Chemistry 132 | *due Wednesday January 16th at the beginning of class* | **Dr. Fantini**
Prelab Assignment #1 | **Preparation page** | January 14, 2013

Name: Key SB#: 007

All work is to be done individually. You can use textbooks, notes, and resources on the internet.

What is the formula weight and mass % Cu for each of the following? (Show work below table.)

compound	formula weight	mass % Cu
$CuCO_3$	123.555 g/mol	51.431%
$Cu(OH)_2Cu(CO_3)$	221.116 g/mol	57.478%
$Cu(OH)_2Cu_2(CO_3)_2$	344.670 g/mol	55.310%

Cu 63.546
C 12.0107
O 15.9994
H 1.00794

$CuCO_3$

63.546
12.0107
$+ 3(15.9994)$
123.5549

$Cu(OH)_2Cu(CO_3)$

123.5549
63.546
$2(15.9994)$
$+ 2(1.00794)$
221.11558

$Cu(OH)_2Cu_2(CO_3)_2$

123.5549
$+ 221.11558$
344.67048

% Cu

$\left(\frac{63.546}{123.5549}\right) 100\%$

51.431%

% Cu

$\left(\frac{2 \times 63.546}{221.11558}\right) 100\%$

57.478%

% Cu

$\left(\frac{3 \times 63.546}{344.67048}\right) 100\%$

55.310%

(over)

When 3.8044 g $CuSO_4 \cdot 5H_2O$ and 2.0503 g Na_2CO_3 were combined as described in the experimental procedure within, 1.5517 g of product was obtained. Assuming the product to be $CuCO_3$, what was the percent yield of the reaction? (Show work.)

mw $CuSO_4 \cdot 5H_2O$

Cu	$1 \times 63.546 =$	63.546
S	$1 \times 32.065 =$	32.065
O	$9 \times 15.9994 =$	143.9946
H	$10 \times 1.00794 =$	10.0794
		249.685 g/mol

mw Na_2CO_3

Na	$22.98977 \times 2 =$	45.97954
C	$12.0107 =$	12.0107
O	$15.9994 \times 3 =$	47.9982
		105.98844 g/mol

# of moles $CuSO_4 \cdot 5H_2O$

$$3.8044\ g\ CuSO_4 \cdot 5H_2O \times \left(\frac{1\ mol\ CuSO_4 \cdot 5H_2O}{249.685\ g\ CuSO_4 \cdot 5H_2O}\right) = 0.0152368\ mol\ CuSO_4 \cdot 5H_2O$$

# of moles Na_2CO_3

$$2.0503\ g\ Na_2CO_3 \times \left(\frac{1\ mol\ Na_2CO_3}{105.98844\ g\ Na_2CO_3}\right) = 0.0193456\ mol\ Na_2CO_3$$

balanced equation

$$CuSO_4 + Na_2CO_3 \longrightarrow Na_2SO_4 + CuCO_3$$

all 1:1, so the $CuSO_4 \cdot 5H_2O$ runs out first. The most "$CuCO_3$" you could make is 0.0152368 mol $CuCO_3$.

$$0.0152368\ mol\ CuCO_3 \times \frac{123.555\ g\ CuCO_3}{1\ mol\ CuCO_3} = 1.88258282\ g\ CuCO_3$$

$$\text{percent yield} = \frac{\text{amount recovered}}{\text{theoretical yield}} \times 100\% = \left(\frac{1.5517\ g\ CuCO_3}{1.882583\ g\ CuCO_3}\right)(100\%)$$

$$= 82.423996\%$$

82.424%