Question / Concept

Identify the type of reaction: $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + \text{Heat}$

Expert Breakdown & Core Points

Expert Breakdown:

- **Combination Reaction** (and it is highly **Exothermic**).

Evaluation Focus: 1 mark for identifying it as a combination reaction.

Neev Academy Pro-Tip

Context to remember: CaO is Quicklime, and $Ca(OH)_2$ is Slaked lime. This exact reaction is used for whitewashing walls.

Question / Concept

Why do we store silver chloride (AgCl) in dark coloured bottles?

Expert Breakdown & Core Points

Expert Breakdown:

- **Photolytic Decomposition:** Silver chloride undergoes photolytic decomposition (breaks down in the presence of sunlight) to form **silver metal** and **chlorine gas**. Dark bottles block sunlight to prevent this.

Evaluation Focus: 1 mark for the keyword "photolytic decomposition" or "prevents decomposition by sunlight".

Question / Concept

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

Expert Breakdown & Core Points

Expert Breakdown:

- **Hydrogen gas** and **Iron chloride** are produced.
- Equation: $Fe(s) + 2HCl(aq) \longrightarrow FeCl_2(aq) + H_2(g)$

Evaluation Focus: 1 mark for correctly identifying the gas (H_2) and the salt ($FeCl_2$).

Neev Academy Pro-Tip

Whenever an active metal (like Fe, Zn, Mg) reacts with a dilute acid (HCl, H_2SO_4), it **always** displaces hydrogen to release H_2 gas.

Question / Concept

Name the oxidizing agent and reducing agent in the following reaction:
$CuO + H_2 \longrightarrow Cu + H_2O$

Expert Breakdown & Core Points

Expert Breakdown:

- **Oxidizing Agent:** CuO (because it provides oxygen and gets reduced).
- **Reducing Agent:** H_2 (because it takes oxygen and gets oxidized).

Evaluation Focus: 1/2 mark for each correct identification.

2. 2-Mark Questions (Short Answer-I)

Question / Concept

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

Expert Breakdown & Core Points

Expert Breakdown:

- **Removal of Protective Layer:** Magnesium is a highly reactive metal. When stored, it reacts with oxygen in the air to form a stable, white layer of **magnesium oxide** (MgO) on its surface.
- **Smooth Burning:** This layer is unreactive and prevents the underlying magnesium from burning. It must be cleaned with sandpaper to expose the pure metal so it can **burn smoothly**.

Evaluation Focus: 1 mark for mentioning the "layer of magnesium oxide". 1 mark for "exposing pure metal/burning smoothly".

Neev Academy Pro-Tip

Never write "to remove dust/dirt". The examiner specifically looks for the chemical term **Magnesium Oxide**.

Question / Concept

Why are food items containing oil and fat flushed with nitrogen gas?

Expert Breakdown & Core Points

Expert Breakdown:

- **Prevention of Rancidity:** Oils and fats slowly react with atmospheric oxygen (undergo **oxidation**), becoming rancid, which causes a change in their smell and taste.
- **Inert Environment:** Nitrogen is an **unreactive (inert) gas**. Flushing bags of chips with nitrogen cuts off the oxygen supply, acting as an **antioxidant** and preserving the food for a longer time.

Evaluation Focus: 1 mark for "preventing oxidation/rancidity". 1 mark for identifying nitrogen as an "unreactive gas/antioxidant".

Question / Concept

Why is respiration considered an exothermic reaction? Explain.

Expert Breakdown & Core Points

Expert Breakdown:

- **Energy Release:** Exothermic reactions are those in which heat/energy is released.
- **Breakdown of Glucose:** During respiration, the food we eat is broken down into **glucose**. This glucose combines with **oxygen** in the cells of our body and **releases energy** to keep us alive.
- **Equation:** $C_6H_{12}O_6(aq) + 6O_2(aq) \longrightarrow 6CO_2(aq) + 6H_2O(l) + \text{Energy}$

Evaluation Focus: 1 mark for the explanation of glucose breaking down to release energy. 1 mark for the balanced chemical equation.

Neev Academy Pro-Tip

Writing the chemical equation for respiration is the ultimate way to secure the full 2 marks without the examiner even reading your paragraph!

Question / Concept

What is a neutralisation reaction? Give two examples.

Expert Breakdown & Core Points

Expert Breakdown:

- **Definition:** A reaction in which an acid reacts with a base to produce **salt and water** is known as a neutralization reaction.
- **Example 1:** $NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$
- **Example 2:** $KOH(aq) + HNO_3(aq) \longrightarrow KNO_3(aq) + H_2O(l)$

Evaluation Focus: 1 mark for the correct definition involving salt and water. 0.5 marks for each correct balanced equation.

3. 3-Mark Questions (Short Answer-II)

Question / Concept

Explain the three different types of decomposition reactions with one balanced chemical equation for each.

