**Name:** _____ **Class:** _____ **Date:** _____ **ID: A**

**Ch 18-19 Practice Test**

**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

| Table of Common Molecules | | | | |
|---|---|---|---|---|
| Name | Hydrogen | Chlorine | Ammonia | Methane |
| Molecular Formula | $H_2$ | $Cl_2$ | $NH_3$ | $CH_4$ |

____ 1. What type of bond do all of the molecules in the table above have in common?
a. polar
b. metallic
c. ionic
d. covalent

____ 2. What is the correct noble gas electron configuration for a Chloride ion?
a. $[Ar]3s^23p^5$
b. $[Ar]3s^23p^6$
c. $[Ne]3s^23p^5$
d. $[Ne]3s^23p^6$

____ 3. What is the correct order of the following bonds in terms of decreasing polarity?
a. As-Cl, P-Cl, N-Cl
b. As-Cl, N-Cl, P-Cl
c. P-Cl, N-Cl, As-Cl
d. P-Cl, As-Cl, N-Cl

____ 4. How many lone pairs of electrons are on the central atom of nitrogen trihydride?
a. 1
b. 2
c. 3
d. 4

____ 5. Which of the following covalent bonds is the most polar?
a. C---C
b. C---Br
c. C---Cl
d. C---H

____ 6. Arrange the following elements: $P^{3-}$, $S^{2-}$, $K^+$, $Ca^{2+}$, $Sc^{3+}$, in order of increasing ionic size.
a. $Sc^{3+}$, $Ca^{2+}$, $K^+$, $S^{2-}$, $P^{3-}$
b. $K^+$, $Ca^{2+}$, $Sc^{3+}$, $S^{2-}$, $P^{3-}$
c. $P^{3-}$, $S^{2-}$, $K^+$, $Ca^{2+}$, $Sc^{3+}$
d. $Sc^{3+}$, $Ca^{2+}$, $K^+$, $P^{3-}$, $S^{2-}$

____ 7. Which of the following elements has the smallest atomic size?
a. Cesium
b. Oxygen
c. Calcium
d. Chlorine

____ 8. If a reaction is reversible, what are the relative amounts of reactant and product at the end of the reaction?
a. no reactant; all product
b. no product; all reactant
c. some product; some reactant
d. The relationship between reactants and products cannot be determined.

____ 9. If sulfur dioxide and oxygen can be made into sulfur trioxide, what is the reverse reaction?
a. $2SO_3 \rightarrow 2SO_2 + O_2$
b. $SO_3 + O_2 \rightarrow SO_5$
c. $2SO_2 + O_2 \rightarrow 2SO_3$
d. $SO_2 + 2SO_3 \rightarrow 3S + 4O_2$

____ 10. In an endothermic reaction at equilibrium, what is the effect of raising the temperature?
a. The reaction makes more products.
b. The reaction makes more reactants.
c. The reaction is unchanged.
d. The answer cannot be determined.

____ 11. Which of the changes listed below would shift the following reaction to the right?
$4HCl(g) + O_2(g) \rightleftharpoons 2Cl_2(g) + 2H_2O(g)$
a. addition of $Cl_2$
b. removal of $O_2$
c. increase of pressure
d. decrease of pressure

____ 12. What is the effect of adding more water to the following equilibrium reaction?
$CO_2 + H_2O \rightleftharpoons H_2CO_3$
a. More $H_2CO_3$ is produced.
b. $CO_2$ concentration increases.
c. The equilibrium is pushed in the direction of reactants.
d. There is no effect.

