CHM151 Quiz 6B 25 Pts Spring 2010 Name: Key

******SHOW ALL WORK TO RECEIVE CREDIT******

1. (6 Pts) The heats of formation, ΔH_f^0 in are shown in the table. What is ΔH in kJ for the reaction

$2C_2H_2 + 5O_{2(g)} \rightarrow 4CO_{2(g)} + 2H_2O_{(g)}$ $\Delta H = ?$

ΔH_f^0 Values (kJ/mole): $C_2H_{2(g)}$ +227, $H_2O_{(g)}$ –242, $CO_{2(g)}$ –393

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

$[4(-393) + 2(-242)] - [2(227) + 5(0)] = -2510$ kJ

2. (6 Pts) Calculate the enthalpy (ΔH)for the combustion of ethane, using the three equations given.

Goal: $C_2H_6(g) + \frac{7}{2}O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$

1 $H_{2(g)} + {}^1/_2O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H^0 = -286$ kJ

2 $C_2H_{4(g)} + H_{2(g)} \rightarrow C_2H_{6(g)}$ $\Delta H^0 = -137$ kJ

3 $C_2H_{4(g)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 2H_2O_{(l)}$ $\Delta H^0 = -1412$ kJ

C_2H_6: reverse #2: $C_2H_6(g) \rightarrow \cancel{C_2H_4(g)} + \cancel{H_2(g)}$ ΔH kJ: +137

O_2: skip

CO_2: #3 as is: $\cancel{C_2H_4(g)} + 3O_2 \rightarrow 2CO_2(g) + 2H_2O(l)$ −1412

H_2O: #1 as is: $\cancel{H_2(g)} + \frac{1}{2}O_2 \rightarrow H_2O(l)$ −286

$C_2H_6(g) + \frac{7}{2}O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$ $\Delta H = -1561$ kJ

3. (6 Pts) Calculate the heat of formation of $SO_{3(g)}$. $S(s) + {}^3/_2O_2 \rightarrow SO_3(g)$

1 $SO_{2(g)} \rightarrow O_{2(g)} + S_{(s)}$ $\Delta H = +300$ kJ

2 $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$ $\Delta H = -200$ kJ

S: reverse #1 $S(s) + O_2(g) \rightarrow \cancel{SO_2(g)}$ −300 kJ

O_2: skip

SO_3: $\frac{1}{2}$ #2 $\cancel{SO_2} + \frac{1}{2}O_2(g) \rightarrow SO_3(g)$ −100 kJ

$S(s) + \frac{3}{2}O_2(g) \rightarrow SO_3(g)$ −400 kJ

4. (6 Pts) A 10.0 g sample of silver is heated to 100.0 °C and then added to 20.0 g of water at 23.0 °C in an insulated calorimeter. At thermal equilibrium the temperature of the system was measured as 25.0 °C. What is the specific heat of silver? The specific heat of water is 4.184 J/g•°C.

Heat gained by water = Heat lost by silver

Joules gained by water: $\frac{4.184\,J}{g \cdot °C} \left| 20.0\,g \right| 2.0\,°C = 167.2$ J

for sp-Ht of Ag: $\frac{167.2\,J}{\left| 10.0\,g \right| 75\,°C} = 0.223\,\frac{J}{g \cdot °C}$