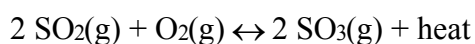


1. Ammonia is produced commercially by the Haber reaction:



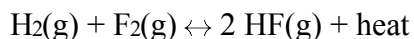
The formation of ammonia is favored by

- A) **an increase in pressure**
 - B) a decrease in pressure
 - C) removal of $\text{N}_2(\text{g})$
 - D) removal of $\text{H}_2(\text{g})$
2. Given the reaction at equilibrium:



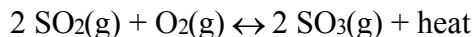
Which change will shift the equilibrium to the right?

- A) increasing the temperature
 - B) **increasing the pressure**
 - C) decreasing the amount of $\text{SO}_2(\text{g})$
 - D) decreasing the amount of $\text{O}_2(\text{g})$
3. Given the system at equilibrium:



Which change will *not* shift the point of equilibrium?

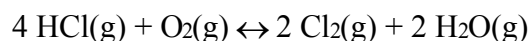
- A) **changing the pressure**
 - B) changing the temperature
 - C) changing the concentration of $\text{H}_2(\text{g})$
 - D) changing the concentration of $\text{HF}(\text{g})$
4. Given the reaction at equilibrium:



The concentration of $\text{SO}_3(\text{g})$ may be increased by

- A) decreasing the concentration of $\text{SO}_2(\text{g})$
- B) decreasing the concentration of $\text{O}_2(\text{g})$
- C) **increasing the pressure**
- D) increasing the temperature

5. Given the reaction at equilibrium:



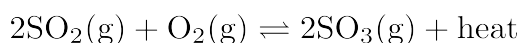
If the pressure on the system is increased, the concentration of $\text{Cl}_2(\text{g})$ will

- A) decrease
 - B) **increase**
 - C) remain the same
6. Given the closed system at equilibrium:



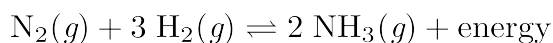
As the pressure on the system increases, the solubility of the $\text{CO}_2(\text{g})$

- A) decreases
 - B) **increases**
 - C) remains the same
7. Given the equation representing a reaction at equilibrium:



Which change causes the equilibrium to shift to the right?

- A) adding a catalyst
 - B) **adding more $\text{O}_2(\text{g})$**
 - C) decreasing the pressure
 - D) increasing the temperature
8. Given the equation representing a reaction at equilibrium:



Which change causes the equilibrium to shift to the right?

- A) decreasing the concentration of $\text{H}_2(\text{g})$
- B) decreasing the pressure
- C) **increasing the concentration of $\text{N}_2(\text{g})$**
- D) increasing the temperature

9. Given the system at equilibrium:

$2 \text{POCl}_3(g) + \text{energy} \rightleftharpoons 2 \text{PCl}_3(g) + \text{O}_2(g)$
Which changes occur when $\text{O}_2(g)$ is added to this system?

- A) The equilibrium shifts to the right and the concentration of $\text{PCl}_3(g)$ increases.
- B) The equilibrium shifts to the right and the concentration of $\text{PCl}_3(g)$ decreases.
- C) The equilibrium shifts to the left and the concentration of $\text{PCl}_3(g)$ increases.
- D) The equilibrium shifts to the left and the concentration of $\text{PCl}_3(g)$ decreases.**

10. Given the reaction at equilibrium:

$\text{N}_2(g) + \text{O}_2(g) + \text{energy} \leftrightarrow 2 \text{NO}(g)$
Which change will result in a *decrease* in the amount of $\text{NO}(g)$ formed?

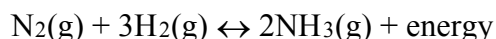
- A) decreasing the pressure
- B) decreasing the concentration of $\text{N}_2(g)$**
- C) increasing the concentration of $\text{O}_2(g)$
- D) increasing the temperature

11. Given the reaction at equilibrium:

$A(g) + B(g) \rightleftharpoons AB(g) + \text{heat}$
The concentration of $A(g)$ can be increased by

- A) lowering the temperature
- B) adding a catalyst
- C) increasing the concentration of $AB(g)$**
- D) increasing the concentration of $B(g)$

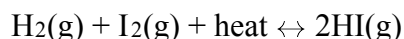
12. Given the equation representing a system at equilibrium:



Which changes occur when the temperature of this system is *decreased*?

