

## 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 <sub>2</sub>	Cl <sub>2</sub>	NH <sub>3</sub>	CH <sub>4</sub>

- \_\_\_\_\_ 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<sup>2</sup>3p<sup>5</sup>  
b. [Ar]3s<sup>2</sup>3p<sup>6</sup>  
c. [Ne]3s<sup>2</sup>3p<sup>5</sup>  
d. [Ne]3s<sup>2</sup>3p<sup>6</sup>
- \_\_\_\_\_ 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<sup>3-</sup>, S<sup>2-</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, Sc<sup>3+</sup>, in order of increasing ionic size.
- a. Sc<sup>3+</sup>, Ca<sup>2+</sup>, K<sup>+</sup>, S<sup>2-</sup>, P<sup>3-</sup>  
b. K<sup>+</sup>, Ca<sup>2+</sup>, Sc<sup>3+</sup>, S<sup>2-</sup>, P<sup>3-</sup>  
c. P<sup>3-</sup>, S<sup>2-</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, Sc<sup>3+</sup>  
d. Sc<sup>3+</sup>, Ca<sup>2+</sup>, K<sup>+</sup>, P<sup>3-</sup>, S<sup>2-</sup>
- \_\_\_\_\_ 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<sub>3</sub> → 2SO<sub>2</sub> + O<sub>2</sub>  
b. SO<sub>3</sub> + O<sub>2</sub> → SO<sub>5</sub>  
c. 2SO<sub>2</sub> + O<sub>2</sub> → 2SO<sub>3</sub>  
d. SO<sub>2</sub> + 2SO<sub>3</sub> → 3S + 4O<sub>2</sub>

- \_\_\_\_\_ 10. In an endothermic reaction at equilibrium, what is the effect of raising the temperature?
- The reaction makes more products.
  - The reaction makes more reactants.
  - The reaction is unchanged.
  - The answer cannot be determined.
- \_\_\_\_\_ 11. Which of the changes listed below would shift the following reaction to the right?
- $$4\text{HCl}(g) + \text{O}_2(g) \rightleftharpoons 2\text{Cl}_2(g) + 2\text{H}_2\text{O}(g)$$
- addition of  $\text{Cl}_2$
  - removal of  $\text{O}_2$
  - increase of pressure
  - decrease of pressure
- \_\_\_\_\_ 12. What is the effect of adding more water to the following equilibrium reaction?
- $$\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$$
- More  $\text{H}_2\text{CO}_3$  is produced.
  - $\text{CO}_2$  concentration increases.
  - The equilibrium is pushed in the direction of reactants.
  - There is no effect.
- \_\_\_\_\_ 13. In an equilibrium reaction with a  $K_{\text{eq}}$  of  $1 \times 10^8$ , the \_\_\_\_\_.
- reactants are favored
  - reaction is spontaneous
  - the products are favored
  - reaction is exothermic
- \_\_\_\_\_ 14. The  $K_{\text{eq}}$  of a reaction is  $4 \times 10^{-7}$ . At equilibrium, the \_\_\_\_\_.
- reactants are favored
  - products are favored
  - reactants and products are present in equal amounts
  - 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?
- sour taste
  - nonelectrolyte
  - strong color
  - unreactive
- \_\_\_\_\_ 16. What is the formula for phosphoric acid?
- $\text{H}_2\text{PO}_3$
  - $\text{H}_3\text{PO}_4$
  - $\text{HPO}_2$
  - $\text{HPO}_4$
- \_\_\_\_\_ 17. Which of these is an Arrhenius base?
- $\text{LiOH}$
  - $\text{NH}_3$
  - $\text{H}_2\text{PO}_4^-$
  - $\text{CH}_3\text{COOH}$
- \_\_\_\_\_ 18. What is transferred between a conjugate acid-base pair?
- an electron
  - a proton
  - a hydroxide ion
  - a hydronium ion
- \_\_\_\_\_ 19. Which compound can act as both a Brønsted-Lowry acid and a Brønsted-Lowry base?
- water
  - ammonia
  - sodium hydroxide
  - hydrochloric acid
- \_\_\_\_\_ 20. In the reaction  $\text{CO}_3^{2-} + \text{H}_2\text{O} \rightleftharpoons \text{HCO}_3^- + \text{OH}^-$ , the carbonate ion is acting as a(n) \_\_\_\_\_.
- Arrhenius base
  - Arrhenius acid
  - Brønsted-Lowry base
  - Brønsted-Lowry acid

