


**GPT-4o:** <Procedure> Add approximately 3 milliliters of copper(II) chloride solution to test tube No.1 using a clean dropper or graduated cylinder. Gently shake or swirl the test tube to ensure thorough mixing of the solution. Observe any changes in color, precipitation, or other visible phenomena that may occur as a result of the reaction.

<Principle> A pale blue precipitate forms, indicating the presence of copper(II) hydroxide. Because copper (II) chloride ( $\text{CuSO}_4$ ) dissociates in water to release copper ions ( $\text{Cu}^{2+}$ ) and sulfate ions ( $\text{SO}_4^{2-}$ ). And obtain  $\text{CuSO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{Cu}(\text{OH})_2\downarrow$  [Overly Verbose]

<Safety> Ensure you are wearing protective gloves and goggles. Avoid contact with the body. [Overly General]

**Qwen2.5-VL-7B:** <Procedure> Add sodium hydroxide solution to a test tube containing copper sulfate solution. Observe the formation of blue flocculent precipitate.

<Principle>  $\text{CuSO}_4 + \text{NaOH} \rightarrow \text{Na}_2\text{SO}_4$ . [Incorrect Principle] [Lack of Safety Guidelines]

**Our ExpStar**  : <Procedure> Add a small amount of copper sulfate solution. Shake gently. Observe the formation of blue flocculent precipitate.

<Principle>  $\text{CuSO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{Cu}(\text{OH})_2\downarrow$  ✓

<Safety> Sodium hydroxide is highly corrosive. You should prevent liquid splashing. ✓



## Wikipedia Passages

Copper(II) hydroxide ( $\text{Cu}(\text{OH})_2$ ) has been known. The alchemists were probably the first to manufacture it by mixing solutions of sodium hydroxide ( $\text{NaOH}$ ) or potassium hydroxide ( $\text{KOH}$ ) and blue copper(II) sulfate ( $\text{CuSO}_4$ ) ...

Sodium hydroxide is a corrosive base and alkali that decomposes lipids and proteins at ambient temperatures and may cause severe chemical burns...