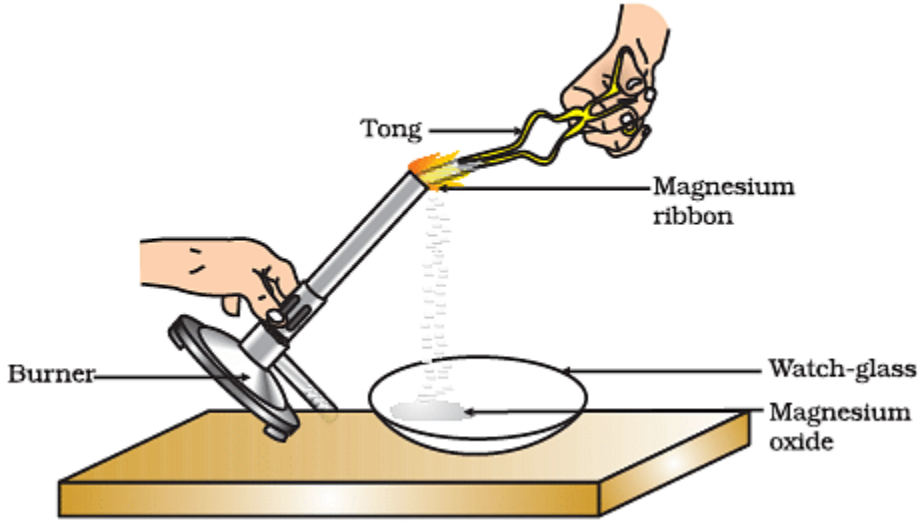
Chemical Reactions and Equations

Q1: Answer the following questions based on the diagram given below:



(i) What is the purpose of burning a magnesium ribbon in air in this experiment?
Ans: The purpose of burning a magnesium ribbon in air is to observe the reaction of magnesium with oxygen and to collect the product, which is magnesium oxide.

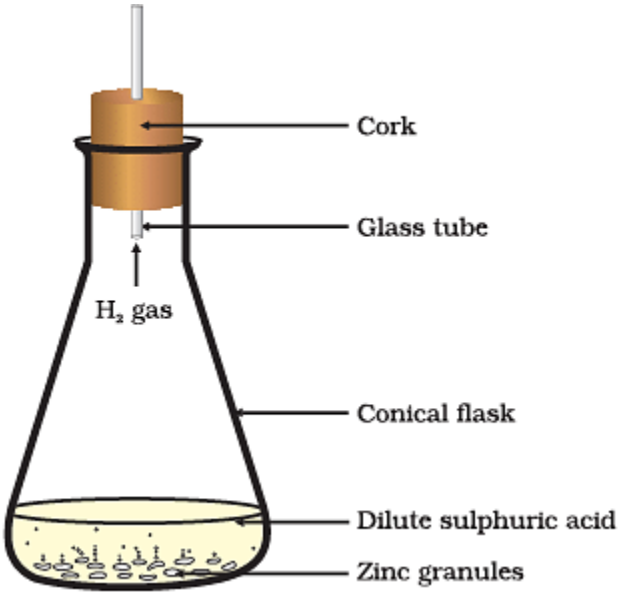
(ii) Describe the appearance of the magnesium ribbon before it is burnt.
Ans: Before burning, the magnesium ribbon appears as a shiny, silver-colored metal strip.

(iii) What happens to the magnesium ribbon when it is burnt in air?
Ans: When the magnesium ribbon is burnt in air, it reacts with oxygen to form magnesium oxide. During this reaction, the magnesium ribbon glows brightly and produces a white powder (magnesium oxide).

(iv) How is magnesium oxide collected in this experiment?
Ans: Magnesium oxide is collected in a watch-glass. It is the white powder that forms on the surface of the watch-glass as a result of the reaction between magnesium and oxygen.

(v) Write the balanced chemical equation for the reaction that takes place when magnesium burns in air.
Ans: The balanced chemical equation for the reaction is:
$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

Q2: Answer the following questions based on the diagram given below:



(i) What is the chemical reaction that occurs when dilute sulfuric acid reacts with zinc?
Ans: The chemical reaction between dilute sulfuric acid and zinc is represented as:
$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\uparrow$
In this reaction, zinc displaces hydrogen from sulfuric acid, forming zinc sulfate and hydrogen gas.

(ii) How can we test the presence of hydrogen gas during this experiment?
Ans: To test the presence of hydrogen gas, you can bring a burning splint near the mouth of the test tube where the reaction is happening. If you hear a "pop" sound and see a flame, it indicates the presence of hydrogen gas.

