

- Consider the following reaction.



Calculate ΔG° (in J mol^{-1}) for this reaction.

$$\Delta G^\circ = -RT \ln K_p = -(8.314 \text{ J K}^{-1} \text{ mol}^{-1}) \times (298 \text{ K}) \times \ln(0.090) = 6.0 \times 10^3 \text{ J mol}^{-1}$$

$$\Delta G^\circ = 6.0 \times 10^3 \text{ J mol}^{-1}$$

Calculate the reaction quotient, Q , at 25°C when $p(\text{H}_2\text{O}) = 18 \text{ mmHg}$, $p(\text{Cl}_2\text{O}) = 2.0 \text{ mmHg}$ and $p(\text{HOCl}) = 0.10 \text{ mmHg}$.

The reaction quotient is given by:

$$Q_p = \frac{p(\text{HOCl})^2}{p(\text{H}_2\text{O})p(\text{Cl}_2\text{O})} = \frac{(0.10)^2}{(18)(2.0)} = 2.8 \times 10^{-4}$$

$$Q = 2.8 \times 10^{-4}$$

In which direction will the reaction proceed spontaneously at these partial pressures?

As $Q < K$, the reaction will proceed towards products (i.e. in the forward direction).