Numerical Problems:

1. ② $\Delta H^\circ_{rxn} = \Delta H^\circ_{prod} - \Delta H^\circ_{reactt}$

$(-1364\ kJ/mol + (-278\ kJ/mol) + (-394\ kJ/mol)) - (-1273\ kJ/mol)$

$\Delta H^\circ_{rxn} = -763\ kJ/mol$

$\Delta S^\circ_{rxn} = (192 + 161 + 213) - (200$

$\doteq 357\ J/(mol\,K)$

$\Delta S_{surr} = -\Delta S_{univ}$

the reaction is not spontaneous under standard state

2. $\Delta S = \int_{T_i}^{T_f} \frac{C_p}{T} dT - \int_{p_i}^{P_f} V\beta dp$

$= \int_{T_i}^{T_f} \frac{112\ J\,mol^{-1}K^{-1}}{78.3^\circ C} -$

$\int_{p_i}^{p_f} 65.6\ J\,mol^{-1}K^{-1} + 2.38 \times 10^{-4} T\ J\,mol^{-1}K^{-2}\ \beta\, dp$

$\Delta_{vap}H_m(25.0C) = 42.3\ kJ\,mol^{-1}$

$C_p^g = 65.6\ J\,mol^{-1}K^{-1} + 2.38 \times 10^{-4} T\ J\,mol^{-1}K^{-2}$

$C_p^l = 112\ J\,mol^{-1}K^{-1}$

Graphical Problems

3. $S_m^\circ(70K) = \int_0^{23.66} \frac{C_{p,m}^{solid,III}}{T} dT + \frac{93.8\ J}{23.66K} + \int_{23.66}^{43.76} \frac{C_{p,m}^{solid,II}}{T} dT + \frac{74.3\ J}{43.76K}$

$+ \int_{43.76}^{54.39} \frac{C_{p,m}^{solid,I}}{T} dT + \frac{445.0\ J}{54.39K} + \int_{54.39}^{70} \frac{C_{p,m}^{liquid}}{T} dT =$

$S_m^\circ(150K) = \int_0^{23.66} \frac{C_{p,m}^{solid,II}}{T} dT + \frac{93.8\ J}{23.66K} + \int_{23.66}^{43.76} \frac{C_{p,m}^{solid,II}}{T} dT + \frac{74.3\ J}{43.76K}$

$+ \int_{43.76}^{54.39} \frac{C_{p,m}^{solid,I}}{T} dT + \frac{445.0\ J}{54.39K} + \int_{54.39}^{90.20} \frac{C_{p,m}^{liquid}}{T} dT + \frac{6815\ J}{90.20K}$

$+ \int_{90.20}^{150} \frac{C_{p,m}^{gas}\, dT}{T} =$