Equilibrium Quiz #2 LeChatelier’s Principle

1. Consider the following reaction: 2SO2(g) + O2(g) ⇄ 2SO3(g) ∆H = -197 kJ/mol

 Which of the following will not shift the equilibrium to the right?

 A. Adding more O2

 B. Adding a catalyst

 C. Increasing the pressure

 D. Lowing the temperature

2. Consider the following equilibrium system: CaCO3(s) ⇄ CaO(s) + CO2(g)

 Which one of the following changes would cause the above system to shift left?

 A. Add more CaO

 B. Remove CaCO3

 C. Decrease volume

 D. Increase surface area of CaO

3. Consider the following equilibrium: SO2Cl2(g) + energy ⇄ SO2(g) + Cl2(g)

 When the temperature is decreased, the equilibrium shifts

 A. Left and [ SO2Cl2 ] increases

 B. Left and [ SO2Cl2 ] decreases

 C. Right and [ SO2Cl2 ] increases

 D. Right and [ SO2Cl2 ] increases

4. Consider the following equilibrium: 2SO3(g)  ⇄ 2SO2(g) + O2(g)

 The volume of the system is decreased at a constant temperature. A new state of equilibrium is established

             by a shift of the original equilibrium to the

 A. Left and [SO3] increases

 B. Right and [SO3] decreases

 C. Left and [SO3] remains unchanged

 D. Right and [SO3] remains unchanged

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

 Which of the following, when added to the system above, would result in a net decrease in [H2O]?

 A. CO2

 B. H2

 C. CO

 D. H2

6. Consider the following equilibrium: C(s) + 2H2(g) ⇄ CH4(g) + 74 kJ

 When a small amount of solid C is added to the system

 A. [H2] decreases

 B. [CH4] increases

 C. The temperature increases

 D. All concentrations remain constant

7. Consider the following equilibrium: 2NO(g) + Cl2(g) ⇄ 2NOCl(g)

 At constant temperature and volume, Cl2 is added to the above equilibrium system.

            As equilibrium re-establishes, the

 A. [NOCl] will decrease

 B. The temperature increases

 C. [NO] will increase

 D. [NOCl] will increase

8. Consider the following equilibrium: Cl2O7(g) +8H2(g) ⇄ 2HCl(g) + 7H2O(g)

 Which of the following would increase the number of moles of HCl?

 A. Increase [H2O]

 B. Increase [Cl2O7]

 C. Increase total pressure

 D. Increase volume of the system

9. Consider the following equilibrium: 2HI(g) ⇄ H2(g) + I2(g) ∆H = -68kJ

 Which of the following would cause the equilibrium to shift right?

 A. Increasing the volume

 B. Decreasing the volume

 C. Increasing the temperature

 D. Decreasing the temperature

10. A 1.00 L flask contains a gaseous equilibrium system. The addition of reactants to this flask results in a

 A. Shift to the left and decrease in the concentration of products

 B. Shift to the left and increase in the concentration of products

 C. Shift to the right and decrease in the concentration of products

 D. Shift to the right and increase in the concentration of products

11. When the temperature of an equilibrium system is increased, the equilibrium always shifts to favor the

 A. Exothermic reaction

 B. Endothermic reaction

 C. Formation of products

 D. Formation of reactants

12. An equilibrium system shifts left when the

 A. Rate of the forward reaction is equal to the rate of the reverse reaction

 B. Rate of the forward reaction is less than the rate of the reverse reaction

 C. Rate of the forward reaction is greater than the rate of the reverse reaction

 A. Rate of the forward reaction and the rate of the reverse reaction are constant

13. Consider the following equilibrium: 2SO2(g) + O2(g) ⇄ 2SO3(g) ∆H = -198 kJ

 There will be no shift in the equilibrium when

 A. More O2 is added

 B. Catalyst is added

 C. The volume is increased

 D. The temperature is increased

14. Consider the following equilibrium: 2NOCl(g) ⇄ 2NO(g) + Cl2(g)

 In a 1.0 L container at equilibrium there are 1.0 mol NOCl, 0.70 mol NO and 0.40 mol Cl2.

            At constant temperature and volume, 0.10 mol NOCl is added. The concentrations in the

           “new” equilibrium in comparison to the concentrations in the “old” equilibrium are

A.

**B.**

C.

