

Worksheet # 7 (Maximum number of points you can get is 3 pts)

1. For a certain chemical reaction one finds a enthalpy difference $\Delta H = -300 \text{ kJ/mol}$ and an entropy difference $\Delta S = -600 \text{ J/(K mol)}$. Assume that these two values do not depend on temperature. At what temperature will be the Gibb's energy difference $\Delta G = 0$?

$$\Delta G = \Delta H - T \Delta S = 0$$

$$\Rightarrow T \Delta S = \Delta H$$

$$\Rightarrow T = \frac{\Delta H}{\Delta S} = \frac{-300 \cdot 10^3 \text{ J/mol}}{-600 \text{ J/(K mol)}} = 500 \text{ K}$$

2. At 300 K, 4 mol of an ideal gas is expanded **isothermally** from 20 dm^3 to 200 dm^3 . Calculate the Gibbs energy difference ΔG .

$$\Delta G = \Delta H - T \Delta S$$

$$T = \text{const} \Rightarrow \Delta H = \text{const } 0$$

$$\Delta S = n R \ln \frac{V_2}{V_1} = 4 \cdot 8.3145 \cdot \ln 10 \text{ J/K mol}$$

$$= 76.56 \text{ J/K}$$

$$T \cdot \Delta S = 300 \cdot 76.56 \text{ J/mol} = 22968 \text{ J}$$

$$\Rightarrow \Delta G = -22.97 \text{ kJ}$$

3. How does the entropy changes during a spontaneous process in an isolated system?

$$\Delta S > 0$$