Equilibrium Quiz # 5 Calculations and Trial Keq

1. Consider the following equilibrium: N2(g)  + O2(g) ⇄ 2NO(g) Keq = 0.010

Initially, a 1.0 L container is filled with 0.40 mol of N2, 0.10 mol of O2 and 0.080 mol of NO.

As the system approaches equilibrium, the

A. [NO], [N2] and [O2] remain unchanged

B. [NO] increases and both [N2] and [O2] decrease

C. [NO] decreases and both [N2] and [O2] increase

D. [NO] decreases and both [N2] and [O2] remain unchanged

2. Consider the following equilibrium: 2O2(g) + N2(g)  ⇄ N2O4(g)

When 2.0 mol of O2 and 3.0 mol of N2 were placed in a 10.0 L container at 25oC, the value of Keq=0.90.

If the same number of moles of reactant were placed in a 5.0 L container at 25oC, the equilibrium constant would be

A. 0.011

B. 0.45

C. 0.90

D. 1.80

3. Consider the following equilibrium system: H2O(g) + CO(g) ⇄ H2(g) + CO2(g)

Initially, 5.0 moles of H2O and 4.0 moles of CO were reacted. At equilibrium, it is found

that 2.0 moles of H2 are present. How many moles of H2O remain in the mixture?

A. 1.0 moles

B. 2.0 moles

C. 3.0 moles

D. 4.0 moles

4. Consider the following equilibrium: PCl5(g)  ⇄ PCl3(g) + Cl2(g) Keq=33.3

Predict what will occur when 2.0 mol of PCl5, 3.0 mol of PCl3 and 4.0 mol of Cl2

are placed in a 1.0 L container and allowed to establish equilibrium.

A. [PCl5] will increase

B. [PCl3] and [CL2] will both increase

C. [PCl5] and [Cl2] will both increase

D. [PCl5] and [PCl3] will both decrease

5. Consider the following equilibrium: CO(g) + 2H2(g) ⇄ CH3OH(g) ∆H= -18kJ

In order to increase the value of Keq for this reaction, you could

A. Increase [CO]

B. Increase the volume

C. Decrease [CH3OH]

D. Decrease the temperature

6. Consider the following: SO2Cl2(g)  ⇄ SO2(g) + Cl2(g)

A 1.0 L container is initially filled with 2.0 mol of SO2Cl2.

As the reaction proceeds towards equilibrium, the rate of the forward reaction

A. Increases and the [SO2] increases

B. Increases and the [SO2] Decreases

C. Decreases and the [SO2] increases

D. Decreases and the [SO2] decreases

7. Consider the following: 2NO2(g) ⇄ N2O2(g)  Keq=1.20

A 1.0 L of flask is filled with 1.4 mol NO2 and 2.0 mol N2O4.

To reach equilibrium, the reaction proceeds to the

A. Left as Trial Keq > Keq

B. Left as Trial Keq < Keq

C. Right as Trial Keq > Keq

D. Right as Trial Keq < Keq

8. Consider the following: 2C(s) + O2(g)  ⇄ 2CO(g)

A 1.0 L flask is initially filled with 2.00 mol C and 0.500 mol O2.

At equilibrium, the [O2] is 0.250 mol/L. The Keq value is

A. 0.444

B. 1.00

C. 2.00

D. 2.25

9. Consider the following: 2H2O(g) ⇄ 2H2(g) + O2(g)

When 0.1010 mol H2O is placed in a 1.000 L container, equilibrium is established.

The equilibrium concentration of O2 is 0.0010 mol/L. the equilibrium concentrations of H2O and H2 are

|  |  |  |
| --- | --- | --- |
|  | [H2O] | [H2] |
| A | 0.0990 | 0.0020 |
| B | 0.1000 | 0.0010 |
| C | 0.1005 | 0.0005 |
| D | 0.1010 | 0.0020 |

10. Which of the following equilibrium systems most favors the products?

A. Cl2(g) ⇄2Cl(g) Keq=6.4 x 10-39

B. Cl2(g) + 2NO(g) ⇄ 2NOCl(g) Keq=3.7 x 108

C. Cl2(g) + 2NO2(g)  ⇄ 2NO2Cl(g) Keq=1.8

D. 2HCl(g) ⇄ H2(g) + Cl2(g)  Keq=2.0 x 10-3

11. Consider the following equilibrium: H2O(g) + Cl2O(g) ⇄ 2HOCl(g) Keq= 9.0 x 10-2

A 1.0 L flask contains a mixture of 1.8 x 10-1 mol H2O. 4.0 x 10-4 mol Cl2O, and 8.0 x 10-2 mol HOCl .

To establish equilibrium, the system will proceed to the

A. Left as Trial Keq > Keq

B. Left as Trial Keq < Keq

C. Right as Trial Keq > Keq

D. Right as Trial Keq < Keq

12. Consider the following equilibrium: 2O3(g) ⇄ 3O2(g)  Keq=55

If 0.060 mol of O3 and 0.70 mol of O2 are introduced into a 1.0 L vessel, the

A. Ktrial > Keq  and the [O2] increases

B. Ktrial < Keq  and the [O2] increases

C. Ktrial > Keq  and the [O2] decreases

D. Ktrial < Keq  and the [O2] decreases

13. Consider the following equilibrium: CO(g) + Cl2(g) ⇄ COCl2(g)

At equilibrium, a 2.0 L sample was found to contain 1.00 mol CO, 0.500 mol Cl2

and 0.100 mol COCl2. The Keq value for the above system is

A. 0.40

B. 0.20

C. 2.5

D. 5.0

14 Consider the following equilibrium: 2SO2(g) + O2(g)⇄ 2SO3(g)  Keq=4.0

In an experiment, 0.40 mol SO2(g), 0.20 mol O2(g) and 0.40 mol SO3(g) are placed into a

1.0 liter container. Which of the following statements relates the changes in [SO2] and [O2]

as equilibrium becomes established?