____ 13. In an equilibrium reaction with a $K_{eq}$ of $1 \times 10^8$, the ____.
a. reactants are favored
b. reaction is spontaneous
c. the products are favored
d. reaction is exothermic

____ 14. The $K_{eq}$ of a reaction is $4 \times 10^{-7}$. At equilibrium, the ____.
a. reactants are favored
b. products are favored
c. reactants and products are present in equal amounts
d. rate of the forward reaction is much greater than the rate of the reverse reaction

____ 15. Which of the following is a property of an acid?
a. sour taste
b. nonelectrolyte
c. strong color
d. unreactive

____ 16. What is the formula for phosphoric acid?
a. $H_2PO_3$
b. $H_3PO_4$
c. $HPO_2$
d. $HPO_4$

____ 17. Which of these is an Arrhenius base?
a. LiOH
b. $NH_3$
c. $H_2PO_4^-$
d. $CH_3COOH$

____ 18. What is transferred between a conjugate acid-base pair?
a. an electron
b. a proton
c. a hydroxide ion
d. a hydronium ion

____ 19. Which compound can act as both a Brønsted-Lowry acid and a Brønsted-Lowry base?
a. water
b. ammonia
c. sodium hydroxide
d. hydrochloric acid

____ 20. In the reaction $CO_3^{2-} + H_2O \rightleftharpoons HCO_3^- + OH^-$, the carbonate ion is acting as a(n) ____.
a. Arrhenius base
b. Arrhenius acid
c. Brønsted-Lowry base
d. Brønsted-Lowry acid

____ 21. Which of the following reactions illustrates amphoterism?

a. $H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$
c. $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$
b. $NaCl \rightleftharpoons Na^+ + OH^-$
d. $NaOH \rightleftharpoons Na^+ + OH^-$

____ 22. What are the acids in the following equilibrium reaction?
$CN^- + H_2O \rightleftharpoons HCN + OH^-$

a. $CN^-$, $H_2O$
c. $CN^-$, $OH^-$
b. $H_2O$, HCN
d. $H_2O$, $OH^-$

____ 23. Which of the following represents a Brønsted-Lowry conjugate acid-base pair?

a. $SO_3^{2-}$ and $SO_2$
c. $H_3O$ and $H_2$
b. $CO_3^{2-}$ and CO
d. $NH_4^+$ and $NH_3$

____ 24. What is the charge on the hydronium ion?

a. 2–
c. 0
b. 2–
d. 1+

____ 25. The products of self-ionization of water are ____.

a. $H_3O^+$ and $H_2O$
c. $OH^+$ and $H^-$
b. $OH^-$ and $OH^+$
d. $OH^-$ and $H^+$

____ 26. In a neutral solution, the $[H^+]$ is ____.

a. $10^{-14} M$
c. $1 \times 10^7 M$
b. zero
d. equal to $[OH^-]$

____ 27. What is pH?

a. the negative logarithm of the hydrogen ion concentration
b. the positive logarithm of the hydrogen ion concentration
c. the negative logarithm of the hydroxide ion concentration
d. the positive logarithm of the hydroxide ion concentration

____ 28. Which of these solutions is the most basic?

a. $[H^+] = 1 \times 10^{-2} M$
c. $[H^+] = 1 \times 10^{-11} M$
b. $[OH^-] = 1 \times 10^{-4} M$
d. $[OH^-] = 1 \times 10^{-13} M$

____ 29. Which of the following pairs consists of a weak acid and a strong base?

a. sulfuric acid, sodium hydroxide
c. acetic acid, sodium hydroxide
b. acetic acid, ammonia
d. nitric acid, calcium hydroxide

**Multiple Response**

*Identify one or more choices that best complete the statement or answer the question.*

**Potassium hydroxide (KOH) is a strong base because it**

____ 30.

a. easily releases hydroxide ions
c. reacts to form salt crystals in water
b. does not dissolve in water
d. does not conduct and electric current

**Of four different laboratory solutions, the solution with the *highest* acidity has a pH of**

____ 31.

a. 11
b. 7
c. 5
d. 3

**Which of the following is an observable property of many acids?**

____ 32.

a. They become slippery when reacting with water
b. They react with metals to release hydrogen gas
c. They produce salts when mixed with other acids
d. Thye beomce more acidic when mixed with a base

**Which would be *most* appropriate for collecting data during a neutralization reaction?**

____ 33.

a. a pH probe
b. a statistics program
c. a thermometer
d. a graphing program

____ 34. An analysis of the equilibrium mixture in a 1-L flask gives the following results: [HCl] = .30 mol,[$O_2$] = .20 mol, [$H_2O$] = 1.2 mol, and [$Cl_2$] = .60