D.

|  |  |  |
| --- | --- | --- |
| [NOCl] | [NO] | [Cl2] |
| new = old | new = old | new = old |
| new > old | new > old | new > old |
| new < old | new < old | new > old  |
| new < old | new > old | new > old |

15. Consider the following equilibrium: N2O4(g) + 58 kJ ⇄ 2NO2(g)

 The equilibrium shifts right when

 A. NO2 is added

 B. N2O4 is removed

 C. The temperature is decreased

 D. The volume of the system is increased

16. Consider the following equilibrium: 2SO2(g) + O2(g) ⇄ 2SO 3(g)

 Which of the following will shift the equilibrium to the right?

|  |
| --- |
| I. Adding more O2 |
| II. Adding more SO3 |
| III. Adding a catalyst |

 A. I only

 B. III only

 C. I and II only

 D. II and III only

17. Consider the following equilibrium:

 energy + 2NaClO3(s) ⇌ 2NaCl(s) + 3O2(g)

 Which of the following will cause a shift to the left?

 A. adding more O2

 B. adding more NaCl

 C. removing some NaClO3

 D. increasing the temperature

18. Consider the following equilibrium:

 CO(g) + 2H2(g) ⇌ CH3OH(g) + energy

 Which of the factors below would decrease the concentration of CH3OH at equilibrium?

 A. an addition of CO

 B. an increase in H2

 C. a decrease in the temperature

 D. an increase in the temperature

19. Consider the following equilibrium:

 energy + 2NaClO3(s) ⇌ 2NaCl(s) + 3O2(g)

 Which of the following will cause a shift to the right?

 A. adding more O2

 B. adding more NaCl

 C. removing some NaCl(s)

 D. increasing the temperature

20. Consider the following equilibrium: 2SO2(g) + O2(g) ⇄ 2SO 3(g)

 Which of the following will shift the equilibrium to the left?

|  |
| --- |
| I. Removing O2 |
| II. Adding more SO3 |
| III. Adding a catalyst |

 A. I only

 B. III only

 C. I and II only

 D. II and III only

21. Consider the following equilibrium: N2O4(g) + energy ⇌ 2NO2(g)

 How are N2O4 and NO2 affected by the addition of He into the container at constant volume.

 N2O4 NO2

 A. no change no change

 B. no change increases

 C. increases decreases

 D. decreases increases

22. Which of the following stresses will cause a shift to the reactants?

 H2(g) + Br2(g) ⇌ 2HBr(g) + energy

 A. increase [Br2]

 B. increase [H2]

 C. decrease temperature

 D. increase temperature

23. Which of the following stresses will cause a shift to the products?

 H2(g) + Br2(g) ⇌ 2HBr(g) + energy

 A. decrease [Br2]

 B. decrease [H2]

 C. decrease temperature

 D. increase temperature

24. Which of the following two stresses will each cause the system to shift to the left?

            2SO2(g) + O2(g) ⇄ 2SO 3(g) + energy

 A. decrease temperature and decrease [O2]

 B. increase temperature and increase [SO3]

 C. increase temperature and decrease [SO3]

 D. decrease temperature and increase [SO2]

25. SrCO3(s) + 215 kJ ⇌ SrO(s) + CO2(g)

Which of the following conditions would produce the greatest yield of SrO(s)?

 Temperature Pressure

 A. low low

 B. low high

 C. high low

 D. high high

26. The Haber Process is used to produce ammonia commercially according to the following equilibrium:

 N2(g) + 3H2(g) ⇌ 2NH3(g) + energy

 Which of the following conditions will produce the highest yield of ammonia?

 A. increase temperature and increase pressure

 B. increase temperature and decrease pressure

 C. decrease temperature and increase pressure

 D. decrease temperature and decrease pressure

27. Consider the following reaction: 2SO2(g) + O2(g) ⇄ 2SO3(g) ∆H = -197 kJ/mol

 If the volume is increased what happens to position of the equilibrium?

 A. shifts to the right

 B.         shifts to the left

 C. no shift

 D. shifts in the exothermic direction

28. Consider the following reaction: 2NH3(g) + energy⇄ N2(g) + 3H2(g)

 If the volume is increased what happens to position of the equilibrium?

 A. shifts to the right

 B. shifts to the left

 C. no shift

 D. shifts in the exothermic direction

29. Consider the following reaction: SrCO3(s) + 215 kJ ⇌ SrO(s) + CO2(g)

 If the volume is decreased what happens to position of the equilibrium?

 A. shifts to the right

 B. shifts to the left

 C. no shift

 D. shifts in the exothermic direction

30. Consider the following reaction: H2(g) + Br2(g) ⇌ 2HBr(g) + energy

 If the volume is increased what happens to position of the equilibrium?

 A. shifts to the right

 B. shifts to the left

 C. no shift

 D. shifts in the exothermic direction

31. Consider the following reaction: N2O4(g) + energy ⇌ 2NO2(g)

 If the volume is decreased what happens to position of the equilibrium?

 A. shifts to the right

 B. shifts to the left

 C. no shift

 D. shifts in the exothermic direction