

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

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

$$\frac{14.0 \text{ mol } CO_2}{3 \text{ mole } CO_2} \times \frac{2220 \text{ kJ}}{1} = 10360 \text{ kJ}$$

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

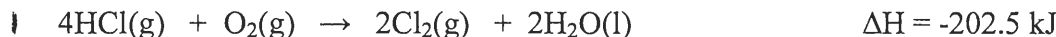
b. (4 Pts) Determine how much heat will be given off if 52.2 grams of  $C_3H_8(g)$  are burned.

$$\frac{52.2 \text{ g } C_3H_8}{44.09 \text{ g}} \times \frac{1 \text{ mol}}{1} \times \frac{2220 \text{ kJ}}{1 \text{ mol } C_3H_8} = 2628 \text{ kJ}$$

$(\Delta H \text{ would have sign})$

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

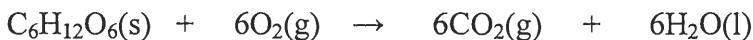
2. (6 Pts) Determine  $\Delta H$  for the reaction:  $C_2H_4(g) + Cl_2(g) \rightarrow C_2H_4Cl_2(l)$  Using the equations given below:



$$\begin{array}{r}
 C_2H_4: \#2 \text{ as is } 2HCl + C_2H_4 + \frac{1}{2}O_2 \rightarrow C_2H_4Cl_2 + H_2O \\
 C_2H_4Cl_2 \text{ in } \#2 \uparrow \\
 Cl_2: \text{ reverse } \#2 + \#2 \quad Cl_2 + H_2O \rightarrow 2HCl + \frac{1}{2}O_2 \\
 \hline
 C_2H_4 + Cl_2 \Rightarrow C_2H_4Cl_2
 \end{array}$$

$\Delta H = -319.6 \text{ kJ}$   
 $\Delta H = +101.25 \text{ kJ}$   
 $-218.35 \text{ kJ}$

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



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

$$\begin{aligned}
 \Delta H_{rxn} &= \sum \Delta H_{products} - \sum \Delta H_{reactants} \\
 &= [6(-393.5) + 6(-285.8)] - [-1274.5 + 0] \\
 \Delta H_{rxn} &= \underset{CO_2}{-4075.8} - \underset{H_2O}{-1274.5} = \boxed{-2801.3 \text{ kJ}}
 \end{aligned}$$

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.

$$\frac{1.00 \text{ g}}{10^{-3} \text{ L}} \times \frac{1 \text{ mol}}{18.02 \text{ g}} = \boxed{55.5 \frac{\text{mol}}{\text{L}}}$$