- \_\_\_\_\_ 21. Which of the following reactions illustrates amphoterism?
- a.  $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$       c.  $\text{HCl} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{Cl}^-$   
b.  $\text{NaCl} \rightleftharpoons \text{Na}^+ + \text{OH}^-$       d.  $\text{NaOH} \rightleftharpoons \text{Na}^+ + \text{OH}^-$
- \_\_\_\_\_ 22. What are the acids in the following equilibrium reaction?  
 $\text{CN}^- + \text{H}_2\text{O} \rightleftharpoons \text{HCN} + \text{OH}^-$
- a.  $\text{CN}^-$ ,  $\text{H}_2\text{O}$       c.  $\text{CN}^-$ ,  $\text{OH}^-$   
b.  $\text{H}_2\text{O}$ ,  $\text{HCN}$       d.  $\text{H}_2\text{O}$ ,  $\text{OH}^-$
- \_\_\_\_\_ 23. Which of the following represents a Brønsted-Lowry conjugate acid-base pair?
- a.  $\text{SO}_3^{2-}$  and  $\text{SO}_2$       c.  $\text{H}_3\text{O}$  and  $\text{H}_2$   
b.  $\text{CO}_3^{2-}$  and  $\text{CO}$       d.  $\text{NH}_4^+$  and  $\text{NH}_3$
- \_\_\_\_\_ 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.  $\text{H}_3\text{O}^+$  and  $\text{H}_2\text{O}$       c.  $\text{OH}^+$  and  $\text{H}^-$   
b.  $\text{OH}^-$  and  $\text{OH}^+$       d.  $\text{OH}^-$  and  $\text{H}^+$
- \_\_\_\_\_ 26. In a neutral solution, the  $[\text{H}^+]$  is \_\_\_\_\_.
- a.  $10^{-14}M$       c.  $1 \times 10^7M$   
b. zero      d. equal to  $[\text{OH}^-]$
- \_\_\_\_\_ 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.  $[\text{H}^+] = 1 \times 10^{-2}M$       c.  $[\text{H}^+] = 1 \times 10^{-11}M$   
b.  $[\text{OH}^-] = 1 \times 10^{-4}M$       d.  $[\text{OH}^-] = 1 \times 10^{-13}M$
- \_\_\_\_\_ 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 | c. 5 |
| b. 7  | d. 3 |

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

- \_\_\_\_\_ 32.
- |   |   |
|---|---|
| a. They become slippery when reacting with water  | c. They produce salts when mixed with other acids |
| b. They react with metals to release hydrogen gas | d. They become more acidic when mixed with a base |

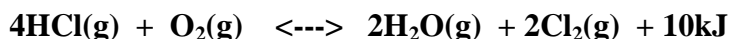
Which would be *most* appropriate for collecting data during a neutralization reaction?

- \_\_\_\_\_ 33.
- |                         |                       |
|-------------------------|-----------------------|
| a. a pH probe           | c. a thermometer      |
| b. a statistics program | d. a graphing program |

- \_\_\_\_\_ 34. An analysis of the equilibrium mixture in a 1-L flask gives the following results: [HCl] = .30 mol, [O<sub>2</sub>] = .20 mol, [H<sub>2</sub>O] = 1.2 mol, and [Cl<sub>2</sub>] = .60

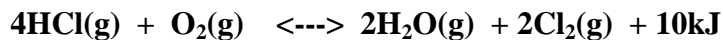


- |   |  |
|---|--|
| a. $[\text{Cl}_2][\text{H}_2\text{O}]/[\text{HCl}][\text{O}_2]$       | c. $[\text{O}_2][\text{HCl}]^4[\text{kJ}]/[\text{H}_2\text{O}]^2[\text{Cl}_2]^2$ |
| b. $[\text{Cl}_2]^2[\text{H}_2\text{O}]^2/[\text{HCl}]^4[\text{O}_2]$ | d. $[\text{HCl}][\text{O}_2]/[\text{Cl}_2][\text{H}_2\text{O}]$                  |
- \_\_\_\_\_ 35. An analysis of the equilibrium mixture in a 1-L flask gives the following results: [HCl] = .30 mol, [O<sub>2</sub>] = .20 mol, [H<sub>2</sub>O] = 1.2 mol, and [Cl<sub>2</sub>] = .60



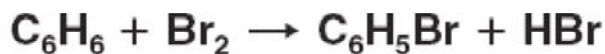
Calculate K<sub>eq</sub>:

- |                      |                      |
|----------------------|----------------------|
| a. 0.51              | c. 1.6               |
| b. $2.2 \times 10^2$ | 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<sub>2</sub>] = .20 mol, [H<sub>2</sub>O] = 1.2 mol, and [Cl<sub>2</sub>] = .60



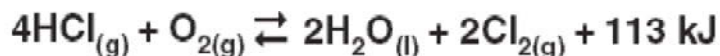
Based on your answer for K<sub>eq</sub> are the reactants or products favored?

