CHEM 3423 001 Spring 2024 **Name:** KEY
ID:

Worksheet # 8 (Maximum number of points you can get is **3 pts**)

1. For a certain chemical reaction one finds a enthalpy difference ΔH = -300 kJ/mol and an entropy difference ΔS = -600 J/(K mol). Assume that these two values do not depend on temperature. At what temperature will be the Gibb's energy difference ΔG =0?

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

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

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

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.

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

$T = const \Rightarrow \Delta H = const\ 0$

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

$$= 76.56\ J/K$$

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

$$\Rightarrow \Delta G = -22.97\ kJ$$

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

$$\Delta S > 0$$