Exam: Ch 1 – 5 & Rxn Products: Precipitation **Name:**
Version E ***I have neither given nor received aid on this exam.***
AP Chem (80 pts) **Period:** **Date:**

Erase mistakes completely. For problems involving calculations, no credit will be given if work is not shown. Final answers should include units and be boxed.

1. (50 pts) A news agency reports that a tanker truck of nitric acid spilled in a downtown area. The spill was neutralized with sodium carbonate, producing sodium nitrate, liquid dihydrogen oxide, and carbon dioxide gas.

Given:

	ΔH_f° (kJ/mol)	
Na_2CO_3 (s)	-1130.9	$q = mc\Delta T$
HNO_3 (aq)	-206.6	$C_p = \Delta H / \Delta T$
$NaNO_3$ (aq)	-446.2	$\Delta H_f = \Sigma (\Delta H_{f\ (products)} - \Delta H_{f\ (reactants)})$
H_2O (l)	-285.83	1 gal = 3.7854 L
CO_2 (g)	-393.5	

   a. (10 pts) Write the net ionic equation for the neutralization reaction described.

   b. (15 pts) Calculate ΔH_{rxn}° of this reaction.

   c. (15 pts) It is learned that 2.00×10^4 gallons of nitric acid were spilled; the acid solution contains 70.0% nitric acid by mass and has a density of 1.42 g/cm^3. What mass of sodium carbonate is required to go beyond the neutralization to achieve a 20.0 % excess of sodium carbonate?

   d. (10 pts) What was the heat of the reaction? (Assume the excess sodium carbonate does not emit/absorb heat as it dissolves.)

2. (30 pts) Give the formulas to show the reactants and the products for the following chemical reactions. Each of the reactions occurs in aqueous solution unless otherwise indicated. Represent substances in solution as ions if the substance is extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction. In all cases a reaction occurs. You need not balance or include states of matter. Box your final answer.

    a. An aqueous solution of potassium sulfate is added to an aqueous solution of strontium oxalate.

    b. An aqueous solution of hydrogen iodide is added to an aqueous solution of silver hydrogen sulfate.

    c. An aqueous solution of plumbous acetate is added to an aqueous solution of strontium hydroxide.

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3. (50 pts) A soap-making factory reports that a large container of potassium hydroxide solution leaked in one of the warehouses. The spill was neutralized with a solution of hydrogen sulfate, producing potassium sulfate and liquid dihydrogen oxide.

Given:

	$\Delta H_f°$ (kJ/mol)	
KOH (aq)	-482.4	$q = mc\Delta T$
H_2SO_4 (aq)	-814.0	$C_p = \Delta H / \Delta T$
K_2SO_4 (aq)	-683.9	$\Delta H_f = \Sigma (\Delta H_{f\ (products)} - \Delta H_{f\ (reactants)})$
H_2O (l)	-285.83	1 gal = 3.7854 L

a. (10 pts) Write the net ionic equation for the neutralization reaction described.

b. (15 pts) Calculate $\Delta H_{rxn}°$ of this reaction.

c. (15 pts) It is learned that 6.00×10^3 gallons of potassium hydroxide solution were spilled; the base solution contains 45.0% potassium hydroxide by mass and has a density of 1.31 g/cm^3. What mass of hydrogen sulfate is required to go beyond the neutralization to achieve a 5.00 % excess of hydrogen sulfate?

d. (10 pts) What was the heat of the reaction? (Assume the excess hydrogen sulfate does not emit/absorb heat as it dissolves.)

4. (30 pts) Give the formulas to show the reactants and the products for the following chemical reactions. Each of the reactions occurs in aqueous solution unless otherwise indicated. Represent substances in solution as ions if the substance is extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction. In all cases a reaction occurs. You need not balance or include states of matter. Box your final answer.

    a. An aqueous solution of cesium chromate is added to an aqueous solution of barium permanganate.

    b. An aqueous solution of mercurous nitrate is added to an aqueous solution of hydrogen bromide.

    c. An aqueous solution of cuprous sulfate is added to an aqueous solution of calcium sulfide.