Homework - Questions??

③ $C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$

$m = 18.0\,g$

Step 1: ΔH_r (general)

$$\Delta H_r = \Sigma n H_{f_P} - \Sigma n H_{f_R}$$

$$= \left[(6\,mol)\left(-393.5\,\tfrac{kJ}{mol}\right) + (6\,mol)\left(-285.8\,\tfrac{kJ}{mol}\right)\right] - \left[(1\,mol)\left(-1273.1\,\tfrac{kJ}{mol}\right) + (6\,mol)\left(0\,\tfrac{kJ}{mol}\right)\right]$$

$$\Delta H_r = -2802.7\,kJ$$

$$H_r = \frac{\Delta H_r}{n} = \frac{-2802.7\,kJ}{1\,mol} = -2802.7\,\tfrac{kJ}{mol}$$

Step 2: n (specific)

$$18.0\,g\,C_6H_{12}O_6 \times \frac{1\,mol\,C_6H_{12}O_6}{180.18\,g\,C_6H_{12}O_6} = 0.100\,mol\,C_6H_{12}O_6$$

Step 3: ΔH_r (specific)

$\Delta H_r = n H_r$

$\Delta H_r = (0.100\,mol)\left(-2802.7\,\tfrac{kJ}{mol}\right)$

$\Delta H_r = -280.\,kJ$

Sample Problem

What mass of octane is completely burned during the heating of 20.L of aqueous ethylene glycol automobile coolant from -10.°C to 70.°C? The volumetric heat capacity of aqueous ethylene glycol is 3.7 kJ/L°C.

Ex. $2C_8H_{18(l)} + 25O_{2(g)} \longrightarrow 18H_2O_{(g)} + 16CO_{2(g)}$

Step 1: Hr (general)

$\Delta H_r = \Sigma n H_{fp} - \Sigma n H_{fr}$

$\Delta H_r = -10148.2\,kJ$

$H_r = \frac{\Delta H_r}{n} = \frac{-10148.2\,kJ}{2\,mol} = -5074.1\,kJ/mol$

Step 2: n (specific)

$\Delta H_r = -q$

$nH_r = -vC\Delta T$

$n\left(-5074.1\,\frac{kJ}{mol}\right) = -(20.L)\left(3.7\,\frac{kJ}{L\cdot°C}\right)(80.°C)$

$n = 1.1667\,mol$

Step 3: mass (specific)

$1.1667\,mol \times \frac{114.26\,g\,C_8H_{18}}{1\,mol\,C_8H_{18}} = 130\,g\,C_8H_{18}$

Worksheet #1-5