**SOLUTION STOICHIOMETRY LAB NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

In this lab, you will be reacting iron with a solution of copper (II) sulfate. You will use the starting quantity of each reactant to predict the amount of solid product to be formed. Following the reaction, you will determine the mass of the product to find your percent yield and percent error.

Skills that will be graded during this lab activity:

1. Solution preparation
2. Designing a lab procedure that will include all necessary measurements.
3. Ability to follow your procedure.
4. Creating a data for your lab.
5. Lab techniques: solution preparation, measurement, filtration, decanting
6. Lab safety
7. Ability to process lab data
8. Per cent error and per cent yield

**DAY 1: PRE-LAB ASSIGNMENT:**

1. Carefully read the lab procedure.
2. Make a list of all measurements that you will need to make during the lab.

1. Re-write the lab procedure, including the measurements you will need to make. (on a separate sheet of paper). You will use **your written sheet of paper** in lab tomorrow.
2. Set up a data table for your experiment. Include all measurements that you will need to make. Use a ruler to draw the lines for your data table. (**on the paper with your procedure**)
3. Prepare 25mL of 0.85M copper (II) sulfate solution.

You will be given solid CuSO4 **.** 5H2O, distilled water and a 25ml volumetric flask. To originally dissolve the copper(II) sulfate pentahydrate, you will need to use hot distilled water. Use the hotplate that is on your lab table, as well as any other lab equipment you need. You can add the crystals to the water while it is on the hot plate.

Show calculations here:

1. Practice decanting a solution.
2. Practice filtering a solution.
3. Write out and balance the equation for the reaction that occurs. The iron will form the +2 ion when it goes into solution. Include state symbols.

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1. Define the term “limiting reactant”: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Solve the problem below:

A student places 5.0g of aluminum in 25.0mL of 1.5M of nickel (II) nitrate.

1. Write the balanced equation for the reaction. Include state symbols.

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1. Predict the mass of solid product that should form.
2. Identify the limiting reactant. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The student measures that he has 2.4g of the solid at the end of the lab. Find his % yield and % error.

ANSWERS TO #10: a. 2 Al(s) + 3 Ni(NO3)2(aq) 🡪 3 Ni(s) + 2 Al(NO3)3(aq) b. 2.2g Ni c. Ni(NO3)2 d. 109.1% yield; 9.1% error

LAB PROCEDURE (WITHOUT MEASUREMENTS)

1. Empty the copper(II) sulfate solution that you prepared last class into a clean, dry 100mL beaker. You will be reacting all of it.
2. Place the beaker on the hot plate. Turn the hot plate to “LOW”.
3. Obtain the iron filings from your teacher. Add the iron filings to the solution in the beaker – a small amount at a time. Continue stirring for 10 minutes while the reaction proceeds. Write down any observations you make during the reaction.
4. Decant the liquid into a 250mL beaker. Do not disturb the solid at the bottom of the beaker.
5. Add about 10mL of water to the solid at the bottom the beaker to wash it. Shake rigorously.
6. Decant again.
7. Write your initials, in ink, on a piece of filter paper. Filter your mixture. Use distilled water to make sure that all the solid is transferred to the filter paper.
8. Open up the filter paper with your solid. Place it on an evaporating dish. Bring the evaporating dish and filter paper to your teacher to place in the oven.
9. Clean up. Once clean up is complete, see your teacher for conclusion questions. Conclusion questions will be answered at your desk, individually.
10. After the solid is dry, your teacher will return the filter paper to you so that you can calculate percent yield and percent error.