**$4HCl(g) + O_2(g) <---> 2H_2O(g) + 2Cl_2(g) + 10kJ$**

a. $[Cl_2]\,[H_2O]/\,[HCl]\,[O_2]$
b. $[Cl_2]^2\,[H_2O]^2\,/\,[HCl]^4\,[O_2]$
c. $[O_2]\,[HCl]^4\,[kJ]/\,[H_2O]^2[Cl_2]^2$
d. $[HCl]\,[O_2]/[Cl_2]\,[H_2O]$

____ 35. An analysis of the equilibrium mixture in a 1-L flask gives the following results: [HCl] = .30 mol,[$O_2$] = .20 mol, [$H_2O$] = 1.2 mol, and [$Cl_2$] = .60

**$4HCl(g) + O_2(g) <---> 2H_2O(g) + 2Cl_2(g) + 10kJ$**

Calculate $K_{eq}$:

a. 0.51
b. $2.2 \times 10^2$
c. 1.6
d. $3.3 \times 10^2$

____ 36. An analysis of the equilibrium mixture in a 1-L flask gives the following results: [HCl] = .30 mol,[$O_2$] = .20 mol, [$H_2O$] = 1.2 mol, and [$Cl_2$] = .60

**$4HCl(g) + O_2(g) <---> 2H_2O(g) + 2Cl_2(g) + 10kJ$**

Based on your answer for $K_{eq}$ are the reactants or products favored?

a. reactants
b. products
c. Both a and B
d. heat

$$C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$$

**Which of the following changes will cause an increase in the rate of the above reaction?**

____ 37.

a. increasing the concentration of Br2
b. decreasing the concentration of CH66
c. increasing the concentration of HBr
d. decreasing the temperature

____ 38. When a reaction is at equilibrium and more reactant is added, which of the following changes is the immediate result?

a. The reverse reaction rate remains the same.
b. The forward reaction rate increases.
c. The reverse reaction rate decreases.
d. The forward reaction rate remains the same.

____ 39. In which of the following reactions involving gases would the forward reaction be favored by an increase in pressure?

a. $A + B \rightleftharpoons AB$
b. $A + B \rightleftharpoons C + D$
c. $2A + B \rightleftharpoons C + 2D$
d. $AC \rightleftharpoons A + C$

$$4HCl_{(g)} + O_{2(g)} \rightleftarrows 2H_2O_{(l)} + 2Cl_{2(g)} + 113\ kJ$$

**Which action will drive the reaction to the right?**

____ 40.

a. heating the equilibrium mixture
b. adding water to the system
c. decreasing the oxygen concentration
d. increasing the system's pressure

$$NO_2(g) + CO(g) \rightleftharpoons NO(g) + CO_2(g)$$

**The reaction shown above occurs inside a closed flask. What action will shift the reaction to the left?**

____ 41.

a. pumping CO gas into the closed flask
b. raising the total pressure inside the flask
c. increasing the NO concentration in the flask
d. venting some CO2 gas from the flask

$NH_4Cl(s) + heat \rightleftharpoons NH_3(g) + HCl(g)$

**What kind of change will shift the reaction above to the right to form more products?**

____ 42.

a. a decrease in total pressure
b. an increase in the concentration of HCl
c. an increase in the pressure of NH3
d. a decrease in temperature

____ 43. Which direction best represents the effect of adding oxygen on the equilibrium position for the equation above.

**$4HCl(g) + O_2(g)$ <---> $2H_2O(g) + 2Cl_2(g) + 10kJ$**

a. left
b. right
c. at equilibirum
d. a and b

$2CO + O_2 \longrightarrow 2CO_2$

**If the above reaction takes place inside a sealed reaction chamber, then which of these procedures will cause a decrease in the rate of reaction?**

