C18 ΔG and K_{eq}

THERMOCHEMISTRY/ ELECTROCHEMISTRY

$$q = mc\Delta T$$

$$\Delta S^\circ = \sum S^\circ \text{ products} - \sum S^\circ \text{ reactants}$$

$$\Delta H^\circ = \sum \Delta H_f^\circ \text{ products} - \sum \Delta H_f^\circ \text{ reactants}$$

$$\Delta G^\circ = \sum \Delta G_f^\circ \text{ products} - \sum \Delta G_f^\circ \text{ reactants}$$

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

$$= -RT \ln K$$

Equation is given on the AP Exam in the Equations and Constants Sheets

$$\Delta G^\circ = -RT \ln K$$

These equations are based starting with standard conditions of 1M or 1 atm for reactants and products

If $K > 1$ then $\Delta G^\circ = (-)$ From standard conditions, work can be done by the reaction → The reactants concentrations will decrease from 1M or 1 atm and products concentrations will increase until $Q = K$. Work can be done by the forward reaction.	$\Delta G^\circ = -RT \times \ln(K > 1)$ $\Delta G^\circ = -RT \times (+)$ $\Delta G^\circ = (-)$
If $K = 1$ then $\Delta G^\circ = 0$ At standard conditions ⇄ No work can be done.	$\Delta G^\circ = -RT \times \ln(K = 1)$ $\Delta G^\circ = -RT \times 0$ $\Delta G^\circ = 0$
If $0 < K^* < 1$ then $\Delta G^\circ = (+)$ From standard conditions the reaction will ← The reactants concentrations will increase from 1M or 1 atm and products concentrations will decrease until $Q = K$. Work will be done by the reverse reaction.	$\Delta G^\circ = -RT \times \ln(0 < K < 1)$ $\Delta G^\circ = -RT \times (-)$ $\Delta G^\circ = (+)$

* Since equilibrium expressions are computed using a quotient (products/reactants) of concentrations and pressures, it is impossible for the equilibrium constant to be less than 0.
K can approach 0, but never be less than 0.

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