(#11-1)

Can I determine the extent (favorability) of a chemical reaction?

Write the equilibrium expression for the following chemical reactions.

1. For each of the following, provide a Kc and a Kp expression.

   a. $A(aq) + B(s) \leftrightarrow C(g)$

   $K_c = \frac{[C]}{[B]}$ $\quad K_p = (P_C)$

   b. $2A(s) + B(g) \leftrightarrow 2C(g)$

   $K_c = \frac{[C]^2}{[B]}$ $\quad K_p = \frac{(P_C)^2}{(P_B)}$

   c. $A(l) + B(aq) \leftrightarrow 3C(aq)$

   $K_c = \frac{[C]^3}{[B]}$ no K_p (no gas)

   d. $Ag_2SO_4(s) \leftrightarrow 2Ag^+_{(aq)} + SO_4^{-2}{}_{(aq)}$ (Balance me please) (solid)

   $K_c = K_{sp} = [Ag^+]^2[SO_4^{-2}]$ no K_p

   e. $PbSO_4(s) \leftrightarrow Pb^{+2} + SO_4^{-2}$ (provide balanced dissolving equation)

   $K_c = K_{sp} = [Pb^{+2}][SO_4^{-2}]$

Reaction Extent

2. A reaction that goes ~~to~~ greatly to its extent produces a lot of (products / reactants)

3. A reaction that is product favored will have a (large K / small K)

   $K = \frac{[P]}{[R]}$ (larger)

4. Question 1d above has a K value = 1.0E-5 and 1e has a K value = 6.3E-7.

   0.00001 $\quad$ 0.0000063

   a. Which reaction will produce more product at equilibrium?

   1d – larger K will have more product

   b. Is the answer from letter a considered product favored?

   K = 1.0E-5 is less than 1 and is reactant favored

5. Reaction $A(s) + B(aq) \leftrightarrow 2C(aq)$

   a. Top beaker has a K = 1.0 E-10 → reactant favored

   b. Bottom beaker has a k = 1.0

   K = 1

   Draw the beaker at equilibrium

   possibilities

   $K = \frac{[C]^2}{[B]} = \frac{1}{1} = 1$

   $K = \frac{(2)^2}{4} = 1$