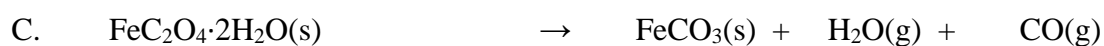
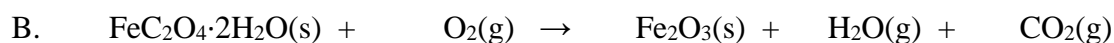
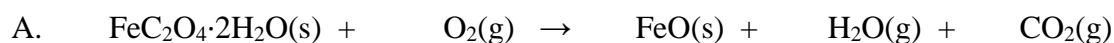


Option Fe: Pre-lab Calculations for the Iron Based Experiment:

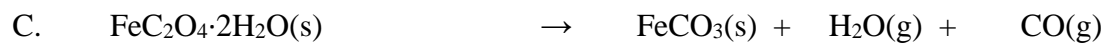
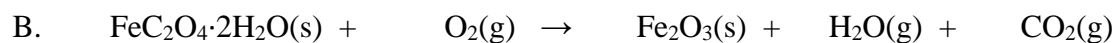
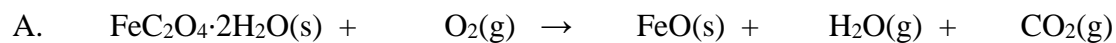
1. Calculate the molar mass of the starting hydrated salt material, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.
2. Your oxalate synthesis product will be $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$. Calculate the molar mass of $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$.
3. Write a balanced molecular equation that shows your $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, reacting with oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$) to form $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$. What will be the other product(s) of the double displacement reaction? Water will need to be added somewhere to balance correctly.
4. Pyrolysis of $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ will follow one of the following molecular equations. Balance each molecular equation. (*It's OK to keep a fraction when balancing the O_2 molecule in A or B*)



Name: _____

Section: _____

5. For each of the possible reactions, calculate the theoretical yield (in grams) of the solid product, assuming that you use 1.0 g $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ and that oxygen is the excess reactant. You will need to write in coefficients from question 4 to balance the molecular equations.



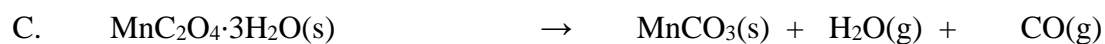
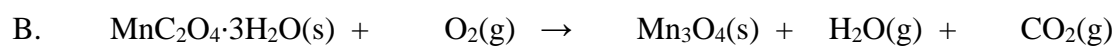
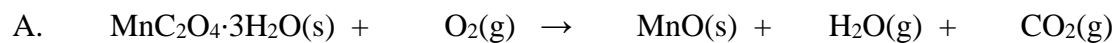
Option Mn: Pre-lab calculations for the Manganese based experiment:

1. Calculate the molar mass of the starting hydrated salt material, $\text{MnSO}_4 \cdot \text{H}_2\text{O}$.
2. Your oxalate synthesis product will be $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$. Calculate the molar mass of $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$
3. Write a balanced molecular equation that shows $\text{MnSO}_4 \cdot \text{H}_2\text{O}$, reacting with oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$) to form $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$. What will be the other product(s) of the double displacement reaction? Water will need to be added somewhere to balance correctly.
4. Pyrolysis of $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$ will follow one of the following molecular equations. Balance each molecular equation. (*It's OK to keep a fraction when balancing the O_2 molecule in A or B.*)
 - A. $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{MnO}(\text{s}) + \text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})$
 - B. $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{Mn}_3\text{O}_4(\text{s}) + \text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})$
 - C. $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}(\text{s}) \rightarrow \text{MnCO}_3(\text{s}) + \text{H}_2\text{O}(\text{g}) + \text{CO}(\text{g})$

Name: _____

Section: _____

5. For each of the possible reactions, calculate the theoretical yield (in grams) of the solid product, assuming that you use 1.0 g $\text{MnC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$ and that oxygen is the excess reactant. You will need to write in coefficients from question 4 to balance the molecular equations.



Data and Calculations**Part 1: Synthesis of Metal Oxalate**

Determine the identity of the limiting reactant, theoretical yield of the hydrated metal oxalate, and the percent yield of the hydrated metal oxalate product. Complete Table 1.

Table 1. Synthesis of Metal Oxalate

a) complete chemical formula of your starting material: (formula found on question 1)	
b) mass of hydrated metal salt used (g) <i>tare your 100 ml beaker and add 1.9-2.1g sample</i>	
c) moles of hydrated metal salt used convert grams from (b) using molar mass in question 1	
d) volume of 0.888M oxalic acid solution used <i>should be close to 25.0mL</i>	
e) moles of oxalic acid used <i>calculate from volume and molarity</i>	
f) mass of filter paper	
g) experimental yield: total mass of hydrated metal oxalate precipitate (grams) after drying by vacuum filtration. filter paper + salt mass: _____ <i>subtract the filter paper</i>	
h) identify the limiting reactant: either your starting formula in part (a) or oxalic acid <i>Refer to the balanced chemical equation in pre-lab quest. #3 and your moles of each reactant calculated in c and e</i>	
i) theoretical yield of hydrated metal oxalate product (g)	
j) percent yield of hydrated metal oxalate product	

Calculations: Show your calculations. Watch your units and report all answers with the correct number of significant figures.

Data and CalculationsPart 2: Decomposition (Pyrolysis) of Metal Oxalate

Complete Table 2. The pyrolysis reaction occurs with near 100% yield, so the actual yield of the pyrolysis reaction should be very close to the theoretical yield you calculated for the correct reaction equation (as calculated in Question #5 of the prelab).

Table 2. Pyrolysis of Metal Oxalate

a) Weigh the empty Aluminum dish before adding the filtered product.	
b) Before pyrolysis: mass of hydrated metal oxalate (grams) <i>Ideally between 0.99 to 1.01 gram</i> Al + oxalate salt mass: _____ <i>subtract the Al dish</i>	
c) After pyrolysis: final mass of pyrolysis product (grams) Al + pyrolyzed salt mass: _____ <i>subtract the Al dish</i>	
d) theoretical mass of product in reaction A From prelab (quest. #5A):	
e) theoretical mass of product in reaction B From prelab (quest. #5B):	
f) theoretical mass of product in reaction C From prelab (quest. #5C):	
g) Using the above information, which pyrolysis reactions actually occurred, A , B or C ?	
h) What is the expected chemical formula of the pyrolyzed metal salt formed?	

Calculations: Refer to your work from prelab Question #5 from your option. Watch your units and report all answers with the correct number of significant figures.