The Equilibrium Constant – Reading Guide

*sections 13.1 – 13.2 in OpenStax*

**Dynamic Equilibrium (section 13.1)**

When a reaction is in equilibrium the

1. The \_\_\_\_\_\_\_\_\_\_\_ are equal for the forward and reverse reactions
2. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of products and reactants remain constant

This does NOT mean that the concentration of reactants and products are equal to one another at equilibrium.

**The Equilibrium Constant (section 13.2)**

Define **reaction quotient (Q)**:

Write the reaction quotient for the following reaction:

2 H2S (g) ⮀ 2 H2 (g) + S2 (g) Q =

Define **equilibrium constant (K or Keq)**:

If the value of K is large, this means at equilibrium there is a high concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(products/reactants)* and a low concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*(products/reactants)*.

If the value of K is small, this means at equilibrium there is a high concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(products/reactants)* and a low concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*(products/reactants)*.

By considering the numerical value we obtain for Q, we can determine whether the reaction is still proceeding toward products or shifting back toward reactants to reach equilibrium.

Reaction is at equilibrium, Q \_\_\_\_\_\_\_ K (=, < or >)

Reaction is proceeding to the right (to make more products): Q \_\_\_\_\_\_\_ K (=, < or >)

Reaction is proceeding to the left (to make more reactants): Q \_\_\_\_\_\_\_ K (=, < or >)

***Watch the video tutorial on*** [***Predicting Equilibrium***](http://www.screencast.com/t/ga57ceVhpZqA)

A beaker is found to contain 0.38 *M* A, 0.43 *M* B and 1.2 *M* C. Is the reaction at equilibrium, shifting right or shifting left? Be sure to explain your answer.

2A (aq) + 3 B (aq) ⮀ C (aq) K = 54.6

*(ans. shifting left, Q =105 which is >K)*

**Kc versus Kp**

To calculate a numerical value for K, you can either use molarity (*M*) for solutions or atmospheres (atm) for gasses.

If you use molarity (*M*), then the value is considered Kc.

If you use pressures (atm), then the value is considered Kp.

To convert from Kc to Kp (and vice versa), use the following equation:

Kp = where Δn =

Work through Example 13.4. When will a reaction have **equal** values of Kc and Kp?

**Heterogeneous Equilibria**

What two things never appear in the equilibrium constant expression?



Write the equation (expression) for K for the following reaction:

2A (s) + B (g) ⮀ 3C (g) K =

**End of Chapter 13 Practice Problems**

#15a–c, 17a–c, 25

For detailed solutions to these problems, go to the [OpenStax website](https://openstaxcollege.org/textbooks/chemistry/resources) and download the “Student Answer and Solution Guide.”