

Chapter 1: Chemical Reactions and Equations

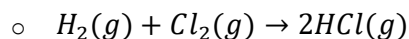
(In-text Questions & Answers)

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

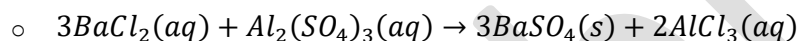
Answer: When magnesium ribbon is exposed to moist air, a white protective layer of **Magnesium Oxide (MgO)** forms on its surface. This layer prevents the magnesium from reacting with oxygen (burning). To remove this layer and bring the magnesium into direct contact with air, it is cleaned by rubbing it with sandpaper.

Question 2: Write the balanced equations for the following chemical reactions:

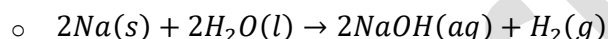
1. **Hydrogen + Chlorine \rightarrow Hydrogen Chloride**



2. **Barium Chloride + Aluminium Sulphate \rightarrow Barium Sulphate + Aluminium Chloride**



3. **Sodium + Water \rightarrow Sodium Hydroxide + Hydrogen**



Question 3: A solution of substance 'X' is used for whitewashing.

1. **Name the substance 'X' and write its formula.**

- The name of substance 'X' is **Calcium Oxide (Quicklime)** and its formula is **CaO** .

2. **Write the reaction of substance 'X' with water.**



(*Calcium Oxide + Water \rightarrow Calcium Hydroxide*)

Question 4: Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Answer: This is a **displacement reaction**. Iron is a more reactive element than copper. When an iron nail is placed in copper sulphate solution, the iron displaces copper from its solution and forms **Ferrous Sulphate**. Consequently, the blue colour of the solution fades and turns light green.

- **Equation:** $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

Question 5: What do you understand by a precipitation reaction? Explain with an example.

Answer: A reaction in which an **insoluble solid** is formed by mixing two solutions is called a precipitation reaction. This insoluble substance is known as a 'precipitate'.

- **Example:** $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(Sodium Sulphate + Barium Chloride → Barium Sulphate (white precipitate) + Sodium Chloride)

Question 6: Why do we paint iron articles?

Answer: Iron articles are painted to protect them from **corrosion (rusting)**. The layer of paint prevents the iron from coming into direct contact with air (oxygen) and moisture, thereby stopping the chemical reaction and keeping the iron safe.

Question 7: Why are oil and fat-containing food items flushed with nitrogen?

Answer: Oil and fat-containing substances get **oxidized** when they come into contact with air, which changes their taste and smell; this is called **rancidity**. Nitrogen is a less reactive gas that displaces oxygen, protecting the food items from oxidation and keeping them fresh for a longer time.

Exercise Solutions (Questions 1-20)

Questions 1 - 3: (Multiple Choice Questions)

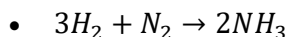
- 1. Which of the following statements about the given reaction are incorrect?**
($2PbO + C \rightarrow 2Pb + CO_2$)
 - **Incorrect Statements:** (a) Lead is getting reduced and (b) Carbon dioxide is getting oxidized.
- 2. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$. The above reaction is an example of:**
 - **Type of Reaction:** (d) Displacement reaction.
- 3. What happens when dilute hydrochloric acid is added to iron fillings?**
 - **Correct Answer:** (a) Hydrogen gas and iron chloride are produced.

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

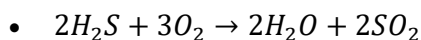
Answer: A chemical equation in which the number of atoms of each element is equal on both sides of the equation is called a balanced chemical equation. It is necessary to balance an equation to satisfy the **Law of Conservation of Mass**, which states that mass can neither be created nor destroyed in a chemical reaction.

Question 5: Translate the following statements into chemical equations and balance them:

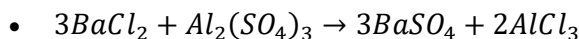
(a) Hydrogen gas combines with nitrogen to form ammonia.



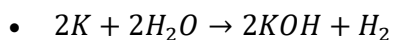
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.



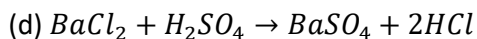
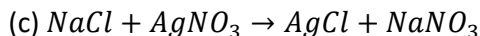
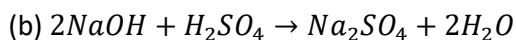
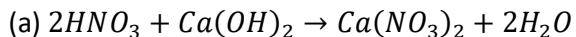
(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.



