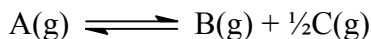


Equilibrium Problems

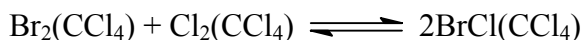
You should be able to do these problems without a calculator

1. For the equilibrium



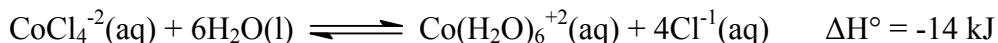
$$K_c = 4.0 \times 10^{-13} \text{ at } 27^\circ\text{C}.$$

- Evaluate K_P at 27°C . [**2.0 x 10⁻¹²**]
 - If a flask initially containing only 1.00 atm of A(g) is allowed to come to equilibrium, what will be the equilibrium pressure of each species?
[**P_A = 1 atm; P_B = 2.0 x 10⁻⁸ atm; P_C = 1.0 x 10⁻⁸ atm**]
2. Bromine and chlorine both dissolve in carbon tetrachloride, whereupon they react (slowly) to form BrCl:



Under equilibrium conditions at some temperature, $[\text{Br}_2] = [\text{Cl}_2] = 0.50 \text{ M}$, and $[\text{BrCl}] = 0.10 \text{ M}$.

- Evaluate the equilibrium constant for this reaction at 25°C . [**0.040 or 1/25**]
 - If 0.22 moles of BrCl were added to the equilibrium mixture above, what would be the new equilibrium concentrations of all species present? Assume 1 L of solution.
([**Br₂**] = [**Cl₂**] = **0.60 M**; [**BrCl**] = **0.12 M**)
3. Predict the effect each of the following would have on the reaction (initially at equilibrium):



Indicate your choice by writing shift **R**ight, shift **L**eft, or **N**o change:

- Adding HCl gas _____
- Heating the reaction _____
- Adding AgNO₃ (AgCl is insoluble) _____
- Adding water _____

[L L R R]

4. The ionization of water is an equilibrium process for which $K_c = 1.0 \times 10^{-14}$ at 25°C :



Should K_w be larger or smaller at 75°C than at 25°C ? How do you know?

Determine the approximate K_w of water at 75°C . [**about $2 \times 10^{-13} \text{ M}$**]

5. The normal boiling point of a liquid is 67°C and its enthalpy of vaporization is 34 kJ/mol . What is its vapour pressure (in atmospheres) at 27°C ? [**about 0.2**]