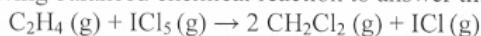


AP Chem
 Take Home Exam Ch 5 – 8, 22, 23
 (40 pts)

Name: KEY
 I have neither given nor received aid on this exam,
 except from my group; list names if applicable:
 Period: 1 2 3 4 Date: 10/27/06

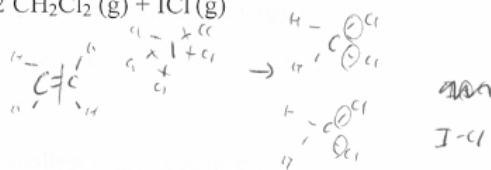
If you need more space, attach further sheets as is necessary. For problems involving calculations, no credit will be given if work is not shown. Use the periodic table and equation sheet provided in class for all values.

1. (20 pts) Use the following balanced chemical reaction to answer the following questions:



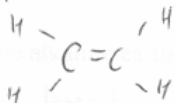
Given:

| | ΔH_f° (kJ/mol) |
|------------------------------------|-----------------------------|
| $\text{ICl}_5(\text{g})$ | -472.5 |
| $\text{CH}_2\text{Cl}_2(\text{g})$ | -103.4 = -403.4 |
| $\text{ICl}(\text{g})$ | 135.0 |

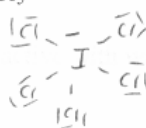


- a. (6 pts) Draw the correct Lewis structure for each of the following.

C_2H_4



ICl_5



- b. (4 pts) Calculate the formal charge of I and Cl in your Lewis structure of ICl_5 .

$$\text{I} : 7 - 7 = 0$$

$$\text{Cl} : 7 - 7 = 0$$

Formal charge (I) = 0
 Formal charge (Cl) = 0

- c. (4 pts) Calculate ΔH_{rxn} for this reaction using the standard molar heats of formation.

$$\begin{aligned} \Delta H_{\text{rxn}}^\circ &= H_p - H_r = [2(403.4) + 135] - [52.30 + (-472.5)] \\ &= \cancel{206.8} - (-420.2) \\ &= \cancel{322} - 251.6 \end{aligned}$$

$$\Delta H = -251.6 \text{ kJ/mol}$$

- d. (4 pts) Calculate ΔH_{rxn} for this reaction using the bond enthalpies.

$$\begin{aligned} \Delta H_{\text{rxn}} &= H_{\text{bonds broken}} - H_{\text{bonds formed}} = [C=C + 4(I-Cl)] - [4(C-Cl) + I-Cl] \\ &= [614 + 4(209)] - [4(328) + 135] \\ &= 1446 - 1312 \\ &= 134 \end{aligned}$$

$$\Delta H = 134 \text{ kJ/mol}$$

- e. (2 pts) Calculate the percent error, assuming that the standard molar heat of formation method is the true value.

$$\frac{|-251.6 - 134|}{-251.6}$$

$$\text{Ans} = 153\%$$

2. (12 pts) Fill in the blank and finish the statement in a sentence or two; you may also use sketches to help. (The answer because "that's the trend." will receive no credit; you must explain, briefly, why the trend is the way it is.)

3 a. Of the period 4 representative elements (except Kr), Ca has the smallest (least negative) electron affinity because...

EA inc \rightarrow b/c of inc ENC (NC) \sim

3 b. Of the halogens (except At), I has the lowest ionization energy because...

IE dec \downarrow b/c valence e^- are further from nucleus
 \bullet shielding e^- \sim

3 c. Of the period 2 elements, Ne has the smallest radius because...

radius dec \rightarrow b/c of inc ENC (NC) and new valence e^- added to same shell \sim

3 d. Of the alkaline earth metals, Ra, Ba is the most reactive with water because...

lowest I.E. \sim

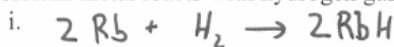
3. (8 pts) For each of the following reactions, in part (i) write a BALANCED equation and in part (ii) answer the question about the reaction. In part (i), coefficients should be in terms of lowest whole numbers. Assume that solutions are aqueous unless otherwise indicated. Represent substances in solutions as ions if the substances are extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction.

3 a. A sample of solid potassium chlorate is heated.



1 ii. The oxidation state of chlorine in potassium chlorate is +5.

3 b. Rubidium metal reacts with hydrogen gas.



\times -1

1 ii. Circle one: Hydrogen is (reduced / oxidized / neither) in this reaction.