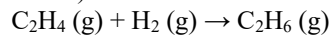


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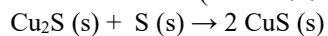
GIBB'S FREE ENERGY PROBLEMS

1. The hydrogenation of ethene gas at 298. K shows a decrease in disorder ($\Delta S^\circ = -0.1207 \text{ kJ}/(\text{mol}\cdot\text{K})$) during an exothermic reaction ($\Delta H^\circ = -136.9 \text{ kJ}/\text{mol}$). Determine whether the reaction is spontaneous or nonspontaneous by calculating ΔG° .



2. The vaporization of bromine requires 31.0 kJ/mol and has an increase in disorder ($\Delta S^\circ = 0.093 \text{ kJ}/(\text{mol}\cdot\text{K})$). At what temperature will this process be spontaneous if the free energy value is 3.14 kJ/mol? $\text{Br}_2(\text{l}) \rightarrow \text{Br}_2(\text{g})$

3. Copper (I) sulfide reacts with sulfur to produce copper (II) sulfide at 25°C. The process is exothermic ($\Delta H^\circ = -26.7 \text{ kJ}/\text{mol}$) with a decrease in disorder ($\Delta S^\circ = -0.0197 \text{ kJ}/(\text{mol}\cdot\text{K})$). Determine the spontaneity of the reaction by calculating ΔG° .



4. For a certain process at 300. K, $\Delta G = -77.0 \text{ kJ}/\text{mol}$ and $\Delta H = -56.9 \text{ kJ}/\text{mol}$. Find the entropy change for this process.

5. The entropy of a system at 337 K increases by $0.2217 \text{ kJ}/\text{mol}\cdot\text{K}$. The free energy value is found to be $-717.5 \text{ kJ}/\text{mol}$. Calculate the change in enthalpy of this system.

6. Determine if the following reaction is spontaneous or not 25°C by determining the free energy value.

