Stoichiometry Lab

In this experiment, you will decompose a mixture of basic copper II carbonate [with the formula $CuCO_3 \cdot Cu(OH)_2$] to form copper II oxide, carbon dioxide and water. You will determine the moles of reactant used and product produced through careful measurement of masses and by stoichiometry. Complete the calculations and answer the questions AS YOU COMPLETE THE LAB. Show your calculations in the areas provided. Don't wait until you are all finished. Fill in the data tables as you go.

Write the balanced equation for the decomposition of basic copper II carbonate below:

MATERIALS & EQUIPMENT

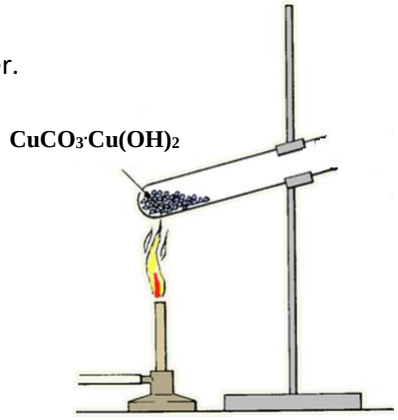
copper II carbonate (basic); approximately 3-4 grams
test tube
retort stand with clamp
portable burner
electronic balance with 0.01 gram precision
weighing boats

SAFETY AND ENVIRONMENTAL CONCERNS

DIAGRAM 1: EXPERIMENTAL SETUP

Note: You might use a portable burner instead of a Bunsen burner. One key to the experiment is not getting the sample too hot.

Diagram modified from an original found at:
http://www.sciencefair-projects.org/images-sciencefair/chemistry/chemistry12.gif



PROCEDURE

Caution: Put on your goggles now!! You are encouraged to wear an apron also.

1. Remember to show all units, and uncertainties, in your data tables. **Fill in the data tables as you go. Make sure to record proper uncertainties and units**.
2. Mass an empty test tube.
3. Place approximately 3-4 grams of copper II carbonate (basic) in the test tube and mass the test tube again.
4. Put your equipment together as in the diagram on page 1.
5. Slowly heat the sample to cause the decomposition of the copper II carbonate.
6. Allow the test tube to cool completely.
7. While it is cooling, work through your calculations. (You may leave your test tube to cool while you go sit at your desk to work through the calculations.)

Data Table 1

Mass of empty test tube	
Mass of test tube with $CuCO_3 \cdot Cu(OH)_2$	
Mass of $CuCO_3 \cdot Cu(OH)_2$	
Moles of $CuCO_3 \cdot Cu(OH)_2$	
Qualitative Observations of the Reaction	

Calculation 1: Calculate the number of moles of $CuCO_3 \cdot Cu(OH)_2$ in your test tube.

Calculation 2: Calculate the moles and grams of copper II oxide that should be produced by this reaction. (Think stoichiometry...if you start with_____ g copper II carbonate, how many moles and/or grams of CuO should be produced? This is the theoretical yield.) Record these values in the data table below. Note that the first two values in the data table will simply be copied from Data Table 1. This will allow for easier comparison.

Data Table 2

Mass of $CuCO_3 \cdot Cu(OH)_2$ to be decomposed	
Moles of $CuCO_3 \cdot Cu(OH)_2$ to be decomposed	
Theoretical Yield of CuO (moles)	
Theoretical Yield of CuO (grams)	

Question 1: What do you notice about the moles of copper II oxide produced compared to the moles of copper II carbonate (basic) that you start with for each test tube? Can you explain this based on the balanced equation?

Back to the method.

8. Now that your test tube is cool, mass the test tube again. Complete the table below. (Note that some values will be repeated values from previous tables. They are placed here for easier comparison.)

Data Table 3

Mass of empty test tube	
Mass of test tube with CuO (after the reaction)	
Mass of CuO in the test tube (Experimental Yield)	
Theoretical Yield of CuO (grams)	
Percent Yield	

Calculations for Data Table 3:
(Note: The first and fourth cells are copied from Data Table 2. The second cell is raw data. The third and fifth cells will require calculations.)