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

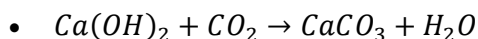


Question 6: Balance the following chemical equations:

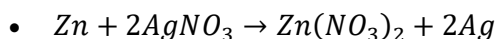


Question 7: Write the balanced chemical equations for the following reactions:

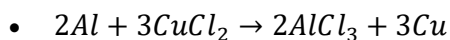
(a) **Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water**



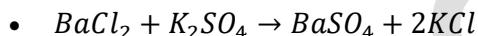
(b) **Zinc + Silver nitrate → Zinc nitrate + Silver**



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



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



Question 8: Identify the type of reaction in each case:



Question 9: What does one mean by exothermic and endothermic reactions?

Answer:

- **Exothermic Reaction:** Reactions in which heat/energy is released along with the products (e.g., Respiration).
- **Endothermic Reaction:** Reactions in which energy is absorbed (e.g., Photosynthesis).

Question 10: Why is respiration considered an exothermic reaction?

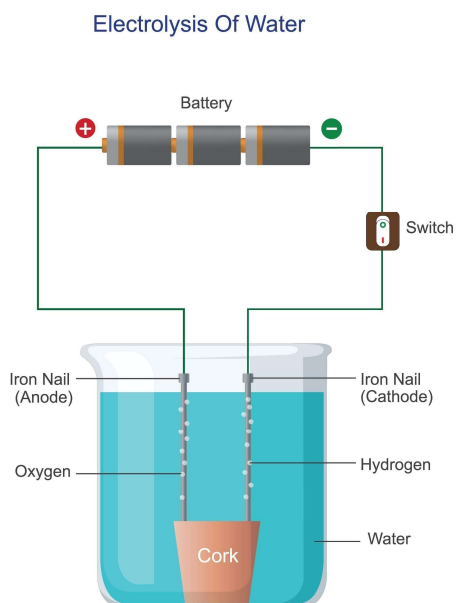
Answer: During digestion, food is broken down into glucose. This glucose combines with oxygen in the cells of our body and provides energy. Since energy is released in this process, respiration is called an exothermic reaction.

Question 11: Why are decomposition reactions called the opposite of combination reactions?

Answer: In a **combination reaction**, two or more substances combine to form a single product. In contrast, in a **decomposition reaction**, a single reactant breaks down to form two or more simpler products.

Question 12: Write equations for decomposition reactions (Heat, Light, Electricity):

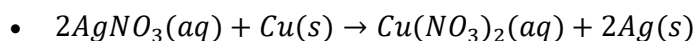
- **By Heat (Thermal):** $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
- **By Electricity (Electrolytic):** $2H_2O \xrightarrow{Elec.} 2H_2 + O_2$
- **By Light (Photolytic):** $2AgCl \xrightarrow{Sunlight} 2Ag + Cl_2$



Question 13: What is the difference between displacement and double displacement reactions?

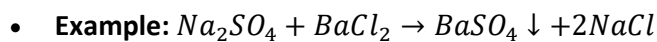
- **Displacement:** A more reactive element displaces a less reactive element from its compound.
- **Double Displacement:** Two different atoms or groups of atoms (ions) are exchanged between the reactants.

Question 14: Reaction for the refining of silver:



Question 15: What do you understand by a precipitation reaction?

Answer: Any reaction that produces an insoluble solid (which settles at the bottom of the solution) is called a precipitation reaction. This insoluble solid is called a 'precipitate'.



Question 16: Explain the following terms with two examples each:

(a) **Oxidation:** The gain of oxygen by a substance. $2Cu + O_2 \rightarrow 2CuO$

(b) **Reduction:** The loss of oxygen from a substance. $CuO + H_2 \rightarrow Cu + H_2O$

Question 17: A shiny brown-colored element 'X' and its black compound:

- **Element X:** Copper Cu
- **Black Compound:** Copper Oxide CuO
- **Equation:** $2Cu + O_2 \rightarrow 2CuO$

Question 18: Why do we apply paint on iron articles?

Answer: Iron articles are painted to prevent them from **corrosion (rusting)**. The paint forms a protective layer that stops iron from coming into contact with moisture and air.