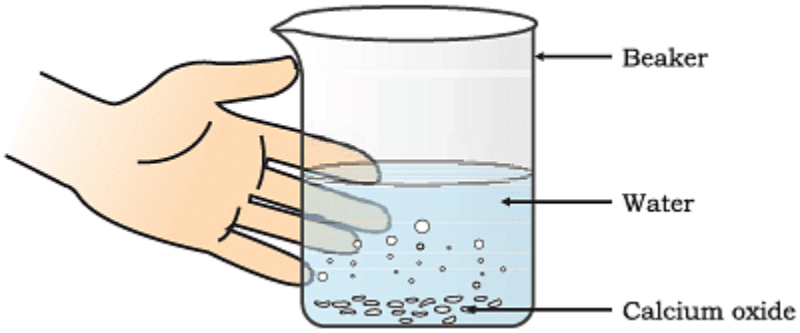
(iii) What is the role of zinc in this reaction?
Ans: Zinc acts as a reducing agent in this reaction. It donates electrons to hydrogen ions in sulfuric acid, leading to the production of hydrogen gas.

(iv) Why do we use dilute sulfuric acid in this experiment instead of concentrated sulfuric acid?
Ans: We use dilute sulfuric acid because it is safer and less reactive than concentrated

sulfuric acid. Concentrated sulfuric acid is highly corrosive and can produce a vigorous reaction with zinc, making it

(v) What is the significance of the "↑" symbol in the chemical equation for this reaction?
Ans: The "↑" symbol indicates that hydrogen gas is produced as a gas and is released into the air during the reaction. It helps us understand that hydrogen gas is one of the products of the reaction and is liberated in the form of bubbles.

Q3: Answer the following questions based on the diagram given below:



(i) What are the reactants in the experiment for the formation of slaked lime?
Ans: The reactants in this experiment are calcium oxide (CaO) and water (H_2O).

(ii) Describe the appearance of calcium oxide (CaO) before the reaction with water.
Ans: Calcium oxide appears as a white, powdery substance before the reaction with water.

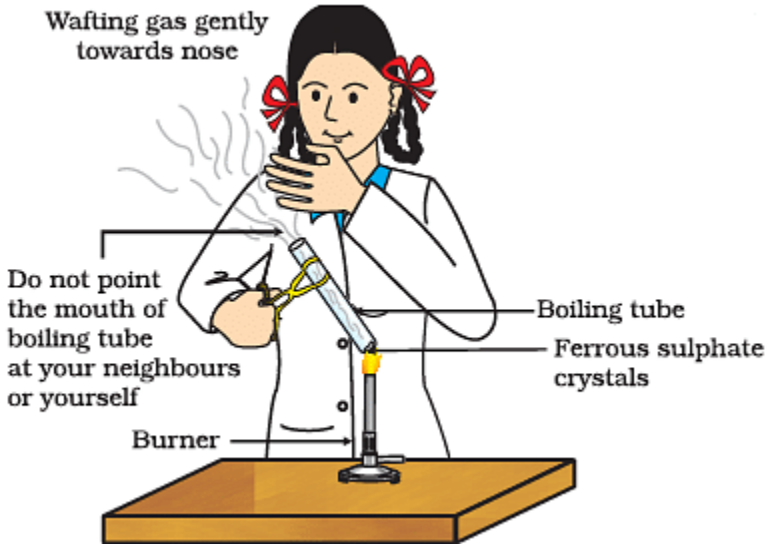
(iii) What is the chemical formula of the product formed in this experiment, and what is its common name?
Ans: The chemical formula of the product formed is calcium hydroxide ($Ca(OH)_2$), and its common name is slaked lime.

(iv) Explain how the appearance of the mixture changes during the reaction between calcium oxide and water.
Ans: During the reaction, the mixture changes from a white, powdery substance (calcium oxide) to a thick, white, and pasty substance (slaked lime or calcium hydroxide).

(v) Why is the formation of slaked lime considered a combination reaction?
Ans: The formation of slaked lime is considered a combination reaction because it involves the combination of two substances, calcium oxide and water, to form a single

product, calcium hydroxide, without the release of any additional substances.

Q4: Answer the following questions based on the diagram given below:



(i) What is the purpose of heating the boiling tube containing crystals of ferrous sulfate in this experiment?
Ans: To observe the effect of heating on the crystals of ferrous sulfate.

