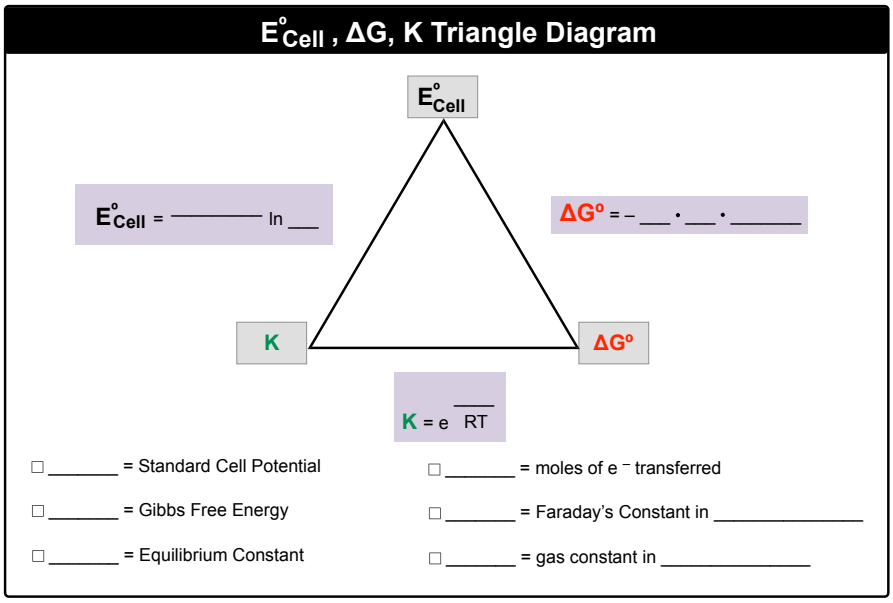
CONCEPT: CELL POTENTIAL: ΔG AND K

- Recall, a spontaneous reaction possesses $E°_{cell}$ ___ 0, $\Delta G°$ ___ 0 and K ___ 1.
  - □ The relationship between these 3 variables and spontaneity can be observed under the following diagram:



EXAMPLE: Calculate the standard cell potential for the following reaction if 10 moles of electrons are transferred.

$$P_4\,(s) + 5\,O_2\,(g) \longrightarrow P_4O_{10}\,(s)$$

Substance	G° (kJ/mol)
P_4 (s)	0.00
O_2 (g)	0.00
P_4O_{10} (s)	-2984

PRACTICE: Given the following standard reduction potentials, determine K_{sp} for $Hg_2Cl_2(s)$ at 25 °C.

$$Hg_2^{2+}\,(aq) + 2\,e^- \longrightarrow 2\,Hg\,(l) \qquad E°_{red} = +\,0.789\ V$$

$$Hg_2Cl_2\,(s) + 2\,e^- \longrightarrow 2\,Hg\,(l) + 2\,Cl^-\,(aq) \qquad E°_{red} = +\,0.271\ V$$

CONCEPT: CELL POTENTIAL: ΔG AND K

PRACTICE: What is the value of the cell potential for the 4 electron transfer reaction below if the equilibrium mixture contains 0.255 M of CH_4, 1.10 M CO_2, 0.388 M CO and 0.250 M H_2 at 25ºC?

$$CH_4\ (g) + CO_2\ (g) \rightleftharpoons 2\ CO\ (g) + 2\ H_2\ (g)$$

PRACTICE: Given the reaction: $2\ Cl_2\ (g) + 2\ H_2O\ (g) \rightleftharpoons 4\ HCl\ (g) + O_2\ (g)$ $Kp = 7.5 \times 10^{-2}$, calculate the Gibbs Free Energy change for the reaction below at 30ºC.

$$8\ HCl\ (g) + 2\ O_2\ (g) \rightleftharpoons 4\ Cl_2\ (g) + 4\ H_2O\ (g)$$