## What is the empirical formula of a salt of copper and hydroxide: Copper (??) hydroxide, Cu<sub>?</sub>(OH)<sub>?</sub>

**Objective:** Use the mole concept to determine a chemical formula from experimental data.

**Materials:** 150 and 250 mL beakers, funnel, filter paper, ring stand, distilled water, 0.1M sodium hydroxide, copper metal, digital balance, 1M nitric acid

1. Obtain a clean dry 150 mL beaker. Place a <u>small sample</u> of copper in the beaker and mass the beaker with copper. Record the mass of the beaker plus copper in **data table 1.** <u>Calculate the moles</u> of copper and record in **data table 1.** 

2. Bring your beaker with the copper to the <u>fume hood</u>. Dr. Dinkins will add ~2.0 mL of concentrated nitric acid  $(HNO_3)$  into your beaker. Observe the signs of a reaction between copper and concentrated nitric acid.

**Note:** Nitric acid is a strong acid and could cause a serious burn. If it comes in contact with your skin, wash the affected area immediately and then report it to your instructor. If you spill nitric acid, tell Dinkins immediately.

Record your observation here:

3. Add ~10 mL of distilled water to the beaker to dilute the contents. Then, add ~50 mL of 0.1M sodium hydroxide (NaOH). Swirl the flask to mix the reagents well.

Record your observation here:

4. Obtain a sheet of filter paper and fold so that it can be put into a funnel. Take the mass of the filter paper and record it in **data table 1**.

5. Wet the filter paper with distilled water so that it will stick to the funnel.

6. Place the funnel in a ring stand. Place a new 250 mL beaker under the funnel and pour your reaction contents into the funnel using a stir rod (see image).

7. Try to pour the liquid first and then use a squirt bottle of water to remove the precipitate from the beaker into the filter funnel. Rinse the precipitate with water several times. *This will wash through all the extra dissolved ions from the reaction beaker so that your product is not contaminated.* 

8. After collecting all the copper hydroxide product in the filter, dry the filter paper overnight.

9. After the filter paper has dried, record the mass of the filter paper and the product. Record this in **data table 1**.

10. Calculate the mass of your product alone by subtracting the mass of the filter paper from step 4.

11. Subtract the mass of the copper from step 1 from the mass of your product in step 10. This value should be the mass of the hydroxide ions in your product. <u>Calculate the moles of hydroxide</u> from this mass.

12. Find the mole ratio of copper to hydroxide, and use this ratio to determine the formula of your product.

## Data Table

Mass of copper	
Moles of copper	
calculate in this space $\rightarrow$	
Mass of filter paper	
Mass of filter paper + copper hydroxide	
Mass of copper hydroxide	
Mass of hydroxide ion in product	
Moles of hydroxide ion	
calculate in this space $\rightarrow$	

## Final step:

Calculate the mole ratio of copper to hydroxide. To do this divide each number of moles by the smallest of the two mole values. Use this ratio [1 : \_\_] to determine the formula of your copper hydroxide product.