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Chemistry - Nail Lab

## Purpose

 The purpose is to determine the ratio of copper produced to iron consumed in a replacement reaction.

## Procedure

**Day 1**

1. Label, then mass a small beaker (record\*).

2. Put between 6.0 and 8.5 g of copper (II) chloride in the beaker.

3. Add about 50 mL distilled water to the beaker. Stir to dissolve the solid. Observe and write\*

4. Mass 2 or 3 nails together to ± 0.01g. (This means include sig figs to the hundredths digit.)

5. Place the nails in the copper chloride solution. Observe the reaction; record your observations\*. Place the labeled beaker in the place designated by your teacher.

**Day 2**

6. Remove the nails. Rinse or scrape the precipitate (copper metal) from the nails into your labeled 150 mL beaker. Place the nails in a labeled small cup. Note the appearance of the nails. Place this cup in the drying oven.

7. Decant solution from the 150 mL beaker. Rinse the precipitate with about 25 mL of distilled water. Try to lose as little of the solid copper as you can when you decant. After a 2nd rinse with distilled water, rinse the copper with 25 mL of 1 M HCl. Rinse one last time with distilled water. Then place the labeled beaker in the drying oven.

8. Mass the dry nails, then discard the nails.

### Day 3

9. Mass the beaker + dry copper. Discard the copper in the place designated by your teacher. Wash your beaker and let dry.

## Data: Mass Observations:

|  |  |  |
| --- | --- | --- |
| Mass 150 mL beaker |  |  |
| Mass 150 mL beaker + copper (II) chloride  |  |
| Mass nails before reaction |  |
| Mass nails after reaction |  |
| Mass 150 mL beaker + dry copper |  |

**Calculations:**

1. Determine the mass of copper produced and the mass of iron used during the reaction.

2. Calculate the moles of copper and moles of iron involved in the reaction.

3. Determine the ratio moles of copper.

moles of iron

 Express this ratio as an integer. For example, a ratio of 1.33 can be expressed as ; 0.67 can be expressed as , etc.

**Questions:**

1. Why did the reaction stop? Which reactant was used up? How do you know?

2. Describe what was happening to the atoms of iron and copper during the reaction. What is this type of reaction called?

3. What would happen to the ratio of copper to iron if you had placed more nails in the beaker? If you had let the reaction go for less time?

4. What is the accepted ratio of copper atoms to iron atoms in this reaction? Account for differences between your experimental value and the accepted value.
Write the balanced equation for the reaction.

Conclusion: