AP CHEMISTRY CHAPTER 13 PRACTICE TEST

1. Consider the equilibrium below:

2NOCl(g) ↔ 2NO(g) + Cl2(g)

If a system at equilibrium is disturbed by adding more NO to the system, which of the following will occur?

1. the equilibrium [Cl2] will decrease and K will decrease
2. the equilibrium [Cl2] will decrease, and the K will remain the same
3. the equilibrium [Cl2] will increase, and the K will increase
4. the equilibrium [Cl2] will increase, but the K will remain the same
5. both the equilibrium [Cl2] and the K will remain the same
6. Consider the following equilibrium: N2O4(g) ↔ 2NO2(g) ΔH = + 58kJ

Under which temperature and pressure conditions will allow for the optimal yield of NO2(g)?

1. high pressure and high temperature
2. low temperature and low pressure
3. high temperature and low pressure
4. low temperature and high pressure
5. Which factors must be equal in a reversible chemical reaction at equilibrium?
6. the concentrations of the reactants and products
7. the potential energies of the reactants and products
8. the activation energies of the forward and reverse reactions
9. the rates of reaction of the forward and reverse reactions
10. Determine the equilibrium constant for the system: N2O4(g) ↔ 2NO2(g) at 25oC. The equilibrium concentrations are [N2O4] = 4.27 x 10-2 M and [NO2] = 1.41 x 10-2 M
11. 0.330
12. 3.03
13. 0.660
14. 215
15. 0.00466
16. For the reaction of gaseous nitrogen with gaseous hydrogen to produce gaseous ammonia, the correct equilibrium expression is
17. [NH3]2 / [N]3[H2]
18. [NH3] / [N2][H2]
19. [NH3]2 / [N2][H2]3
20. [NH3] / [N][H]3
21. none of these
22. Write the equilibrium expression for the following reaction:

CaCO3(s) ↔ CaO(s) +CO2(g)

1. K = [CaCO3]
2. K = [CO2]
3. K = [CaO]
4. K = [CaO][CO2] / [CaCO3]
5. K = [CaO] / [CaCO3]
6. Which of the following is an example of a homogeneous equilibrium?
7. MgCO3(s) ↔ MgO(s) + CO2(g)
8. NaCl(s) ↔ Na+(aq) + Cl-(aq)
9. 3H2(g) + N2(g) ↔ 2NH3(g)
10. C(s) + CO2(g) ↔ 2CO(g)
11. None of these
12. For a certain reactions at 25oC, the value of K is 1.2 x 10-3. At 50oC, the value of K is 3.4 x 10-1. This means that the reaction is
13. exothermic
14. endothermic
15. more information is needed
16. Given the equation A(g) ↔ B(g) + 2C(g). At a particular temperature, K = 1.4 x 105. If you initially mix 1.2 mol B, 0.050 mol C and 0.003 mol A in a 1.0 L container, in which direction would the reaction proceed to reach equilibrium?
17. to the left
18. to the right
19. the mixture is already at equilibrium
20. cannot tell from the information given
21. Which of the following statements is(are) typically true for a catalyst?
22. The concentration of the catalyst will decrease as a reaction proceeds
23. The catalyst provides a new pathway for the reaction
24. The catalyst speeds up the reaction
25. Two of these
26. None of these

11. Consider the equilibrium: N2(g) + 3H2(g) ↔ 2NH3(g)

Initially 0.154 mol of N2, 0.235 mol of H2, and 0.293 mol of NH3 were combined in a 1.50 L flask at 295oC.

1. Write the K expression for this reaction
2. If 0.312 mol of H2 were present at equilibrium
3. What are the equilibrium concentrations for N2 and NH3?
4. In which direction did the reaction shift in order to reach equilibrium?
5. Find the equilibrium constant (K) for this system at equilibrium
6. What will be the K of the reverse reaction?
7. Calculate Kp for this reaction
8. Consider the following equilibrium, which has an equilibrium constant K = 0.26 at 25oC.

2IBr(g) ↔ I2(g) + Br2(g)

In an experiment 0.10 mol of IBr is initially placed in a 0.50 L flask, and the system is allowed to reach equilibrium.

1. In which direction will the reaction shift in order to reach equilibrium? Justify your answer.
2. Find the equilibrium concentration of all substances in the equilibrium mixture.
3. What will happen to the equilibrium position if the following changes take place at equilibrium?
4. The concentration of I2(g) is increased
5. The Pressure in increased by decreasing the volume
6. Br2(g) is removed as soon as it is produced
7. Helium is added to the system

ANSWERS:

1. B
2. C
3. D
4. E
5. C
6. B
7. C
8. B
9. B
10. D
11. a. K = [NH3]2/ [N2][H2]3

b. [NH3] = .161 M

[N2] = .120 M

Left

c. 24.0

d. 0.0417

e. 0.0110

12. a. shift right. There are only reactants present so it can only go in one direction or Q<K therefore it must shift right to make more products to achieve equilibrium

b. [I2] = 0.050 M

[Br2] = 0.050 M

[IBr] = 0.10 M

c.left, no change, right, no change