14.6

Why is it useful to write the mass action expression with product concentrations in the numerator?	Written this way, the value of Kc gives us information about how far the reaction proceeds to completion.
What do large and small values of Kc tell us?	Large Kc: reaction moves to completion (lots of product formed). Small Kc (e.g. 4.8×10^{-31}): hardly any products are formed. Kc = 1: roughly equal concentrations of reactants and products.
Give an example of a reaction that has a large value of Kc.	For $2H_2(g) + O_2(g) \text{—} 2H_2O(g)$, Kc = 9.1×10^{80}.

14.7

State Le Chatelier's principle.	If an equilibrium in a system is upset, the system will tend to react in a direction that will reestablish equilibrium.
Which factors can influence an equilibrium?	Adding or removing a reactant or product, changing the volume in a gaseous reaction, changes in temperature, presence of a catalyst.
How does adding or removing a reactant or product affect an equilibrium?	It changes the concentration of a reactant or product (the equilibrium is forced to shift to maintain Kc). For example, if reactants are removed the equilibrium shifts toward reactants.
Illustrate how adding H_2 or removing NH_3 affects $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$.	Figure 14.4 pg. 562.
What affect does changing the volume in a gaseous reactions have on an equilibrium? Why?	A decrease in volume will cause a shift toward the fewest number of moles. An increase in volume will have the opposite effect. The reason for this is that a decrease in volume changes the concentration of gasses (when volume changes so does mol/L). The equilibrium is forced to shift to maintain Kc.
How will a decrease in volume affect $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$?	The equilibrium will shift to the right to maintain Kc.
When does a change in volume not result in a change in an equilibrium (2 cases)?	1) When a reaction has no gaseous reactants or products. 2) When the total number of moles on each side of the reaction equation is equal. For example, in $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ (both sides have a total of 2 moles each).
How is the affect of temperature on an equilibrium easily indicated?	Write heat as part of the equation. E.g. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + \text{heat}$
Write endothermic and exothermic reactions with "heat". Indicate how a high temp. will affect equilibrium.	Endothermic: $A + B + \text{heat} \rightleftharpoons C$ ($\uparrow$ temperature = shift to right) Exothermic: $A + B \rightleftharpoons C + \text{heat}$ ($\uparrow$ temperature = shift to left)
What influence does the addition of a catalyst have on an equilibrium?	It will reduce the time required to reach equilibrium. However, it will not affect equilibrium concentrations because it speeds forward and reverse reactions equally.
List another factor that has no affect on equilibrium. Explain.	The addition of an inert gas at constant volume has no affect because the concentrations of gasses are unchanged (L, mol, and mol/L remain constant), thus the equilibrium law is unaffected.

14.8

What is often helpful when solving Kc problems?	A chart with the Molar ratios, and [Initial], [Change], and [Equilibrium] of all products and reactants (as a mnemonic remember RICE, MICE, or ICE box).