(ii) What is the appearance of ferrous sulfate crystals before heating, and how does it change after heating?
Ans: Before heating, the ferrous sulfate crystals are usually green in color. After heating, they turn white and lose their water of crystallization.

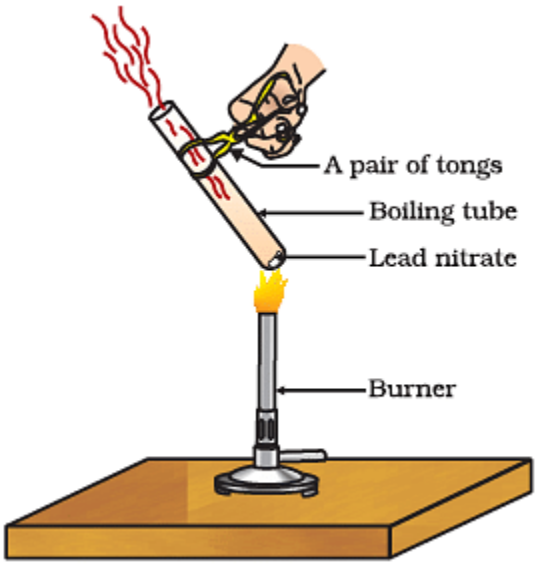
(iii) Why is it important to observe the odor during this experiment?
Ans: Odor observation helps identify the presence of sulfur dioxide gas, which is released when ferrous sulfate is heated.

(iv) Describe the odor you would expect when heating ferrous sulfate crystals, and explain the chemical reaction responsible for it.
Ans: The odor would be of burning sulfur or a pungent, rotten egg smell. This is due to the decomposition of ferrous sulfate, which releases sulfur dioxide gas (SO_2) when heated.

(v) How would you test the presence of sulfur dioxide gas in this experiment?
Ans: You can pass the gas produced during heating through a glass tube into a solution

of sodium hydroxide (NaOH). If sulfur dioxide gas is present, it will react with NaOH to form sodium sulfite (Na_2SO_3), which can be detected by the formation of a white precipitate.

Q5: Answer the following questions based on the diagram given below:



(i) What is the initial substance in the experiment shown in Figure?
Ans: The initial substance in the experiment is lead nitrate (Pb(NO3)2).

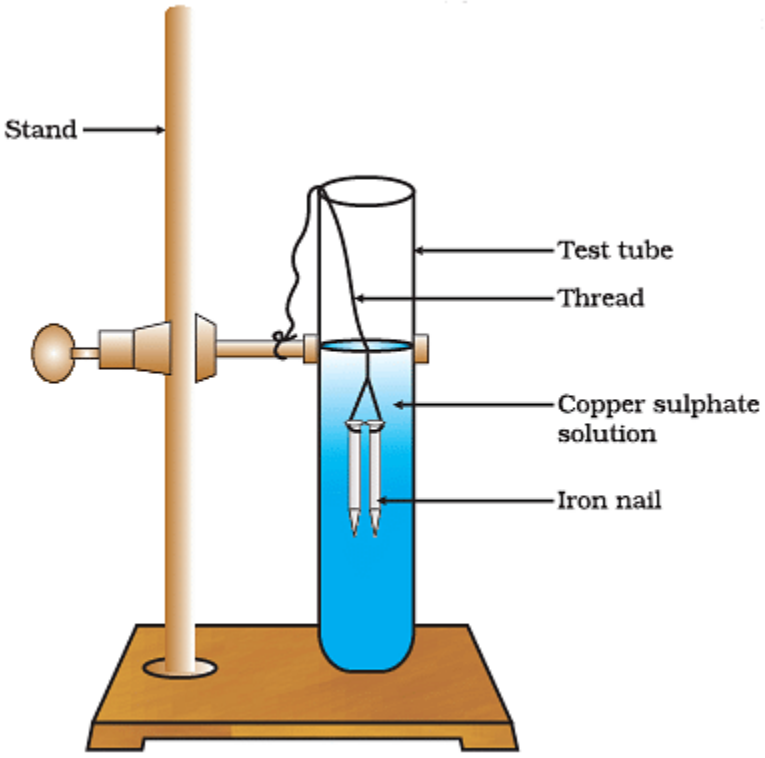
(ii) What is the evidence that a chemical reaction has occurred during heating?
Ans: The evidence of a chemical reaction is the emission of brown fumes, which are identified as nitrogen dioxide (NO_2). This indicates that a chemical change has taken place.