- A) The concentration of $\text{H}_2(g)$ increases and the concentration of $\text{N}_2(g)$ increases.
- B) The concentration of $\text{H}_2(g)$ decreases and the concentration of $\text{N}_2(g)$ increases.
- C) The concentration of $\text{H}_2(g)$ decreases and the concentration of $\text{NH}_3(g)$ decreases.
- D) The concentration of $\text{H}_2(g)$ decreases and the concentration of $\text{NH}_3(g)$ increases.**

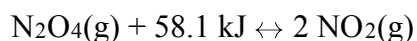
13. Given the equation representing a reaction at equilibrium:



Which change favors the reverse reaction?

- A) decreasing the concentration of $\text{HI}(g)$
- B) decreasing the temperature**
- C) increasing the concentration of $\text{I}_2(g)$
- D) increasing the pressure

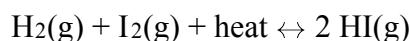
14. Given the system at equilibrium:



What will be the result of an increase in temperature at constant pressure?

- A) The equilibrium will shift to the left, and the concentration of $\text{NO}_2(g)$ will decrease.
- B) The equilibrium will shift to the left, and the concentration of $\text{NO}_2(g)$ will increase.
- C) The equilibrium will shift to the right, and the concentration of $\text{NO}_2(g)$ will decrease.
- D) The equilibrium will shift to the right, and the concentration of $\text{NO}_2(g)$ will increase.**

15. Given the equilibrium reaction in a closed system:



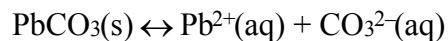
What will be the result of an increase in temperature?

- A) The equilibrium will shift to the left and $[\text{H}_2]$ will increase.
- B) The equilibrium will shift to the left and $[\text{H}_2]$ will decrease.
- C) The equilibrium will shift to the right and $[\text{HI}]$ will increase.**
- D) The equilibrium will shift to the right and $[\text{HI}]$ will decrease.

16. What occurs when the temperature is increased in a system at equilibrium at constant pressure?

- A) The rate of the forward reaction increases, and the rate of the reverse reaction decreases.
- B) The rate of the forward reaction decreases, and the rate of the reverse reaction increases.
- C) The rate of the endothermic reaction increases.**
- D) The rate of the exothermic reaction decreases.

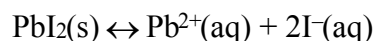
17. Given the system at equilibrium:



How will the addition of $\text{Na}_2\text{CO}_3(\text{aq})$ affect $[\text{Pb}^{2+}](\text{aq})$ and the mass of $\text{PbCO}_3(\text{s})$?

- A) $[\text{Pb}^{2+}](\text{aq})$ will decrease and the mass of $\text{PbCO}_3(\text{s})$ will decrease.
- B) $[\text{Pb}^{2+}](\text{aq})$ will decrease and the mass of $\text{PbCO}_3(\text{s})$ will increase.**
- C) $[\text{Pb}^{2+}](\text{aq})$ will increase and the mass of $\text{PbCO}_3(\text{s})$ will decrease.
- D) $[\text{Pb}^{2+}](\text{aq})$ will increase and the mass of $\text{PbCO}_3(\text{s})$ will increase.

18. Given the solution at equilibrium:



The addition of which nitrate salt will cause a decrease in the concentration of $\text{I}^{-}(\text{aq})$?

- A) $\text{Pb}(\text{NO}_3)_2$
- B) $\text{Ca}(\text{NO}_3)_2$
- C) LiNO_3
- D) KNO_3

19. When a chemical reaction is at equilibrium, the concentration of each reactant and the concentration of each product must be

- A) constant**
- B) variable
- C) equal
- D) zero

20. Which statement describes a chemical reaction at equilibrium?

- A) The products are completely consumed in the reaction.
- B) The reactants are completely consumed in the reaction.
- C) The concentrations of the products and reactants are equal.
- D) The concentrations of the products and reactants are constant.**

21. Given the equation representing a closed system:



Which statement describes this system at equilibrium?

- A) The volume of the $\text{NO}_2(\text{g})$ is greater than the volume of the $\text{N}_2\text{O}_4(\text{g})$.
 - B) The volume of the $\text{NO}_2(\text{g})$ is less than the volume of the $\text{N}_2\text{O}_4(\text{g})$.
 - C) The rate of the forward reaction and the rate of the reverse reaction are equal.**
 - D) The rate of the forward reaction and the rate of the reverse reaction are unequal.
-

Answer Key
LECHAT-FIRST PRACTICE.

1. A

2. B

3. A

4. C

5. B

6. B

7. B

8. C

9. D

10. B

11. C

12. D

13. B

14. D

15. C

16. C

17. B

18. A

19. A

20. D

21. C
