Challenging Equilibrium Calculations

Below are some more challenging examples of K_c and K_p calculations. Before you try them, make sure you can do the more basic examples!

When you have tried them, you can watch video walkthroughs explaining each one here.

1. Equal number of moles of Fe^{2+} and Ag^{+} ions were mixed together and allowed to reach equilibrium according to the following equation:

   $Fe^{2+}(aq) + Ag^{+}(aq) \rightleftharpoons Fe^{3+}(aq) + Ag(s)$

   Given that K_c is equal to 0.120 $mol^{-1}dm^3$, and the equilibrium concentration of Fe^{3+} was 0.046 $moldm^{-3}$, calculate the equilibrium concentration of silver ions.

2. Methanol can be made by passing carbon monoxide and hydrogen over a catalyst:

   $CO(g) + 2H_2(g) \rightleftharpoons CH_3OH\ (g)$

   When one mole of carbon monoxide was reacted with one mole of hydrogen in a volume of $5dm^3$, equilibrium was reached once 15% of the carbon monoxide had reacted. Calculate the equilibrium constant K_c under these conditions. Give your answer to 3 significant figures and include units.

3. When the equilibrium shown below was established at 350K, the partial pressure of the dinitrogen tetroxide was found to be 200kPa. Calculate the partial pressure of the nitrogen dioxide and hence the total pressure in the container.

   $N_2O_4\ (g) \rightleftharpoons 2NO_2\ (g)$ $\qquad\qquad$ $K_p = 3890$ kPa

4. Nitrogen and hydrogen were mixed in a 1:3 ratio and left to react equilibrium in a reaction vessel.

   $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

   At equilibrium, the total pressure in the container was 150kPa and the mole fraction of ammonia was 0.8. Calculate a value for K_p, giving units with your answer.