Chapter 15 Practice Questions

1) Which of the following is TRUE for a system that is in dynamic equilibrium?
   A) The concentration of products is equal to the concentration of the reactants.
   B) The reaction rate of the forward reaction approaches zero.
   C) The forward reaction goes to 100% completion.
   D) Both the forward and reverse reactions come to a halt.
   E) none of the above

2) Given N_2 (g) + 3 H_2 (g) ⇌ 2 NH_3 (g), which scenario will allow you to eventually reach an equilibrium mixture involving these chemicals?
   A) Place only NH_3 into a sealed vessel.
   B) Place only N_2 into a sealed vessel.
   C) Place only H_2 into a sealed vessel.
   D) All of the above scenarios.
   E) none of the above

3) For the reaction 2A + B ⇌ 2C + 3D, the equilibrium expression is:

   A) $K_{eq} = \dfrac{[A]^2[B]}{[C]^2[D]^3}$

   B) $K_{eq} = \dfrac{[2C][3D]}{[2A][B]}$

   C) $K_{eq} = \dfrac{[2][1]}{[2][3]}$

   D) $K_{eq} = \dfrac{[C]^2[D]^3}{[A]^2[B]}$

   E) none of the above

4) The chemical equation that would generate the equilibrium expression $Keq = \dfrac{[B]^2\,[C]}{[A]^3}$ is _____. (Assume all substances are gases in this reaction.)
   A) C + 2B ⇌ 3A
   B) A ⇌ B + C
   C) 1/2 B + C ⇌ 1/3 A
   D) 3A ⇌ 2B + C
   E) none of the above

5) Which equilibrium constant represents a reaction that favors the formation of the products to the greatest extent?
   A) $K_{eq} = 1.0 \times 10^8$
   B) $K_{eq} = 100$
   C) $K_{eq} = 1.0 \times 10^{-18}$
   D) $K_{eq} = 1.0 \times 10^{-3}$
   E) not enough information

6) For the reaction $2 H_2O$ (l) $\rightleftharpoons 2H_2$ (g) $+ O_2$ (g), the equilibrium expression is:

A) $K_{eq} = \dfrac{[H_2]^2 \, [O_2]}{[H_2O]^2}$

B) $K_{eq} = \dfrac{[H_2]^2 \, [O]^2}{[H_2O]^2}$

C) $K_{eq} = [H_2O]^2$

D) $K_{eq} = [H_2]^2 \, [O_2]$

E) none of the above

7) For the reaction $2 A \rightleftharpoons B$, the equilibrium concentrations are as follows: $[A] = 0.056$ M and $[B] = 0.12$ M. Calculate the equilibrium constant (K_{eq}) for the reaction.

A) 2.6×10^{-2}
B) 38
C) 0.26
D) 2.1
E) none of the above

8) For the reaction $Ag_2S(s) \rightleftharpoons 2Ag^+(aq) + S^{2-}(aq)$, $K_{eq} = 2.4 \times 10^{-4}$ and the equilibrium concentration of silver ion is $[Ag^+] = 2.5 \times 10^{-1}$ M. What is $[S^{2-}]$ at equilibrium?

A) 1.0×10^3
B) 9.6×10^{-4}
C) 2.6×10^2
D) 0.0038
E) none of the above

9) For the reaction $Ag_2S(s) \rightleftharpoons 2Ag^+(aq) + S^{2-}(aq)$, what happens to the equilibrium position if aqueous ammonium sulfide is added?
A) shifts to the right
B) halves
C) doubles
D) shifts to the left
E) does nothing

10) Consider the reaction: $2N_2O(g) \rightleftharpoons O_2(g) + 2N_2(g)$. Which of the following, done at constant volume and temperature, will cause a shift in the equilibrium to the right?
1. Add more N_2O
2. Remove O_2
3. Remove N_2

A) 1 and 2 only
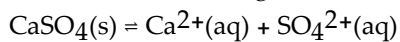B) 2 and 3 only
C) 1 and 3 only
D) All of 1, 2, and 3
E) Neither 1, 2, or 3

11) We have the following reaction at equilibrium in a flask,

$CaSO_4(s) \rightleftharpoons Ca^{2+}(aq) + SO_4^{2+}(aq)$

What will happen to $[Ca^{2+}]$ if additional $CaSO_4$ is added to the flask?

A) It will not change.
B) It will decrease.
C) It will increase.
D) Cannot tell with the information provided.

12) Which of the following equilibrium systems will shift to the right (towards products) when pressure is increased.

A) $2 PbS (s) + 3O_2 (g) \rightleftharpoons 2PbO (s) + 2 SO_2 (g)$

B) $H_2 (g) + CO_2 (g) \rightleftharpoons H_2O (g) + CO (g)$

C) $PCl_5 (g) \rightleftharpoons PCl_3 (g) + Cl_2 (g)$

D) all of these

E) none of these

13) For the reaction $2N_2O(g) \rightleftharpoons O_2(g) + 2N_2(g)$, what happens to the equilibrium position if the volume decreases?

A) shifts to the left
B) shifts to the right
C) does nothing
D) doubles
E) halves

14) Consider the following endothermic equilibrium reaction:

$Fe_2O_3 (s) + 3H_2 (g) \rightleftharpoons 2Fe (s) + 3H_2O (g)$
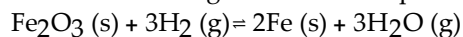
Which of the following actions will result in a shift to the left (towards reactants)?

A) increasing the pressure in the container
B) increasing the temperature
C) removing $H_2O (g)$
D) all of these
E) none of these

1) E
2) A
3) D
4) D
5) A
6) D
7) B
8) D
9) D
10) D
11) A
12) A
13) A
14) E