____ 44.

a. raising the temperature of the reaction chamber
b. increasing the volume inside the reaction chamber
c. removing the CO2 as it is formed
d. adding more CO to the reaction chamber

____ 45. The hydronium ion in the following reaction, HI + $H_2O$ --> $H_3O^+$ + I-, would be considered a:

a. acid
b. base
c. conjugate acid
d. conjugate base

____ 46. $C_3H_8 + 5O_2 \leftrightarrows 3CO_2 + 4H_2O$

Which of these could be added to the above reaction to increase the rate of reaction over time?

a. $C_3H_8$ and $O_2$
b. $H_2O$ and $CO_2$
c. $O_2$ and $CO_2$
d. $O_2$ and $H_2O$

____ 47. Given the reaction, $ClO^{2-}$ + $H_2O$ --> $HClO^{2-}$ + $OH^-$
water is acting as:

a. an acid
b. a base
c. a conjugate base
d. a conjugate acid

____ 48.

**pH Levels**

| $[H_3O^+]$ | pH | Example |
|---|---|---|
| 1 x 100 | 0 | HCl (4%) |
| $1 \times 10^{-1}$ | 1 | Stomach acid |
| $1 \times 10^{-2}$ | 2 | Lemon juice |
| $1 \times 10^{-3}$ | 3 | Vinegar |
| $1 \times 10^{-4}$ | 4 | Soda |
| $1 \times 10^{-5}$ | 5 | Rainwater |
| $1 \times 10^{-6}$ | 6 | Milk |
| $1 \times 10^{-7}$ | 7 | Pure water |
| $1 \times 10^{-8}$ | 8 | Egg whites |
| $1 \times 10^{-9}$ | 9 | Baking soda |
| $1 \times 10^{-10}$ | 10 | Ammonia |
| $1 \times 10^{-11}$ | 11 | |
| $1 \times 10^{-12}$ | 12 | Drain cleaner |
| $1 \times 10^{-13}$ | 13 | NaOH (4%) |
| $1 \times 10^{-14}$ | 14 | |

Which substance is the most acidic?

a. Baking soda
b. Drain cleaner
c. Milk
d. Rainwater

____ 49. Given the reaction $HSO_3^- + H_2O \rightarrow SO_3^{2-} + H_3O^+$, sulfite is the:

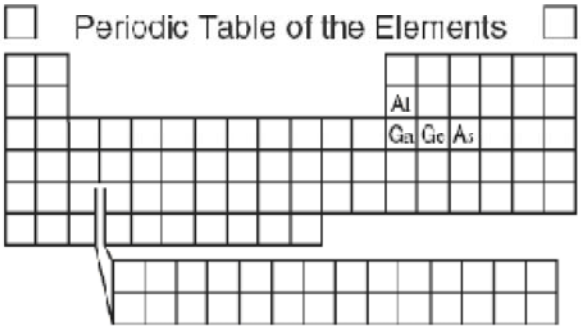
a. acid
b. base
c. conjugat acid
d. conjugate base

____ 50. Which of the following pairs of elements is most likely to form an ionic compound?

a. magnesium and fluorine
b. sodium and aluminum
c. nitrogen and sulfur
d. oxygen and chlorine

____ 51. Choose the correct molecular shapter for ammonia, $NH_3$.

a. bent
b. linear
c. trigonal planar
d. trigonal pyramidal




____ 52. Which of the following elements has the same Lewis dot structure as Silicon?

a. Germanium
b. Aluminum
c. Gallium
d. Arsenic

____ 53. Determine the shape of $SCl_2$:

a. bent
b. linear
c. tetrahedral
d. trigonal pyramidal

**Ch 18-19 Practice Test**
**Answer Section**

## MULTIPLE CHOICE

1. ANS: D PTS: 1 STA: 2b
2. ANS: D PTS: 1
3. ANS: A PTS: 1
4. ANS: A PTS: 1
5. ANS: C PTS: 1
6. ANS: A PTS: 1
7. ANS: B
   St. 1c

