Quiz #4 Writing and Calculating Keq

1. The equilibrium constant expression for the following reaction is:

2Hg(l) + O2(g) ⇄ 2HgO(s)

A. Keq = 1/[O2]

B. Keq = [O2]

C. Keq = [2HgO] / [O2] [2Hg]

D. Keq = [HgO]2 / [Hg]2[O2]

2. Identify the equilibrium system that least favors the formation of products

A. 2HgO ⇄ 2Hg + O2                 Keq = 1.2 x 10-22

B. CH3COOH + H2O ⇄ H3O+ + CH3COO-Keq = 1.8 x 10-5

C. 2NO + O2 ⇄2NO2 Keq = 6.5 x 105

D. H2  + Cl2 ⇄ 2HCl Keq = 1.8 x 1033

3. Consider the following equilibrium system: 3O2(g)  ⇄ 2O3(g) Keq = 1

Which equation compares the concentration of oxygen and ozone?

A. [O2] = [O3]2/3

B. [O2] = [O3]

C. [O2] = [O3]3/2

D. [O2] 2/5 = [O3]

4. For which of the following equilibrium does Keq = [O2]

A. O2(l)  ⇄ O2(g)

B. 2O3(g)  ⇄ 3O2(g)

C. 2H2O(l) ⇄ 2H2(g) + O2(g)

D. 2Hg(s) + O2(g) ⇄ 2HgO(s)

5. Consider the following equilibrium system at 25O C : 2SO2(g) + O2(g)  ⇄ 2SO3(g)

At equilibrium, [SO2] is 4.00 x 10-3 mol/L, [O2] = 4.00 x 10-3 mol/L and

[SO3] is 2.33 x 10-3 mol/L. From this data, the Keq value for the above system is

A. 6.85 x 10-3

B. 1.18 x 10-2

C. 84.8

D. 146

6. Consider the following equilibrium system: PCl5(g) ⇄ PCl3(g) + Cl2(g)

At equilibrium, [PCl5] is a 0.400 M. [PCl3] is 1.50 M and [Cl2] is 0.600 M.

The Keq for the reaction is

A. 0.360

B. 0.444

C. 0.900

D. 2.25

7. Consider the following equilibrium: 2H2S(g) ⇄ 2H2(g) + S2(g)

At equilibrium, [H2S] = 0.50 mol/L. [H2] = 0.10 mol/L and [S2] = 0.40 mol/L.

The value of Keq is calculated using the ratio

A (0.10)(0.40)

(0.50)

B. (0.10)2(0.40)

(0.50)2

C. (0.50)

(0.10)(0.50)

D. (0.50)2

(0.10)2(0.40)

8. Consider the following equilibrium: 2NO(g) + Cl2(g) ⇄ 2NOCl(g) Keq = 12

At equilibrium, [NOCl] = 1.60 mol/L and [NO] = 0.80 mol/L. The [Cl2] is

A. 0.17 mol/L

B. 0.27 mol/L

C. 0.33 mol/L

D. 3.0 mol/L

9. Consider the following equilibrium: I2(s) + H2O(l) ⇄ H+(aq) + I-(aq) + HOI(aq)

The equilibrium constant expression for the above system is

A. Keq = [H+][I-]

B. Keq = [H+][I-][HOI]

C. Keq = [H+][I-][HOI]

[I2][H2O]

D. Keq = [H+][I-][HOI]

[H2O]

10. Consider the following equilibrium: 2CO(g) + O2(g) ⇄ 2CO2(g)

The ratio used to calculate the equilibrium constant is

A. [2CO]2[O2]

[2CO2]2

B. [2CO2]2

[2CO]2[O2]

C. [CO]2[O2]

[CO2]2

D. [CO2]2

[CO]2[O2]

11. Consider the following equilibrium: 2Fe(s) + 3H2O(g) ⇄ Fe2O3(s) + 3H2(g)

The equilibrium constant expression is

A. Keq = [Fe2O3][H2]3

[Fe]2[H2O]3

B. Keq = [Fe2O3][3H2]

[2Fe] [3H2O]

