CHM 151 Quiz 7b 25 Pts Spring 2010 Name: Key

1. Given the reaction: $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$ $\Delta H = -2220$ kJ

a. (4 Pts) Determine how much heat was given off if 14.0 moles of $CO_2(g)$ was produced.

$$\frac{14.0 \text{ mol } CO_2}{3 \text{ mole } CO_2} \left| \frac{2220 \text{ kJ}}{} \right. = 10360 \text{ kJ}$$

($\Delta H_{rxn} = -10360$ kJ)

b. (4 Pts) Determine how much heat will be given off if 52.2 grams of $C_3H_8(g)$ are burned.

$$\frac{52.2 \text{ g } C_3H_8}{44.09 \text{ g}} \left| \frac{\text{mol}}{\text{mol } C_3H_8} \right| \frac{2220 \text{ kJ}}{} = 2628 \text{ kJ}$$

(ΔH would have + sign)

c. (1 Pts) Is the reaction endothermic or exothermic? exothermic

2. (6 Pts) Determine ΔH for the reaction: $C_2H_4(g) + Cl_2(g) \rightarrow C_2H_4Cl_2(l)$ Using the equations given below:

1 $4HCl(g) + O_2(g) \rightarrow 2Cl_2(g) + 2H_2O(l)$ $\Delta H = -202.5$ kJ
2 $2HCl(g) + C_2H_4(g) + \frac{1}{2}O_2(g) \rightarrow C_2H_4Cl_2(l) + H_2O(l)$ $\Delta H = -319.6$ kJ

C_2H_4: #2 as is $2HCl + C_2H_4 + \frac{1}{2}O_2 \rightarrow C_2H_4Cl_2 + H_2O$ $\Delta H = -319.6$ kJ

$C_2H_4Cl_2$ in #2 ↑

Cl_2: reverse #1 ÷2 $Cl_2 + H_2O \rightarrow 2HCl + \frac{1}{2}O_2$ $\Delta H = +101.25$ kJ

$C_2H_4 + Cl_2 \Rightarrow C_2H_4Cl_2$ $\Delta H = -218.35$ kJ

3. (6 Pts) Determine the enthalpy change for the reaction below using enthalpy values provided.

$$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$$

$C_6H_{12}O_6(s)$ $\Delta H = -1274.5$ kJ/mol; $O_2(g)$ $\Delta H = 0$ kJ/mol; $CO_2(g)$ $\Delta H = -393.5$ kJ/mol; $H_2O(l)$ $\Delta H = -285.8$ kj/mol

$\Delta H_{RXN} = \sum \Delta H_{products} - \sum \Delta H_{reactants}$

$= [6(-393.5) + 6(-285.8)] - [-1274.5 + 0]$ (CO_2, H_2O, $C_6H_{12}O_6$, O_2)

$\Delta H_{RXN} = -4075.8 - -1274.5 = -2801.3$ kJ

4. (4 Pts) Water has a density of 1.00 g/mL and a molar mass of 18.02 g/mol. Determine the concentration of water in moles/L.

$$\frac{1.00 \text{ g}}{10^{-3} \text{ L}} \left| \frac{\text{mol}}{18.02 \text{ g}} \right. = 55.5 \frac{\text{mol}}{\text{L}}$$