Expert Breakdown & Core Points

Expert Breakdown: A single reactant breaking down to give simpler products is a decomposition reaction. It requires energy in three forms:

- **1. Thermal Decomposition (Heat):** When decomposition is carried out by heating.
  $CaCO_3(s) \xrightarrow{\text{Heat}} CaO(s) + CO_2(g)$
- **2. Electrolytic Decomposition (Electricity):** When decomposition is carried out by passing an electric current.
  $2H_2O(l) \xrightarrow{\text{Electricity}} 2H_2(g) + O_2(g)$
- **3. Photolytic Decomposition (Light):** When decomposition is carried out in the presence of sunlight.
  $2AgBr(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Br_2(g)$

Evaluation Focus: 1 mark for each type correctly named with its corresponding balanced chemical equation.

Neev Academy Pro-Tip

Do not forget to write "Heat", "Electricity", or "Sunlight" over the yield arrow ($\longrightarrow$). Omitting the condition will result in a half-mark deduction per equation.

Question / Concept

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

Expert Breakdown & Core Points

Expert Breakdown:

- **Displacement Reaction:** A **more reactive element displaces a less reactive element** from its aqueous salt solution.
  Example: $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$
  (Iron is more reactive than copper, so it displaces copper).
- **Double Displacement Reaction:** A reaction in which there is an **exchange of ions** between the reactants to form new compounds. It usually results in the formation of a **precipitate**.
  Example: $Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s)\downarrow + 2NaCl(aq)$
  (Barium and Sodium exchange their sulfate and chloride ions).

Evaluation Focus: 1.5 marks for Displacement (definition + eq). 1.5 marks for Double Displacement (definition + eq).

Question / Concept

Define oxidation and reduction. Identify the substances that are oxidized and the substances that are reduced in the following reaction:
$MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$

Expert Breakdown & Core Points

Expert Breakdown:

- **Oxidation:** The addition of oxygen to a substance OR the **removal of hydrogen** from a substance.
- **Reduction:** The addition of hydrogen to a substance OR the **removal of oxygen** from a substance.
- **Analysis of the Equation:**
  - HCl is oxidized to Cl_2 (because hydrogen is removed from HCl).
  - MnO_2 is reduced to $MnCl_2$ (because oxygen is removed from MnO_2).

Evaluation Focus: 1 mark for definitions. 1 mark for identifying oxidized substance (HCl). 1 mark for identifying reduced substance (MnO_2).

Neev Academy Pro-Tip

Crucial Rule: The substance oxidized, substance reduced, oxidizing agent, and reducing agent are **ALWAYS** chosen from the Reactants side (left side), NEVER from the Products side.

4. 4-Mark Questions (Case-Based)

Note: The exam will feature a descriptive passage or a diagram of an activity, followed by 3 sub-questions (1+1+2 marks).

Question / Concept

Case Study Topic: Iron Nails in Copper Sulphate
Passage Summary: "Rohan took three iron nails and cleaned them with sandpaper. He took two test tubes marked A and B. In each test tube, he poured 10 mL of blue copper sulphate solution. He tied two iron nails with a thread and immersed them carefully in test tube B for 20 minutes."
Q1. What color change is observed in the copper sulphate solution in test tube B? (1 mark)
Q2. What is the brownish coating formed on the iron nails? (1 mark)
Q3. Name the type of reaction taking place and write its balanced chemical equation. (2 marks)

Expert Breakdown & Core Points

Expert Breakdown:

- **Ans 1:** The bright **blue** color of the copper sulphate solution slowly fades and turns **pale green**.
- **Ans 2:** The brownish coating is a deposit of **copper metal**.
- **Ans 3:**
  - **Type:** Displacement reaction.
  - **Equation:** $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Evaluation Focus: Explicit color changes (Blue $\rightarrow$ Pale Green) are mandatory for full marks. Mentioning iron(II) sulphate ($FeSO_4$) causes the green color is a bonus.

Question / Concept

Case Study Topic: Heating of Ferrous Sulphate Crystals
Passage Summary: "A student took 2 grams of ferrous sulphate crystals in a dry boiling tube and heated it over the flame of a burner. He observed a change in the color of the crystals and smelled a characteristic odor of burning sulfur."
Q1. What is the initial color of the ferrous sulphate crystals? (1 mark)
Q2. Name the two suffocating gases evolved during this reaction. (1 mark)
Q3. Write the balanced chemical equation for this reaction and classify it. (2 marks)

Expert Breakdown & Core Points

Expert Breakdown:

- **Ans 1:** The initial color of ferrous sulphate crystals ($FeSO_4 \cdot 7H_2O$) is **pale green**.
- **Ans 2:** Sulphur dioxide (SO_2) and Sulphur trioxide (SO_3).
- **Ans 3:**
  - **Classification:** Thermal Decomposition Reaction.