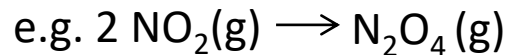
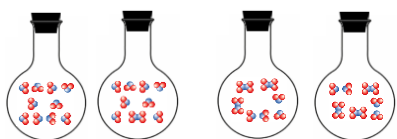


Key Concepts

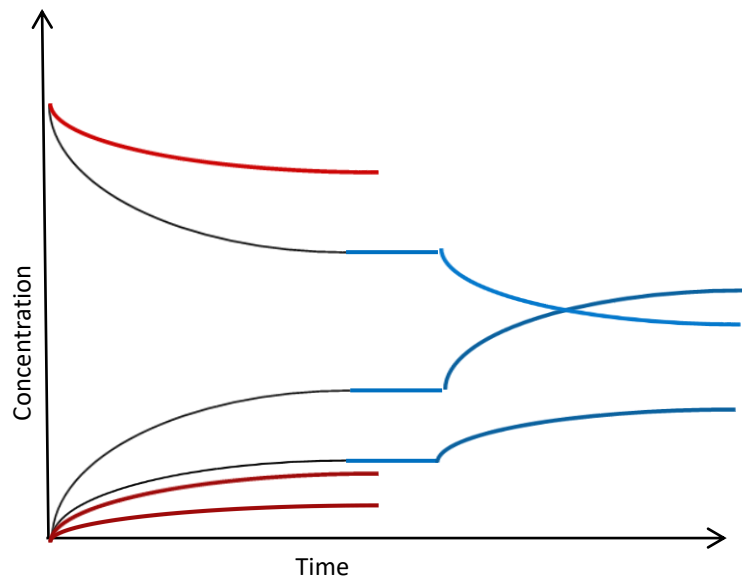
Chemical Reactions....



How FAR does a reaction proceed?



$$K = \frac{[\text{N}_2\text{O}_4]_{\text{E}}}{[\text{NO}_2]_{\text{E}}^2}$$

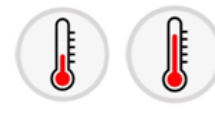


.....are dynamic equilibria

The equilibrium or extent is described by an equilibrium constant, K.

Equilibria can be disturbed.

Equilibria can be altered.



The following pages are titled with respect to the learning objectives that their content relates to.

Learning Objectives

Qualitatively *describe* chemical equilibrium.

Generate and *manipulate* expressions for K and Q for reactions occurring using concentrations or partial pressures, based on a given reaction or set of related reactions.

Determine the direction in which a reaction will proceed using values of K and Q .

Determine either K , initial concentration, or equilibrium concentration, given the other two values.

Describe (qualitatively and quantitatively) the effect of changes in concentration, partial pressures and volume on equilibrium.

Describe (qualitatively and quantitatively) the effect of changes in temperature on equilibrium.

Key Concepts

How far?

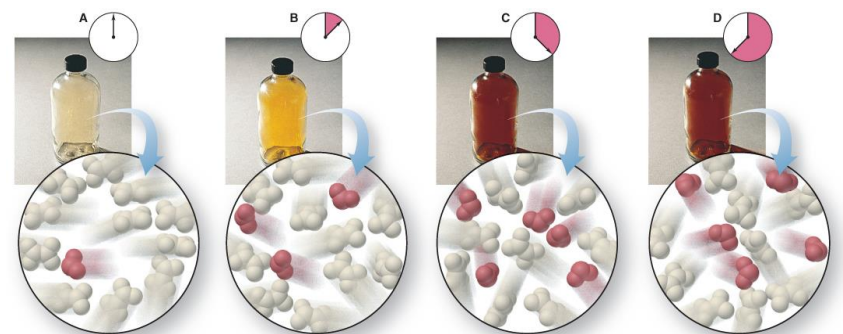
Chemical reactions are dynamic equilibria.

The equilibrium, or extent of a reaction, is described by an equilibrium constant, K .

Equilibria can be disturbed.

Equilibria can be altered.

Qualitatively *describe* chemical equilibrium.