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



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

- \_\_\_\_\_ 37. a. increasing the concentration of Br<sub>2</sub>      c. increasing the concentration of HBr  
b. decreasing the concentration of CH<sub>6</sub>      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.      c. The reverse reaction rate decreases.  
b. The forward reaction rate increases.      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.  $\text{A} + \text{B} \rightleftharpoons \text{AB}$       c.  $2\text{A} + \text{B} \rightleftharpoons \text{C} + 2\text{D}$   
b.  $\text{A} + \text{B} \rightleftharpoons \text{C} + \text{D}$       d.  $\text{AC} \rightleftharpoons \text{A} + \text{C}$



Which action will drive the reaction to the right?

- \_\_\_\_\_ 40. a. heating the equilibrium mixture      c. decreasing the oxygen concentration  
b. adding water to the system      d. increasing the system's pressure



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      c. increasing the NO concentration in the flask  
b. raising the total pressure inside the flask      d. venting some CO<sub>2</sub> gas from the flask



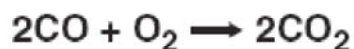
What kind of change will shift the reaction above to the right to form more products?

- \_\_\_\_\_ 42. \_\_\_\_\_ 43. Which direction best represents the effect of adding oxygen on the equilibrium position for the equation above.

- a. a decrease in total pressure  
b. an increase in the concentration of HCl  
c. an increase in the pressure of NH<sub>3</sub>  
d. a decrease in temperature



- a. left  
b. right  
c. at equilibrium  
d. a and b



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. \_\_\_\_\_ 45. The hydronium ion in the following reaction,  $\text{HI} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{I}^-$ , would be considered a:
- a. raising the temperature of the reaction chamber  
b. increasing the volume inside the reaction chamber  
c. removing the CO<sub>2</sub> as it is formed  
d. adding more CO to the reaction chamber
- a. acid  
b. base  
c. conjugate acid  
d. conjugate base
- \_\_\_\_\_ 46.  $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightleftharpoons 3\text{CO}_2 + 4\text{H}_2\text{O}$

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

- a. C<sub>3</sub>H<sub>8</sub> and O<sub>2</sub>  
b. H<sub>2</sub>O and CO<sub>2</sub>  
c. O<sub>2</sub> and CO<sub>2</sub>  
d. O<sub>2</sub> and H<sub>2</sub>O
- \_\_\_\_\_ 47. Given the reaction,  $\text{ClO}^{2-} + \text{H}_2\text{O} \rightarrow \text{HClO}^{2-} + \text{OH}^-$  water is acting as:
- a. an acid  
b. a base  
c. a conjugate base  
d. a conjugate acid



Name: \_\_\_\_\_

ID: A

- \_\_\_\_\_ 53. Determine the shape of  $\text{SCl}_2$ :
- 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 OBJ: 19.1.2	PTS: 1 STA: Ch.5.b	DIF: L2	REF: p. 591
23.	ANS: D OBJ: 19.1.2	PTS: 1 STA: Ch.5.e	DIF: L2	REF: p. 591
24.	ANS: D OBJ: 19.2.1	PTS: 1 STA: Ch.5.b	DIF: L1	REF: p. 594
25.	ANS: D OBJ: 19.2.1	PTS: 1 STA: Ch.5.c	DIF: L1	REF: p. 594
26.	ANS: D OBJ: 19.2.1	PTS: 1 STA: Ch.5.d	DIF: L1	REF: p. 595
27.	ANS: A OBJ: 19.2.2	PTS: 1 STA: Ch.5.f	DIF: L1	REF: p. 596
28.	ANS: C OBJ: 19.2.2	PTS: 1 STA: Ch.5.d	DIF: L2	REF: p. 597   p. 598
29.	ANS: C OBJ: 19.3.2	PTS: 1 STA: Ch.5.c	DIF: L3	REF: p. 609

**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