CHAPTER 7 SUMMARY

MAKE A SUMMARY

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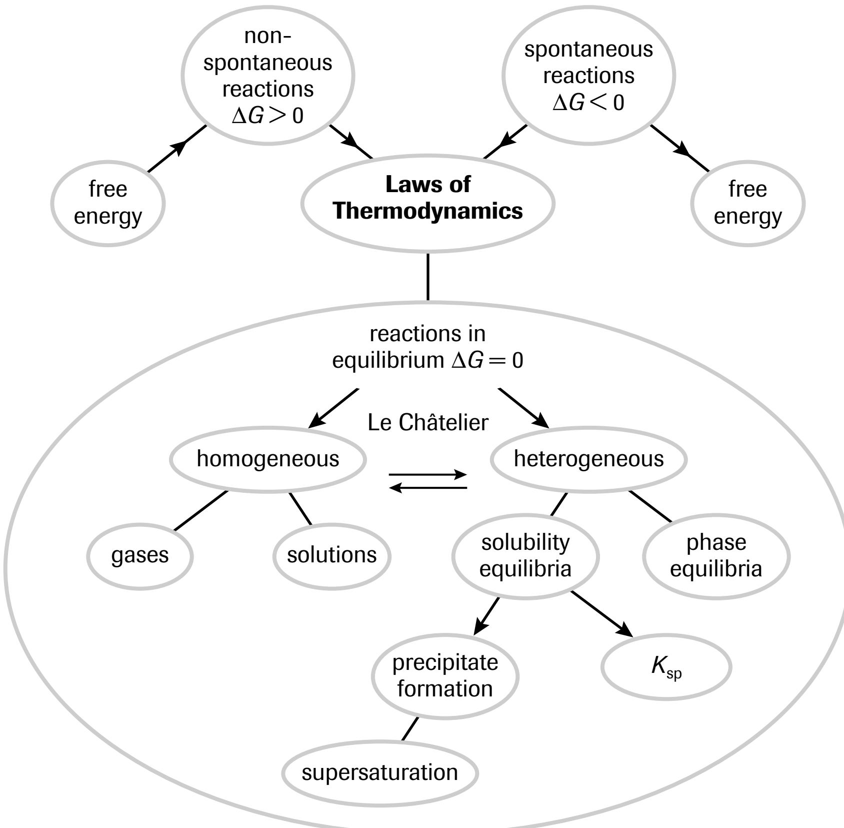

CHAPTER 7 SELF-QUIZ

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1. False. Chemical equilibrium involves two opposing reactions occurring at the same rate.
2. True
3. False. A catalyst does not shift either reaction. A catalyst speeds up the time required to reach equilibrium.
4. True
5. False. Exothermic reactions shift to the left when heated.
6. False. If trial ion product is greater than K_{sp}, a precipitate will form.
7. False. The reaction will be spontaneous only at low temperatures.
8. True
9. True
10. True
11. (e)
12. (a)
13. (e)
14. (b)
15. (d)
16. (a)
17. (a)

18. (a)
19. (c)
20. (a)

CHAPTER 7 REVIEW

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Understanding Concepts

1. (a) Chemical equilibrium is a dynamic equilibrium between the reactants and products of a chemical reaction in a closed system.
   (b) Chemical equilibrium depends on the rate of the two opposing processes being equal.
2. Two ways to describe the relative amounts of reactants and products are percent reaction and the equilibrium law expression.
3. (a) A soft drink is in a non-equilibrium state when it is open.
   (b) A soft drink is in an equilibrium state when it is closed.
4. When a chemical system at equilibrium is disturbed by a change in a property, the system adjusts in a way that opposes the change.
5. Given the size of the equilibrium constant, the amount of water present at equilibrium far exceeds the amount of hydrogen and oxygen. For all practical purposes, this reaction is complete.
6. Variables commonly manipulated to shift the position of the equilibrium include: concentration, temperature, volume/pressure.
7. An increase in volume of a container results in a decrease in pressure. Conversely, a decrease in volume results in an increase in pressure.
8. An increase in the concentration of reactants as well as a decrease in the concentration of products can improve yield.
9. (a)

$$2\ H_{2(g)} + O_{2(g)} \overset{\text{approx. 100\%}}{\rightleftharpoons} 2\ H_2O_{(g)}$$

$$K = \frac{[H_2O_{(g)}]^2}{[H_{2(g)}]^2[O_{2(g)}]}$$

   (b)

$$CO_{(g)} + H_2O_{(g)} \overset{\text{approx. 67\%}}{\rightleftharpoons} CO_{2(g)} + H_{2(g)}$$

$$K = \frac{[CO_{2(g)}][H_{2(g)}]}{[CO_{(g)}]^2[H_2O_{(g)}]}$$

   (c)

$$N_{2(g)} + 3\ H_{2(g)} \overset{<10\%}{\rightleftharpoons} 2\ NH_{3(g)}$$

$$K = \frac{[NH_{3(g)}]^2}{[N_{2(g)}][H_{2(g)}]^3}$$

10. (a) $2\ NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$

$$K = \frac{[N_2O_{4(g)}]}{[NO_{2(g)}]^2}$$

   (b) $\dfrac{[N_2O_{4(g)}]}{[0.050]^2} = 1.15$

$[N_2O_{4(g)}] = 2.9 \times 10^{-3}$ mol/L

The concentration of dinitrogen tetroxide is 2.9×10^{-3} mol/L.

   (c) An increase in the nitrogen dioxide concentration will shift the equilibrium to the right.
11. (a) left
   (b) left
   (c) right
   (d) no effect
   (e) no effect