbonate formation:  $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 \downarrow + \text{H}_2\text{O}$ .
- (c) Oxygen (O<sub>2</sub>): Introduce a glowing wooden splinter into the gas. The splinter instantly catches fire and burns brightly as oxygen supports combustion

**15. What is rancidity? List two methods to prevent rancidity in fat-containing food products.**

**Answer:** Rancidity is the chemical oxidation of fats and oils present in food items when exposed to atmospheric oxygen over time, resulting in bad smell, altered taste, and spoilage.

**Prevention Methods:**

1. Packing food products inside sealed bags flushed with inert Nitrogen gas to prevent contact with oxygen.
2. Adding commercial antioxidants (such as BHA - Butylated Hydroxyanisole) to food items to slow down the oxidation cycle.

**16. A white colored powder 'X' is heated strongly in a dry boiling tube. It emits thick brown fumes 'Y' and leaves a yellow colored residue 'Z'.**

- (a) Identify X, Y, and Z.
- (b) Write a fully balanced chemical equation for the reaction.
- (c) What type of chemical reaction is this? Define it.

**Answer:** (a) X is Lead Nitrate [Pb(NO<sub>3</sub>)<sub>2</sub>], Y is Nitrogen Dioxide gas [NO<sub>2</sub>], and Z is Lead Oxide [PbO].

(b) Balanced Equation:  $2\text{Pb(NO}_3)_2(\text{s})[\text{White}] \xrightarrow{\text{Heat}} 2\text{PbO}(\text{s})[\text{Yellow}] + 4\text{NO}_2(\text{g})[\text{Brown Fumes}] + \text{O}_2(\text{g})$

(c) This is a Thermal Decomposition Reaction. It is defined as a type of chemical reaction in which a single complex chemical compound splits apart into two or more simpler component substances when thermal energy (heat) is supplied.



## IMPORTANT QUESTIONS

17. (a) A substance 'X' is used for white-washing walls. On adding water to it, it reacts vigorously releasing a large amount of heat to form 'Y'. Identify X and Y and write the balanced chemical equation.

(b) When 'Y' is applied to walls, it develops a shiny look after 2-3 days due to the formation of 'B'. Identify 'B' and write the equation for its formation.

**Answer:**

(a) X is Calcium Oxide (CaO, commonly called Quicklime). Y is Calcium Hydroxide [Ca(OH)<sub>2</sub>, commonly called Slaked Lime].

Equation:  $\text{CaO(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2\text{(aq)} + \text{Heat}$

(b) When slaked lime solution ('Y') is applied to walls, it absorbs atmospheric carbon dioxide slowly over 2-3 days to form a thin, shiny crystal layer of Calcium Carbonate ('B').

Equation:  $\text{Ca(OH)}_2\text{(aq)} + \text{CO}_2\text{(g)} \rightarrow \text{CaCO}_3\text{(s)}[\text{Shiny Layer}] + \text{H}_2\text{O(l)}$

18. Write balanced chemical equations with state symbols for the following transformations:

(a) Sodium hydroxide solution reacts with acetic acid solution to form sodium acetate solution and water.

(b) Ethanol liquid is warmed with ethanoic acid in the presence of concentrated sulphuric acid to form ethyl acetate ester and water.

(c) Ethene gas is burned in oxygen to form carbon dioxide gas, water vapor, and heat.

(d) Zinc metal reacts with an aqueous solution of sodium hydroxide to form sodium zincate and hydrogen gas.

**Answer:**

(a)  $\text{NaOH(aq)} + \text{CH}_3\text{COOH(aq)} \rightarrow \text{CH}_3\text{COONa(aq)} + \text{H}_2\text{O(l)}$

(b)  $\text{C}_2\text{H}_5\text{OH(l)} + \text{CH}_3\text{COOH(l)} \xrightarrow{\text{H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5\text{(l)} + \text{H}_2\text{O(l)}$

(c)  $\text{C}_2\text{H}_4\text{(g)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{CO}_2\text{(g)} + 2\text{H}_2\text{O(g)} + \text{Heat}$

(d)  $\text{Zn(s)} + 2\text{NaOH(aq)} \rightarrow \text{Na}_2\text{ZnO}_2\text{(aq)} + \text{H}_2\text{(g)}$  (Note: Forms Sodium Zincate, not zinc hydroxide)



## IMPORTANT QUESTIONS

### 19. Case Study: Industrial Metal Interactions and Acid Storage Dynamics

A chemical manufacturing plant stores bulk fluids in various metal vats. The warehouse contains vats made of Copper (Cu) and Aluminium (Al). The facility needs to store solutions of dilute Hydrochloric acid (HCl) and Zinc Chloride (ZnCl<sub>2</sub>).

- (a) Can we store dilute HCl inside an Aluminium vat? Justify with an equation. (2 Marks)
- (b) Explain why copper vats are safe for holding both dilute HCl and ZnCl<sub>2</sub>. (2 Marks)

**Answer:**

(a) No, Aluminium is highly reactive and lies above hydrogen in the reactivity series. It will react vigorously with hydrochloric acid to release hydrogen gas, causing corrosion and holes in the vat. Equation:  $2\text{Al(s)} + 6\text{HCl(aq)} \rightarrow 2\text{AlCl}_3\text{(aq)} + 3\text{H}_2\text{(g)}$

(b) Copper is a less reactive metal placed below both hydrogen and zinc in the metal reactivity series. It cannot displace hydrogen from HCl or zinc from ZnCl<sub>2</sub>. Since no chemical reaction occurs, copper vats remain uncorroded and safe.

### 20. Case Study: Laboratory Observations on Metal Displacements

A student places a polished copper wire into an aqueous solution of Silver Nitrate (AgNO<sub>3</sub>) kept in test tube A, and places a silver wire into an aqueous solution of Copper Sulphate (CuSO<sub>4</sub>) kept in test tube B.

- (a) State the observations recorded in test tube A after 1 hour, along with its balanced equation. (2 Marks)
- (b) Predict the reaction changes inside test tube B and give a reason. (2 Marks)

**Answer:** (a) In test tube A, copper is more reactive than silver and displaces silver ions. Observation: The colorless solution turns blue due to copper nitrate formation, and shiny grey silver crystals deposit on the wire.

Equation:  $\text{Cu(s)} + 2\text{AgNO}_3\text{(aq)} \rightarrow \text{Cu(NO}_3)_2\text{(aq)}[\text{Blue}] + 2\text{Ag(s)}$

(b) In test tube B, no chemical reaction takes place. Silver is less reactive than copper according to the activity series, so it cannot displace copper ions from the stable copper sulphate solution. The solution remains blue with no changes.