C. Keq = [H2]3

[H2O]3

D. Keq = [H2]3

12. Consider the following equilibrium: N2O4(g) ⇄ 2NO2(g) Keq = 0.133

At equilibrium, the [N2O4] is equal to

A. 0.133

[NO2]

B. [NO2]

0.133

C. 0.133

[NO2]2

D. [NO2]2

0.133

13. Consider the following equilibrium: 4KO2(s) + 2H2O(g) ⇄ 4KOH(s) + 3O2(g)

The equilibrium constant expression is

A. Keq = [KOH]4[O2]3

[KO2]4[H2O]2

B. Keq = [O2]3

[H2O]2

C. Keq = [KO2]4[H2O]2

[KOH]4[O2]3

D. Keq = [H2O]2

[O2]3

14. Consider the following equilibrium: C(s) + H2O(g) ⇄ CO(g) + H2(g)

The contents of a 1.00 L container at equilibrium were analyzed and found to

contain 0.20 mol C, 0.20 mol H2O, 0.60 mol CO and 0.60 mol H2. The equilibrium constant is

A. 0.11

B. 0.56

C. 1.8

D. 9.0

15. Consider the following equilibrium: N2O4(g) ⇄ 2NO2(g) Keq = 4.61 x 10-3

A 1.00 L container at equilibrium was analyzed and found to contain 0.0200 moles NO2.

At equilibrium, the concentration of N2O4 is

A. 0.0868 mol/L

B. 0.230 mol/L

C. 4.34 mol/L

D. 11.5 mol/L

16. Consider the following equilibrium: CH4(g) + H2O(g) ⇄ CO(g) + 3H2(g) Keq= 5.7

At equilibrium, the [CH4] = 0.40 mol/L [CO] = 0.30 mol/L and [H2] = 0.80 mol/L.

The [H2O] is

A. 0.067 mol/L

B. 0.11 mol/L

C. 2.2 mol/L

D. 5.3 mol/L

17. Consider the following equilibrium: H2(g) + I2(g) ⇄2HI(g)

At equilibrium, the [H2] = 0.020 mol/L. [I2] = 0.020 mol/L and [HI] = 0.160 mol/L.

The value of the equilibrium constant is

A. 2.5 x 10-3

B. 1.6 x 10-2

C. 6.4 x 101

D. 4.0 x 102

18. Consider the following constant expression: Keq = [CO2]. Which one of the following

equilibrium systems does the above expression represent?

A. CO2(g) ⇄ CO2(s)

B. PbO(s) + CO2(g) ⇄ PbCO3(s)

C. CaCO3(s)  ⇄ CaO(s) + CO2(g)

D. H2CO3(aq)  ⇄ H2O(l) + CO2(aq)

19. Given the following equilibrium system: Br2(g)  ⇄ Br2(l)

The equilibrium constant expression for the above system is

A. Keq = [Br2(l)]

[Br2(g)]

B. Keq = [Br2(g)]

C. Keq = 1 \_\_

[Br2(g)]

D. Keq = [Br2(g)] [Br2(g)]

 20. Consider the following equilibrium: CO(g) + 2H2(g) ⇄CH3OH(g)  + 91 kJ

A change in temperature of the above system increases the value of the equilibrium constant.

The new state of equilibrium was established by a shift

A. Left as a result of a decrease in temperature

B. Right as a result of a decrease in temperature

C. Left as a result of an increase in temperature

D. Right as a result of an increase in temperature

21. Consider the equilibrium: SrCO3(s) ⇌ SrO(s) + CO2(g) In a 2.5 L container

at equilibrium there are 2.42 g CO2, 1.00 g SrCO3 and 1.00 SrO.

Which of the following is the value of Keq?

A. 0.022

B. 0.011

C. 0.020

D. 91

22. Consider the following equilibrium: CCl4(g) ⇌ C(s) + 2Cl2(g)

Initially, 0.62 mol CCl4 was placed in a 2.0L container. At equilibrium, [Cl2]= 0.060 M.

Which of the following is the value of Keq?

A. 0.00039

B. 0.013

C. 0.014

D. 0.78

23. Consider the following equilibrium: CH4(g) + H2O(g) ⇌ CO(g) + 3H2(g)

At equilibrium, 1.20 mol CH4, 1.20 mol H2O, 0.080 mol CO and 0.040 mol H2

are present in a 2.0 L container. What is the value of Keq ?

