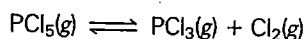


# INTRO. TO $K_{eq}$ CALC'S

## Review and Practice

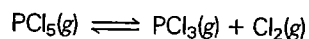
1. In an equilibrium expression for a reaction, do the concentrations of the reactants appear in the numerator or the denominator?
2. Write the equilibrium expression for the following reactions:
  - a.  $H_2(g) + S(g) \rightleftharpoons H_2S(g)$
  - b.  $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
  - c.  $4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(g)$
  - d.  $CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(g)$

3. The following reaction represents an equilibrium system.



Calculate the equilibrium constant for this reaction if the equilibrium concentrations are  $[PCl_5] = 0.32$ ,  $[PCl_3] = 0.40$ , and  $[Cl_2] = 0.40$ .

4. The following reaction reaches equilibrium at  $25^\circ C$  and has an equilibrium constant of 1.78.



If the equilibrium concentrations of  $PCl_3$  and  $Cl_2$  are both  $0.85 \text{ mol/L}$ , calculate the concentration of  $PCl_5$  at equilibrium.

5. Two moles of  $NO_2(g)$  are injected into an evacuated 1 L flask. At  $55^\circ C$  the equilibrium concentration of  $N_2O_4$  is  $0.64M$ . What is the equilibrium concentration of  $NO_2(g)$ ?
6. When  $0.60 \text{ mol}$  of gas X and  $0.40 \text{ mol}$  of gas Y react in a  $2.0 \text{ L}$  container to produce Z, an equilibrium is reached in which [Z] is found to  $0.080 \text{ mol/L}$ . The reaction is  $X(g) + 2Y(g) \rightleftharpoons 2Z(g)$ . Calculate the value of  $K_{eq}$ .
7. At a certain temperature,  $K_{eq}$  for the reaction  $H_2(g) + CO_2(g) \rightleftharpoons H_2O(g) + CO(g)$  is found to be 1.50. If the initial concentration of each of the four substances  $H_2$ ,  $CO_2$ ,  $H_2O$ , and  $CO$  is  $0.40M$ , calculate the equilibrium concentration of  $CO_2$  and  $CO$ .
8. For the reaction of  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ , what will be the value of  $K_{eq}$  if  $0.10 \text{ mol}$  of  $N_2$  is mixed with  $0.50 \text{ mol}$  of  $H_2$  in a  $1.0 \text{ L}$  flask, and at equilibrium  $[NH_3]$  is found to be  $0.12M$ ?
9. At a particular temperature,  $K_{eq}$  for the reaction  $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$  is 400. If the initial  $[H_2] = 0.40M$  and the initial  $[I_2] = 0.40M$ , what is the equilibrium  $[H_2]$ ?