FLINN SCIENTIFIC

Name_____

Empirical Formula of Copper Carbonate Worksheet

Data Table. Part I. Gas Evolution Method

Mass of clean and dry Erlenmeyer flask	
Mass of flask and basic copper carbonate sample	
Mass of basic copper carbonate analyzed	
Mass of cylinder and HCl	
Mass of cylinder after HCl was added to reaction flask	
Mass of HCl added to flask	
Mass of flask + basic copper carbonate sample + HCl	
Mass of flask + final solution after CO_2 loss	
Mass of released CO_2	
Percent CO_2 in basic copper carbonate sample	

Data Table. Part II. Colorimetric Comparison

Test Tube	1	2	3	4	5	6	Unknown
Volume of $CuSO_4$ stock solution	10.0 mL	8.0 mL	7.0 mL	6.0 mL	4.0 mL	2.0 mL	1.30 g of basic copper carbonate diluted to 100.0 mL with 0.2 M sulfuric acid
Final volume of diluted solution (mL)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Color comparison (rank solutions from lightest blue = 1 to deepest blue = 6)	6	5	4	3	2	1	The known solution whose color matches the unknown =
Copper ion concentration in standard solution	0.20 M	0.16 M	0.14 M	0.12 M	0.08 M	0.04 M	Estimated concentration of copper ion in the unknown solution =

Post-Lab Analysis and Calculations

1. Show the calculations for the gas evolution method Data Table.
   a. Mass of basic copper carbonate analyzed
   b. Mass of HCl added to flask
   c. Mass of flask + basic copper carbonate sample + HCl
   d. Mass of released CO_2
   e. Percent CO_2 in basic copper carbonate sample

2. Calculate the percent copper based on the results from Part II, the colorimetric comparison. Example: if the color of the unknown basic copper carbonate solution most closely resembled test tube #2, which has a concentration of 0.16 M, the calculation would be:

$$\frac{0.16 \text{ moles}}{\text{L}} \times 0.1 \text{ L} \times \frac{63.55 \text{ g Cu}}{\text{mol}} = 1.02 \text{ g Cu in the 100 mL unknown solution}$$

Unknown basic copper carbonate solution size is 100 mL.

$$\frac{1.02 \text{ g Cu}}{1.30 \text{ g copper carbonate}} \times 100\% = 78\% \text{ Cu}$$

3. Fill in the table below and identify the most likely form of basic copper carbonate that was tested in this lab. Write a short paragraph explaining your choice and describe the supporting evidence quantitatively.

	% CO_2 theoretical	% CO_2 experimental	% copper theoretical	% copper experimental
$Cu_2(OH)_2CO_3$				
$Cu_3(OH)_2(CO_3)_2$				