Name: Key - Sample Data Date:
Lab Partner:

Experiment: Copper—Silver Nitrate Reaction

REACTION

$$Cu_{(s)} + 2AgNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + 2Ag_{(s)}$$

PROCEDURE

1. Obtain 30 cm of bare copper wire, a clean dry 100 mL beaker, a test tube and a vial of about 1.5 g of silver nitrate.
2. Record the mass of 100 mL beaker. Record the mass of vial, cap, and silver nitrate.
3. Measure about 20 mL distilled water into the test tube. Add the silver nitrate to the test tube. Record the mass of the empty vial and cap. With a stirring rod, mix the silver nitrate and water until it dissolves.
4. Using a pen or pencil, coil the copper wire. Record the mass of the copper wire before. Place coiled copper wire into the test tube. Record observations every 10 minutes. Allow to react for 30 minutes.
5. When you are done, carefully lift the wire out of the test tube. Using a wash bottle, rinse the wire into the 100 mL beaker. Empty the contents of the test tube into the 100 mL beaker. Dip the copper wire in acetone. Record the mass of the copper wire after.
6. Let the silver crystals settle in the beaker and carefully decant the liquid. Wash 2-3 times with 10 mL of distilled water. Allow the silver crystals to dry overnight. Record the mass of beaker plus silver crystals.

DATA TABLE

a. Mass of clean, dry 100 mL beaker	69.19 g
b. Mass of vial, cap, and silver nitrate	7.20 g
c. Mass of empty vial and cap	5.80 g
d. Mass of copper wire before reaction	3.56 g
e. Mass of copper wire after reaction	3.30 g
f. Mass of beaker plus silver crystals	70.08 g

PROCESSING THE DATA

1. Determine how many grams of copper wire were lost during the experiment.

   B - E = ______ g Cu lost   3.56 g - 3.30 g = 0.26 g Cu lost

2. Determine the moles of copper. MM Cu = 63.5 g/mol

   Ans #1 ÷ 63.5 g/mole = ______ mol Cu lost   .26 g ÷ 63.5 g/mole = .00409 mol Cu

3. Determine how many grams of silver were produced.

   F - A = ______ g Ag formed   70.08 g - 69.19 g = 0.89 g Ag

4. Determine the moles of silver. MM Ag = 108 g/mol

   Ans #3 ÷ 108 g/mole = ______ mol Ag formed   .89 g ÷ 108 g/mol = .00824 mol Ag

5. Divide the moles of silver by the moles of copper to determine the ratio of Ag/Cu.

$$\frac{\text{Ans \#4}}{\text{Ans \#2}} = \frac{.00824 \text{ mol Ag}}{.00409 \text{ mol Cu}} = 2.01 \frac{\text{mol Ag}}{\text{mol Cu}}$$ ← should be "2"

6. Determine the moles of $AgNO_3$ used. MM $AgNO_3$ = 170 g/mol

(B) - (C) ÷ 170 g/mol = ______ mol $AgNO_3$ = $(7.20_g - 5.80_g) \div 170 = .00824$ mol $AgNO_3$

7. Divide the moles of silver by the moles of silver nitrate to determine the ratio of $Ag/AgNO_3$.

$$\frac{\text{Ans \#4}}{\text{Ans \#6}} = \frac{.00824 \text{ mol Ag}}{.00824 \text{ mol } AgNO_3} = 1.001 \frac{\text{mol Ag}}{\text{mol } AgNO_3}$$ ← should be "1"

8. How many atoms of copper were removed from the wire in the experiment?

(Ans #2) × 6.02×10^{23} = ______ atoms Cu lost

$.00409 \text{ mol Cu} \times 6.02 \times 10^{23} =$ 2.46×10^{22} atoms Cu lost

9. How many atoms of silver metal were formed in your experiment?

(Ans #4) × 6.02×10^{23} = ______ atoms Ag formed

$.00824 \text{ mol Ag} \times 6.02 \times 10^{23} =$ 4.96×10^{21} atoms Ag formed

POINTS TO PONDER

1. What caused the color in the solution to appear as the reaction took place?

The blue color in the solution was the other product, $Cu(NO_3)_2$

2. From the chemical equation on the front, the actual ratio of Ag/Cu is 2. Calculate the percent error of your result.

$$\frac{2 - \text{Ans \#5}}{2} \times 100 \qquad \frac{|2-2.01|}{2} \times 100 = \boxed{0.5\%}$$

3. From the chemical equation on the front, the actual ratio of $Ag/AgNO_3$ is 1. Calculate the percent error of your result.

$$\frac{1 - \text{Ans \#7}}{1} \times 100 \qquad \frac{|1-1.001|}{1} \times 100 = \boxed{0.1\%}$$

Sources of error: