Name: ____________________

Decomposition Reactions

Part #1: Copper(II) Sulphate Pentahydrate (bluestone) ➜ $CuSO_4 \bullet 5H_2O$	
mass of clean dry empty test tube	21.738 g
mass of test tube plus copper(II) sulphate pentahydrate	23.334 g
mass of test tube plus copper(II) sulphate residue	22.891 g

Observations during heating: ____________________

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Obseravtions when water was added back: ____________________

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Part #2: Cobalt(II) Chloride Hexahydrate ➜ $CoCl_2 \bullet 6H_2O$	
mass of clean dry empty test tube	20.738 g
mass of test tube plus cobalt(II) chloride hexahydrate	22.550 g
mass of test tube plus cobalt(II) chloride residue	21.729 g

Observations during heating: ____________________

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Observations when water was added back: ____________________

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Perform the Following Calculations For $CuSO_4 \bullet 5H_2O$:

1. Write a balanced chemical equation for this reaction:

   $CuSO_4 \bullet 5H_2O \rightarrow CuSO_4 + 5H_2O$

2. Calculate the mass of $CuSO_4 \bullet 5H_2O(s)$ that is available to react:

   mass $CuSO_4 \bullet 5H_2O(s)$ = (mass t.t. plus $CuSO_4 \bullet 5H_2O(s)$ – (mass t.t.)

   mass $CuSO_4 \bullet 5H_2O(s)$ = 23.334 g - 21.738 g

   mass $CuSO_4 \bullet 5H_2O(s)$ = 1.596 g

3. Predicted mass of $CuSO_4$ residue that should remain after heating (three conversion factors starting with the mass of $CuSO_4 \bullet 5H_2O(s)$

$$1.596\ CuSO_4 \bullet 5H_2O \times \frac{1\ mol\ CuSO_4 \bullet 5H_2O}{249.72\ g\ CuSO_4 \bullet 5H_2O}$$

$$\times \frac{1\ mol\ CuSO_4}{1\ mol\ CuSO_4 \bullet 5H_2O} \times \frac{159.62\ g\ CuSO_4}{1\ mol\ CuSO_4} = 1.020\ g\ CuSO_4$$

   This is called the **"Theoretical Mass"** of $CuSO_4$

4. **"Experimental Mass"** of $CuSO_4$ residue that remains after heating

   mass $CuSO_4(s)$ = (mass t.t. plus $CuSO_4$ residue) – (mass t.t.)

   mass $CuSO_4(s)$ = 22.761 g - 21.738 g

   mass $CuSO_4(s)$ = 1.153 g

5. Experimental Error Calculation:

$$\%\ error = \frac{|theoretical\ mass\ -\ experimental\ mass|}{theoretical\ mass} \times 100\%$$

$$= \frac{|1.020\ g\ -\ 1.153\ g|}{1.020\ g} \times 100\%$$

$$= 13.04\ \%$$

Repeat the Calculations from the previous page for $CoCl_2$●$6H_2O$

Questions – attach a separate sheet with the answers. (Please answer in full sentences ...)

1. Give a good definition for an “exothermic reaction”.

2. Give a good definition for an “endothermic reaction”.

3. Identify the exothermic reactions in the procedure that you followed for these two decompositions. How do you know that these reactions were exothermic?

4. Was the decomposition of $CuSO_4 \bullet 5H_2O$ and/or $CoCl_2 \bullet 6H_2O$ exothermic or endothermic. Explain using two distinct points.

5. What are some possible sources of error in this experiment. Explain that the effect of this error could have on the final mass of residue obtained (i.e. would the mass become more or less).