Question 19: Why are oil and fat-containing food items flushed with nitrogen?

Answer: They are flushed with nitrogen to prevent **Rancidity**. Nitrogen acts as an antioxidant and prevents the food from getting oxidized when it comes in contact with air.

Question 20: Explain the following terms with one example each:

(a) **Corrosion:** The slow eating up of metals by the action of air, moisture, or chemicals (e.g., Rusting of iron).

(b) **Rancidity:** The oxidation of fats and oils in food resulting in a change in smell and taste (e.g., Chips getting a bad smell if left open).

Important Questions & Answers from Previous Board Exams

Part 1: Very Short Answer Questions (1 Mark)

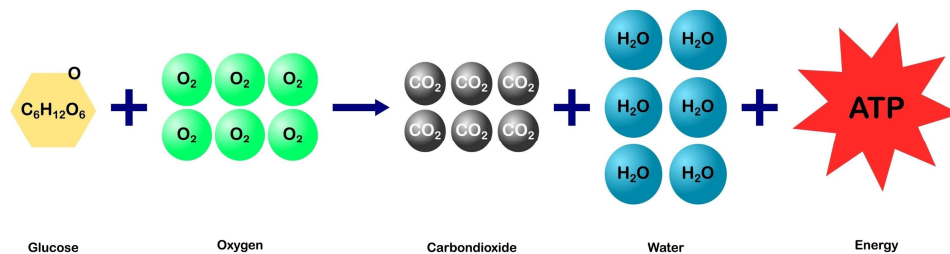
Question 1: Why is nitrogen gas filled in bags of potato chips? [CBSE 2018, RBSE 2022]

Answer: Nitrogen gas, which is an inert gas, is filled to prevent **rancidity** and to stop the **oxidation** of the chips.

Question 2: Why is respiration considered an exothermic reaction? [CBSE 2019, RBSE 2024]

Answer: Because during respiration, glucose undergoes combustion (oxidation) which provides energy (in the form of heat/ATP) to our body.

cellular respiration



Question 3: What type of reaction is the rusting of iron an example of? [RBSE 2017]

Answer: It is an example of **corrosion** and an **oxidation-reduction (Redox)** reaction.

Part 2: Short Answer Questions (2-3 Marks)

Question 4: Why is it necessary to balance a chemical equation? [CBSE 2020, RBSE 2023]

Answer: According to the **Law of Conservation of Mass**, mass can neither be created nor destroyed in a chemical reaction. Therefore, the number of atoms of each element must be equal on both the reactant and product sides.

Question 5: Give examples for the three types of decomposition reactions. [CBSE 2018, 2023]

Answer: 1. Thermal Decomposition: $CaCO_3 \xrightarrow{\text{Heat}} CaO + CO_2$

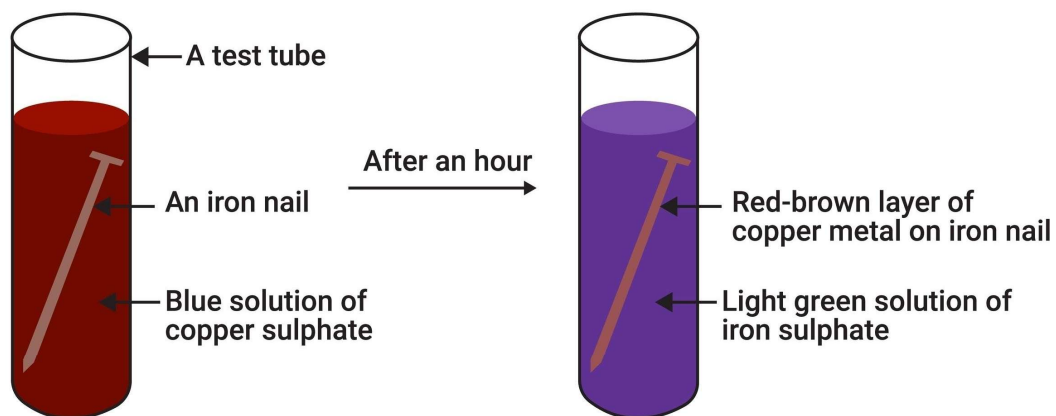
2. Electrolytic Decomposition: $2H_2O \xrightarrow{\text{Electricity}} 2H_2 + O_2$

3. Photolytic Decomposition: $2AgBr \xrightarrow{\text{Sunlight}} 2Ag + Br_2$

Question 6: What is the difference between displacement and double displacement reactions? [RBSE 2022, CBSE 2017]

Answer: In a **displacement reaction**, a more reactive element displaces a less reactive element from its position (e.g., $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$). In contrast, in a **double displacement reaction**, there is an exchange of ions between the reactants (e.g., $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$).

