CHM 151 Quiz 8a 25 Pts Fall 2008 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

Enthalpy values (kJ/mol): $H_2O(l)$ -285.83; $HCl(g)$ -92.30; $SiCl_4(l)$ -640.1; $SiO_2(s)$ -910.9
Molar masses: H 1.008; C 12.01

1. (4 Pts) Use the enthalpy values listed on the top of the page to calculate the standard enthalpy change for the reaction: $SiCl_4(l) + 2H_2O(l) \rightarrow SiO_2(s) + 4HCl(g)$

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

$\Delta H_{RXN} = (-910.9\text{ kJ} + 4(-92.30)\text{ kJ}) - (-640.1 + 2(-285.83\text{ kJ})) = \boxed{-68.3\text{ kJ}}$

2. (7 Pts) Use the enthalpies of reaction 1-3

(1)	$H_2(g) + F_2(g)$	$\rightarrow 2HF(g)$	$\Delta H = -537$ kJ
(2)	$C(s) + 2F_2(g)$	$\rightarrow CF_4(g)$	$\Delta H = -680$ kJ
(3)	$2C(s) + 2H_2(g)$	$\rightarrow C_2H_4(g)$	$\Delta H = +52.3$ kJ

to calculate ΔH for the reaction: $C_2H_4(g) + 6F_2(g) \rightarrow 2CF_4(g) + 4HF(g)$

C_2H_4: rev #3 $\quad C_2H_4(g) \rightarrow \cancel{2C(s)} + \cancel{2H_2(g)}$ $\quad \Delta H = -52.3$ kJ

F_2: skip found in more than one equation.

CF_4: #2 x 2 $\quad \cancel{2C(s)} + 4F_2(g) \rightarrow 2CF_4(g)$ $\quad \Delta H = -1360$

HF: #1 x 2 $\quad \cancel{2H_2(g)} + 2F_2(g) \rightarrow 4HF(g)$ $\quad \Delta H = -1074$

$C_2H_4(g) + 6F_2(g) \rightarrow 2CF_4(g) + 4HF(g)$ $\quad -2486.3$ kJ

3. (5 Pts) Calculate the enthalpy change that occurs when 45.0 grams of $C_6H_6(l)$ undergoes the decomposition reaction shown below:

$C_6H_6(l) \rightarrow 3C_2H_2(g) \quad \Delta H = +630$ kJ

$\frac{45.0\text{ g } C_6H_6}{} \cdot \frac{\text{mol}}{78.108\text{ g}} \cdot \frac{+630\text{ kJ}}{\text{mol } C_6H_6} = \Delta H = +363\text{ kJ}$

4. (4 Pts) The specific heat ethylene glycol is 2.42 J/g·K. Determine how many J of heat are needed to raise the temperature of 454 g ethylene glycol from 14.0 °C to 212 °C.

$\frac{2.42\text{ J}}{\text{g}\cdot{}^\circ\text{C}} \cdot 454\text{ g} \cdot (212 - 14.0)\,{}^\circ\text{C} = 218{,}000\text{ J}$

5. (5 Pts) The specific heat of iron is 0.450 J/g·K. If 455 J of heat are added to 25.0 grams of iron at 25.0 °C, what will be the final temperature of the iron?

Gives → ΔT

$\frac{\text{g}\cdot\text{K}}{0.450\text{ J}} \cdot 455\text{ J} \cdot \frac{1}{25.0\text{ g}} = 40.4\text{ K}$

$25.0 + 40.4 = \boxed{65.4\,{}^\circ\text{C}}$