A. The [SO2] and [O2] increase

B. The [SO2] and [O2] decrease

C. The [SO2] and [O2] do not change

D. The [SO2] increases and the [O2] decreases

15. Consider the following equilibrium system: H2(g) + S(s) ⇄ H2S(g)

In a 1.0 L container at equilibrium there are 0.050 mol H2, 0.050 mol S and 1.0 mol H2S.

The value of Keq is

A. 2.5 x 10-3

B. 5.0 x 10-2

C. 2.0 x 101

D. 4.0 x 102

16. Consider the following equilibrium and experimental data:

N2O4(g) ⇄ 2NO2(g)

Initial Equilibrium

[N2O4] [NO2] [N2O4] [NO2]

Trial 1 0.0400 M 0.0000 M 0.0337 M 0.0125 M

Trial 2 0.0200 M 0.0600 M 0.0429 M 0.0141 M

Which of the following represents the Keq value?

A. 0.00464

B. 0.371

C. 0.742

D. 216

17. Consider the following equilibrium: Cl2(g) + 2NO(g) ⇌ 2NOCl(g) Keq = 5.0

At equilibrium, [Cl2] = 1.0 M and [NO] = 2.0 M.

What is the [NOCl] at equilibrium?

A. 0.80 M

B. 0.89 M

C. 4.5 M

D. 10 M

18. Consider the following equilibrium: Cl2(g) + 2NO(g) ⇌ 2NOCl(g)

If 12.0 moles of Cl2, 10.24 moles of NO, and 2.00 moles NOCl are placed in a

2.00 L container and the system moves to the right to get to equilibrium,

If there are 10.0 moles NOCl at equilibrium, calculate the Keq.

A. 0.996

B. 5.58

C. 1.12

D. 4.98

19. What will cause the value of Keq for an exothermic reaction to decrease?

A. increasing the pressure

B.         increasing the temperature

C.        decreasing the temperature

D. decreasing the surface area

20. Consider the following: H2(g) + I2(g) ⇌ 2HI(g)

Initially, some HI is placed into a 1.0 L container. At equilibrium there are 0.010 mol H2,

0.010 mol I2 and 0.070 mol HI present. How many moles of HI were initially added to the container?

A. 0.060 mol

B. 0.070 mol

C. 0.080 mol

D. 0.090 mol

21. Consider the following equilibrium: 3NO2(g) ⇌ N2O5(g) + NO(g).

Initially, some NO2, N2O5 and NO were placed in a container and allowed to reach equilibrium.

When equilibrium was established, it was found that the pressure had increased.

Which of the following explains what happened?

A. Trial Keq > Keq so the system shifted left.

B. Trial Keq < Keq so the system shifted left.

C. Trial Keq > Keq so the system shifted right.

D. Trial Keq < Keq so the system shifted right.

22. Consider the following equilibrium: 3NO2(g) ⇌ N2O5(g) + NO(g).

Initially, 8.00 moles NO2 were placed in a 2.0 L container and allowed to reach equilibrium.

The equilibrium concentration of NO was 1.10 M. Calculate the Keq.

A. 1.7

B. 1.9

C. 3.5

D. 0.050

23. Consider the following equilibrium: 3NO2(g) ⇌ N2O5(g) + NO(g).

At a different temperature, 4.00 M NO2 were placed in a 2.0 L container and

allowed to reach equilibrium. The equilibrium concentration of NO2 was 1.00 M. Calculate the Keq.

A. 0.11

B. 1.0

C. 3.0

D. 10.

24. Consider the reaction: 2HBr(g) ⇌ H2(g) + Br2(g) Keq = 49.0

If 4.0 M HBr is initially placed into a container, what will be the equilibrium [HBr]?

A. 0.27 M

B.        3.7 M

C. 5.3 M

D. 8.8 M

25. Consider the reaction: 2HBr(g) ⇌ H2(g) + Br2(g) Keq = 49.0

If 0.120 M H2, 0.120 M Br2 and 0.01714 M HBr are placed into a container at

440 C, which of the following is true as equilibrium is approached?

A. [Br2] decreases significantly.

B. [HBr] decreases significantly.

C. [H2] decreases significantly.

D. [H2] remains the same.

26. Consider the reaction: 2HBr(g) ⇌ H2(g) + Br2(g) Keq = 49.0

If 1.20 M H2, 1.20 M Br2 and 1.00 M HBr are placed into a container at

440 C, which of the following is true as equilibrium is approached?

A. [Br2] decreases significantly.

B. [HBr] decreases significantly.

C. [H2] decreases significantly.

D. [H2] remains the same.

27. Which Keq is most likely to favour the formation of reactants?

A. Keq = 1.65 x 104

B. Keq = 5.69 x 10-11

C. Keq = 3.95 x 10-11

D. Keq = 7.67 x 104

28. Which Keq is most likely to favour the formation of products?

A. Keq = 1.65 x 10-4

B. Keq = 5.69 x 10-11

C. Keq = 3.95 x 10-11

D. Keq = 7.67 x 10-4

29. Consider the following equilibrium system: 2NO(g) + Cl2(g) ⇌ 2NOCl(g) + 25 kJ

In which direction will the equilibrium shift and what happens to the value of Keq

when the temperature of the system is increased?

Shift Keq

A. right increases

B. right decreases

C. left increases

D. left decreases

30. Consider the following equilibrium system: 2NO(g) + Cl2(g) ⇌ 2NOCl(g) + 25 kJ

In which direction will the equilibrium shift and what happens to the value of Keq when NO is added?

Shift Keq

A. right increases

B. right constant

C. left increases

D. left constant

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