(iii) Write the chemical equation for the thermal decomposition of lead nitrate.
Ans: The chemical equation for the thermal decomposition of lead nitrate is: $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$. This equation represents the conversion of lead nitrate into lead oxide, nitrogen dioxide, and oxygen.

(iv) What is the role of heat in this experiment?
Ans: Heat is used as an energy source to break the chemical bonds in lead nitrate ($Pb(NO_3)_2$). This process, known as thermal decomposition, results in the formation of lead oxide (PbO), nitrogen dioxide (NO_2), and oxygen (O_2).

(v) Why is it important to use tongs while heating the boiling tube?
Ans: Tongs are used to hold the boiling tube because the experiment involves high temperatures, and it can become very hot. Using tongs ensures the safety of the experimenter by preventing direct contact with the hot glass, which could cause burns or injuries.

Q6: Answer the following questions based on the diagram given below:



(i) Describe the setup of the experiment where iron nails are dipped in copper sulfate solution.
Ans: In the experiment, take a beaker and fill it with copper sulfate solution. Place some iron nails in the solution and observe the changes over time. Ensure that the nails are fully immersed in the solution.

(ii) What is the initial color of the copper sulfate solution, and what happens to it as the experiment proceeds?
Ans: Initially, the copper sulfate solution is blue in color. As the experiment proceeds, the blue color of the solution starts to fade, and the solution turns greenish due to the formation of a new compound.

(iii) Explain the chemical reaction that occurs when iron nails are dipped in copper sulfate solution.

Ans: When iron nails are dipped in copper sulfate solution, a displacement reaction occurs. The iron in the nails reacts with copper sulfate to form iron sulfate and copper metal. The chemical equation for this reaction is:

Iron (Fe) + Copper Sulfate ($CuSO_4$) $\rightarrow$ Iron Sulfate ($FeSO_4$) + Copper (Cu)

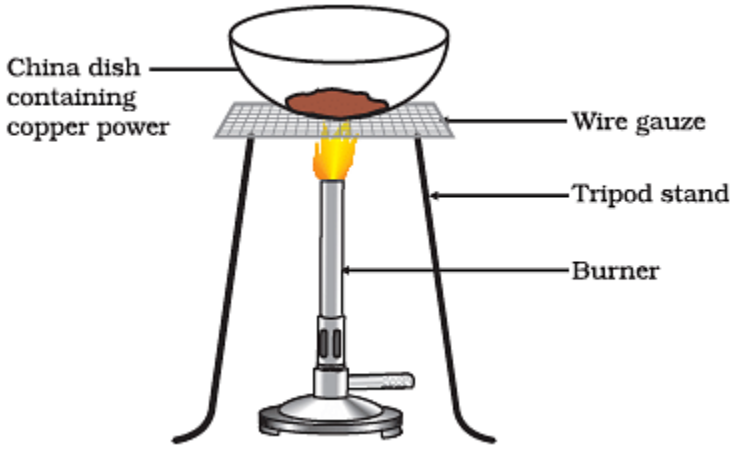
(iv) What is the solid substance that forms on the surface of the iron nails during the experiment?

Ans: A reddish-brown solid substance, which is copper, forms on the surface of the iron nails during the experiment. This is a visible result of the displacement reaction taking place.

(v) How can you confirm the presence of copper in the final solution after the experiment?

Ans: To confirm the presence of copper in the final solution, you can perform a simple test. Add a few drops of dilute hydrochloric acid (HCl) to the greenish solution. If copper is present, a brown gas (hydrogen gas) will be evolved, and you may also notice the solution turning blue again due to the formation of copper chloride. This confirms the presence of copper in the solution.

Q7: Answer the following questions based on the diagram given below:



(i) What is the initial color of the copper wire before the oxidation experiment?

Ans: The initial color of the copper wire is reddish-brown.

(ii) Describe the changes in the color of the copper wire after it undergoes oxidation.
Ans: After oxidation, the copper wire turns black due to the formation of copper oxide.

(iii) Explain the role of heat in the oxidation of copper.
Ans: Heat is necessary for the oxidation of copper. It provides the energy required for copper atoms to react with oxygen in the air and form copper oxide.

(iv) What type of chemical reaction is observed during the oxidation of copper?
Ans: The oxidation of copper is a chemical reaction called a redox reaction, where copper atoms lose electrons and combine with oxygen to form copper oxide.

(v) Why is the copper wire cleaned before the experiment?
Ans: The copper wire is cleaned before the experiment to remove any impurities, such as grease or dirt, that might hinder the oxidation process and to ensure accurate observations during the experiment.