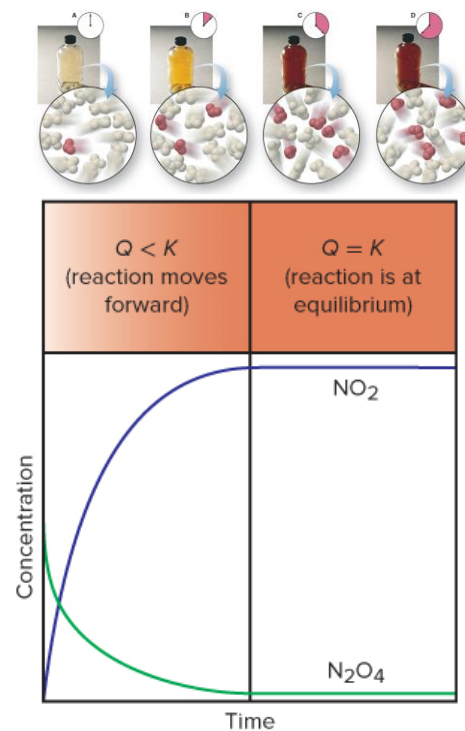
Modified Figure 15.1

Generate and manipulate expressions for K and Q for reactions using concentrations or partial pressures, based on a given reaction or set of related reactions.

What is K ?

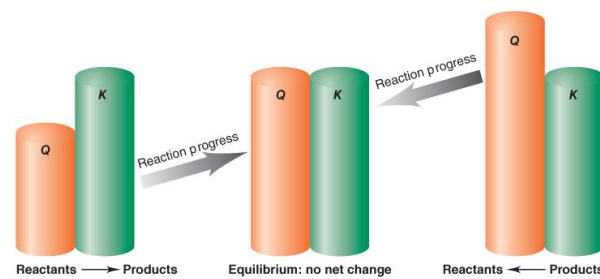
What is Q ?

How are K and Q related?



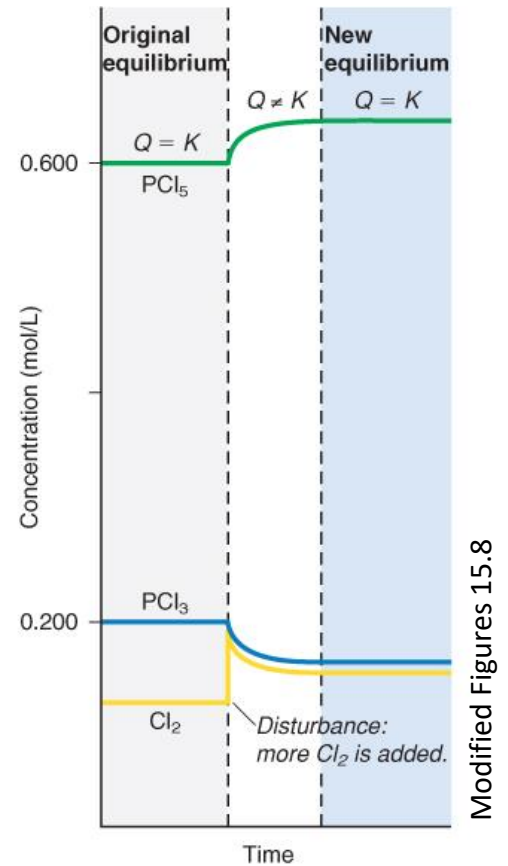
Modified Figures 15.1 and 15.3

Determine the direction in which a reaction will proceed using values of K and Q .



Determine either K , initial concentration or equilibrium concentration, given the other two values.

Describe (qualitatively and quantitatively) the effect of changes in concentration and partial pressures.

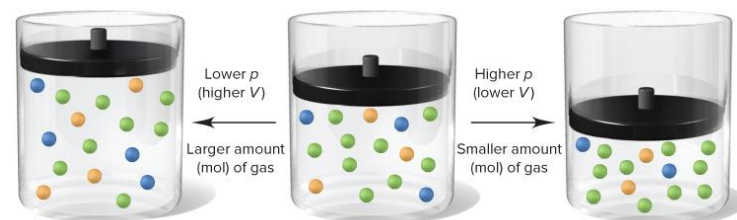


Describe (qualitatively and quantitatively) the effect of changes in volume on equilibrium.

FIGURE 15.9 The effect of a change in pressure (volume) on a system at equilibrium. The system of gases (centre) is at equilibrium. For the reaction



an increase in pressure (*right*) decreases the volume, so the equilibrium shifts to form *fewer* molecules. A decrease in pressure (*left*) increases the volume, so the equilibrium shifts to form *more* molecules.



Describe (qualitatively and quantitatively) the effect of changes in temperature on equilibrium.