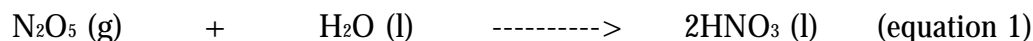
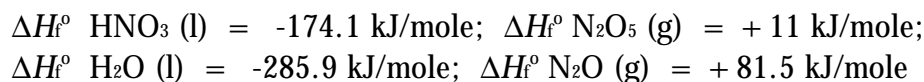


For full credit, please show all work clearly; please answer all questions on the paper provided.
Please write your name on all answer sheets:

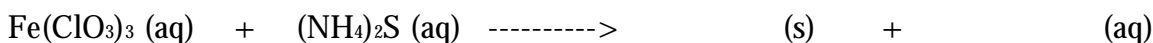
- (1.) The equation below represents the formation of nitric acid from its anhydride:



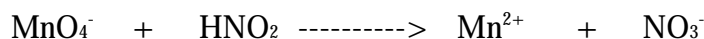
- (a) Please use from the following ΔH_f° values to determine the enthalpy change accompanying the reaction. (10 points)



- (b) The anhydride $\text{N}_2\text{O}_5 (\text{g})$ is produced from the reaction of dinitrogen monoxide gas, and oxygen gas. Please write the *balanced* equation for this reaction, and call it equation 2. (10 points)
- (c) Please use ΔH_f° values above to determine the enthalpy change in part (b) (10 points)
- (d) Please show equations 1 and 2 on the same enthalpy-level diagram, and also show the enthalpy change for the production of $\text{HNO}_3 (\text{l})$ from dinitrogen monoxide gas, oxygen gas, and water. (10 points)
- (2.) Suppose 138.2 mL of 0.170 M $\text{Fe}(\text{ClO}_3)_3 (\text{aq})$ solution is mixed with 117.0 mL of 0.260 M $(\text{NH}_4)_2\text{S} (\text{aq})$ solution.



- (a) Please complete and balance the equation shown above: (5 points)
- (b) Is this a metathesis reaction? (2 pts)
- (c) What is the name of the solid which is produced? (4 pts)
- (d) Please write the net ionic reaction (2 pts). Please name the spectator ions (2 pts)
- (e) Please show which reactant is the limiting reactant (10 pts).
- (f) What is the theoretical yield (in g) of the precipitate? (5 points)
- (g) The precipitate was collected and dried, and the percentage yield determined to be 97.7%. What was the mass of this product? (5 points)
- (h) Before mixing the solutions, what is the concentration of the chlorate ion? (2 points)
- (i) After mixing the solutions, what is the concentration of the chlorate ion? (3 points)
- (3.) Please derive the balanced equation for the redox reaction below, in acidic solution, then in basic solution. (14 points)



Please clearly identify the oxidizing and reducing agents. (6 points)