Displacement reaction between iron (nail) and copper sulphate solution



Part 3: Long Answer Questions (5 Marks)

Question 7: What is a Redox reaction? Explain with an equation. [CBSE 2019, RBSE 2025 (Potential)]

Answer: A reaction in which oxidation (gain of oxygen) of one reactant and reduction (loss of oxygen) of another reactant occur simultaneously is called a redox reaction.

Example: $CuO + H_2 \xrightarrow{\text{Heat}} Cu + H_2O$

- Here, CuO is reduced to Cu .
- H_2 is oxidized to H_2O .

Question 8: Explain corrosion and rancidity in detail. [RBSE 2020, 2024, CBSE 2022]

Answer: * **Corrosion:** When metals come into contact with moisture, air, or acids, they gradually deteriorate. Example: Rusting of iron. **Prevention:** Painting, oiling, or galvanization.

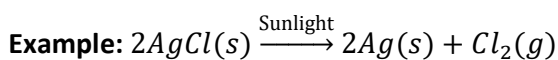
- **Rancidity:** Oils and fats in food become oxidized when exposed to air, changing their smell and taste. **Prevention:** Using nitrogen gas or airtight containers.

Important Potential Questions for Future Exams

Part 1: Short Answer Questions (2-3 Marks)

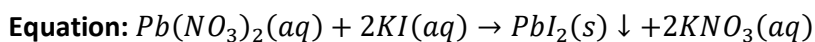
Question 1: Why is a decomposition reaction also called an 'analysis' reaction? Is it endothermic?

Answer: In a decomposition reaction, a single reactant breaks down into two or more simpler products. Yes, it is usually **endothermic** because energy in the form of heat, light, or electricity is required to break the bonds of the reactants.



Question 2: What happens when a solution of potassium iodide is added to a solution of lead nitrate? Write the type of reaction and the equation.

Answer: This is a **double displacement** and **precipitation** reaction. A yellow precipitate of lead iodide is formed.



Question 3: How to identify the oxidizing agent and reducing agent in a 'Redox reaction'?

Answer: * **Oxidizing Agent:** The substance that oxidizes others and gets reduced itself (loses oxygen).

- **Reducing Agent:** The substance that reduces others and gets oxidized itself (gains oxygen).

Example: In $ZnO + C \rightarrow Zn + CO$, C is the reducing agent and ZnO is the oxidizing agent.

Part 2: Long Answer Questions (5 Marks)

Question 4: Describe the process of electrolysis of water with a diagram. Why is the amount of gas collected in one test tube double that of the other?

Answer: During the electrolysis of water H_2O , water breaks down into hydrogen and oxygen gas.

Reason: A molecule of water contains two atoms of hydrogen and one atom of oxygen (a 2:1 ratio). Therefore, the volume of **hydrogen gas** collected at the cathode is double the volume of **oxygen gas** collected at the anode.



Question 5: What is corrosion? Write two harmful effects and three ways to prevent it.

Answer: When metals react with moisture and air in their surroundings and are gradually destroyed, it is called corrosion.

- **Harmful Effects:** 1. Weakening of iron bridges and ships. 2. Damage to automobile bodies.
- **Prevention Methods:** 1. Applying paint or grease. 2. **Galvanization** (coating iron with zinc). 3. Making **alloys** (e.g., converting iron to stainless steel).

Question 6: Which techniques are used to preserve fatty foods for a long time and why?

Answer: To prevent **rancidity**, the following measures are taken:

1. **Nitrogen flushing:** Nitrogen is filled in chip packets to displace oxygen because it is an inert gas.

2. **Antioxidants:** Added to slow down the rate of oxidation.
3. **Airtight containers:** To minimize contact with oxygen.
4. **Refrigeration:** Low temperatures slow down the rate of oxidation.



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