A. 4.3 x 10-6

B. 2.2 x 10-2

C. 2.2 x 10-4

D. 8.9 x 10-7

24. Consider the following equilibrium: Cr2O72-(aq) + 2OH-(aq) ⇌ 2CrO42-(aq) + H2O(l)

The concentration of ions at equilibrium was measured at a specific temperature and found to be

[CrO42-] = 0.100 M, [Cr2O72-] = 0.20 M, and [OH-] = 0.11 M. What is the Keq?

A. 41

B. 4.13

C. 0.83

D. 0.11

25. Consider the following equilibrium: Cr2O72-(aq) + 2OH-(aq) ⇌ 2CrO42-(aq) + H2O(l) Keq = 4.14

The concentration of ions at equilibrium was measured at a specific temperature and found to be

[Cr2O72-] = 0.100 M and [OH-] = 0.20 M. What is the equilibrium [CrO42-] ?

A. 0.017 M

B. 0.083 M

C. 0.13 M

D. 0.32 M

26. Consider the following equilibrium: 2COF2(g) ⇌ CO2(g) + CF4(g) Initially, 0.32 M CO2 and 0.40 M CF4

are placed in a container. At equilibrium, it is found that the [COF2] is 0.16 M. What is the value of Keq?

A. 0.026

B. 1.5

C. 9.3

D. 3.0

27. Consider the following equilibrium: Cr2O72-(aq) + 2OH-(aq) ⇌ 2CrO42-(aq) + H2O(l) Keq = 4.14

The concentration of ions at equilibrium was measured at a specific temperature and found to be

[CrO42-] = 0.100 M and [OH-] = 0.20 M. What is the equilibrium [Cr2O72-] ?

A. 0.060 M

B. 0.083 M

C. 0.13 M

D. 0.32 M

28. Consider the following equilibrium: Cr2O72-(aq) + 2OH-(aq) ⇌ 2CrO42-(aq) + H2O(l) Keq = 4.14

The concentration of ions at equilibrium was measured at a specific temperature and found to be

[CrO42-] = 0.100 M and [Cr2O72-] = 0.20 M. What is the equilibrium [OH-]?

A. 0.012 M

B. 0.083 M

C. 0.13 M

D. 0.11 M

29. Consider the following equilibrium: 2COF2(g) ⇌ CO2(g) + CF4(g) Initially, 0.16 M CO2 and 0.20 M CF4

are placed in a container. At equilibrium, it is found that the [COF2] is 0.080 M. What is the value of Keq?

A. 0.12

B. 1.5

C. 8.0

D. 3.0

30. Consider the following equilibrium: CH4(g) + H2O(g) ⇌ CO2(g) + 3H2(g) Keq = 5.67

An equilibrium mixture of this system was found to contain the following concentrations:

[CH4] = 0.59 M , [H2O] = 0.63 M, [CO2] = 0.25 M.

What was the equilibrium [H2] ?

A. 0.26 M

B. 0.64 M

C. 2.0 M

D. 8.4 M

31.       Consider the following equilibrium: 2COF2(g) ⇌ CO2(g) + CF4(g)

Initially, 0.32 M CO2 and 0.40 M CF4 are placed in a container.  At equilibrium, it is found that the [COF2] is 0.16 M.

              What is the value of Keq?

               A.           0.026

               B.           1.5

               C.           9.3

               D.           3.0

32.       Consider the following equilibrium:            CCl4(g)  ⇌   C(s)   +    Cl2(g)

Initially, 0.62 mol CCl4 was placed in a 2.0L container.

At equilibrium, [Cl2]= 0.060 M. Which of the following is the value of Keq?

A.           0.00039

B.           0.24

C.           0.014

D.           0.78

33.        Consider the following equilibrium:  2COF2(g) ⇌   CO2(g)   +   CF4(g)

             Initially, 0.16 M CO2 and 0.20 M CF4 are placed in a container.

             At equilibrium, it is found that the [COF2] is 0.080 M.

             What is the value of Keq?

              A.           0.12

              B.           1.5

              C.           8.0

              D.           3.0