E4-A SEQUENCE OF CHEMICAL REACTIONS

Section_____ Name_____

Report Sheet

Quantitative Analysis

mass of Cu(s) at beginning of experiment: _____

mass recovered at the end of the experiment: _____

% Cu recovered: _____

Comments and discussion:

1) Show your calculation for % copper recovered.

2) A student reports 115% recovery. How could he possibly have more copper at the end of the experiment than he started with? Explain.

3) Another student reported less than 100% yield. Is this a violation of the law of conservation of mass? Explain.

4) Compare the theoretical mass of zinc (calculated in the Pre-lab) with the amount we actually use. Explain any differences.

Qualitative Analysis

Table of observations

The steps in the experiment	Write the symbol / formula for the form of copper that is present in the following steps of the experiment	The color of the solution in each step
a. before adding nitric acid		
b. after adding nitric acid:		
c. after adding NaOH (litmus paper turns blue):		
d. after boiling:		
e. after adding sulfuric acid:		
f. after adding zinc:		

QUESTIONS

1) What should the student do, if the solution is still blue in step d in the table above?

2) What should the student do, if the solution is still blue in step f in the table above?

3) What was the purpose of adding concentrated nitric acid to the original copper sample?

Write the reaction equation:

4) What was the purpose of adding 6 M NaOH to the solution from Step 1in the procedure?

Write the reaction equation:

5) What was the purpose of heating the mixture (precipitate and aqueous layer) in Step 3 in the procedure?

Write the reaction equation:

6) What was the purpose of adding 3 M sulfuric acid to the solid that you recovered in Step 3 in the procedure?

Write the reaction equation:

7) What was the purpose of adding zinc to the copper solution in Step 5 in the procedure?

Write the reaction equation:

8) What was the purpose of adding 3M sulfuric acid to the copper/zinc mixture in Step 5 in the procedure?

Write the reaction equation:

9) What was the purpose of rinsing the final solid with DI water?

Why was acetone/ethanol used in the last step?

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Pre-Laboratory Assignment

1. Find in the procedure and describe:

   (a) A test for a basic solution

   (b) A test to decide whether enough zinc has been added

2. Does observing a color change always indicate that a chemical change has occurred? Explain.

3. The equation for the reconversion of copper into copper metal is as follows:

$$Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$$

Calculate the theoretical mass of zinc needed to carry out the reaction for a 0.424 g copper sample. Show all of your work.