   PTS: 1
8. ANS: C PTS: 1 DIF: L1 REF: p. 549 | p. 550
   OBJ: 18.2.1 STA: Ch.8.a
9. ANS: A PTS: 1 DIF: L2 REF: p. 549
   OBJ: 18.2.1 STA: Ch.8.a
10. ANS: A PTS: 1 DIF: L2 REF: p. 554
    OBJ: 18.2.2 STA: Ch.9.a
11. ANS: C PTS: 1 DIF: L2 REF: p. 554
    OBJ: 18.2.2 STA: Ch.9.a
12. ANS: A PTS: 1 DIF: L2 REF: p. 552 | p. 553
    OBJ: 18.2.2 STA: Ch.9.a
13. ANS: C PTS: 1 DIF: L1 REF: p. 556
    OBJ: 18.2.3 STA: Ch.9.c
14. ANS: A PTS: 1 DIF: L1 REF: p. 556
    OBJ: 18.2.3 STA: Ch.9.c
15. ANS: A PTS: 1 DIF: L1 REF: p. 587
    OBJ: 19.1.1 STA: Ch.5.a
16. ANS: B PTS: 1 DIF: L1 REF: p. 588
    OBJ: 19.1.1
17. ANS: A PTS: 1 DIF: L1 REF: p. 589
    OBJ: 19.1.2 STA: Ch.5.e
18. ANS: B PTS: 1 DIF: L1 REF: p. 591
    OBJ: 19.1.2 STA: Ch.5.e
19. ANS: A PTS: 1 DIF: L2 REF: p. 591
    OBJ: 19.1.2 STA: Ch.5.e
20. ANS: C PTS: 1 DIF: L2 REF: p. 590
    OBJ: 19.1.2 STA: Ch.5.e
21. ANS: A PTS: 1 DIF: L2 REF: p. 592
    OBJ: 19.1.2 STA: Ch.5.e

22. ANS: B PTS: 1 DIF: L2 REF: p. 591
OBJ: 19.1.2 STA: Ch.5.b
23. ANS: D PTS: 1 DIF: L2 REF: p. 591
OBJ: 19.1.2 STA: Ch.5.e
24. ANS: D PTS: 1 DIF: L1 REF: p. 594
OBJ: 19.2.1 STA: Ch.5.b
25. ANS: D PTS: 1 DIF: L1 REF: p. 594
OBJ: 19.2.1 STA: Ch.5.c
26. ANS: D PTS: 1 DIF: L1 REF: p. 595
OBJ: 19.2.1 STA: Ch.5.d
27. ANS: A PTS: 1 DIF: L1 REF: p. 596
OBJ: 19.2.2 STA: Ch.5.f
28. ANS: C PTS: 1 DIF: L2 REF: p. 597 | p. 598
OBJ: 19.2.2 STA: Ch.5.d
29. ANS: C PTS: 1 DIF: L3 REF: p. 609
OBJ: 19.3.2 STA: Ch.5.c

**MULTIPLE RESPONSE**

30. ANS: A
5c

PTS: 1
31. ANS: D
5d

PTS: 1
32. ANS: B
5a

PTS: 1
33. ANS: A
5a

PTS: 1
34. ANS: B
9b

PTS: 1
35. ANS: D
8b

PTS: 1

36. ANS: B
9b

PTS: 1
37. ANS: A
9a

PTS: 1
38. ANS: B
9a

PTS: 1
39. ANS: A
9a

PTS: 1
40. ANS: D
9b

PTS: 1
41. ANS: C
9a

PTS: 1
42. ANS: A
9a

PTS: 1
43. ANS: B
9a

PTS: 1
44. ANS: B
8a

PTS: 1
45. ANS: C
5b

PTS: 1
46. ANS: D
8a and 8b

PTS: 1

47. ANS: A
5b

PTS: 1
48. ANS: D
5a

PTS: 1
49. ANS: D
8b

PTS: 1
50. ANS: A
2c

PTS: 1
51. ANS: D
2f

PTS: 1
52. ANS: A
2e

PTS: 1
53. ANS: A
2f

PTS: 1