

Chem Study 19 Test

1. How many of the following are strong bases?



- a. one b. two c. three d. four

2. What is the pH of 0.0200 M $Sr(OH)_2$?

- a. 12.3 b. 12.6 c. -1.7 d. 1.40

3. How many of the following represent acidic conditions?

$[H^+] = 3 \times 10^{-5} M$ pH = 3.9 pH = 9.3 $[OH^-] = 4 \times 10^{-9} M$

$[OH^-] = 6 \times 10^{-4} M$

- a. 1 b. 2 c. 3 d. 4

4. Which of the indicators listed below should you use in the titration of lactic acid with sodium hydroxide?

- a. methyl red (color change at pH 5)
 b. litmus (color change at pH 7)
 c. phenolphthalein (color change at pH 9)
 d. any of these three indicators will work

5. How many of the following anions are derived from strong acids?

chloride acetate phosphate nitrate carbonate

- a. 1 b. 2 c. 3 d. 4 e. 5

6. The ionization constant for acetic acid is 1.8×10^{-5} ; that for hydrocyanic acid is 4×10^{-10} . In 0.1-molar solutions of sodium acetate and sodium cyanide, it is true that

- (A) $[H^+]$ equals $[OH^-]$ in each solution
 (B) $[H^+]$ exceeds $[OH^-]$ in each solution
 (C) $[H^+]$ of the sodium acetate solution is less than that of the sodium cyanide solution
 (D) $[OH^-]$ of the sodium acetate solution is less than that of the sodium cyanide solution
 (E) $[OH^-]$ for the two solutions is the same

7. $HCl > HC_2H_3O_2 > HCN > H_2O > NH_3$

Five acids are listed above in the order of decreasing acid strength. Which of the following reactions must have an equilibrium constant with a value less than 1?

- (A) $HCl + CN^- \rightleftharpoons HCN + Cl^-$
 (B) $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$
 (C) $HC_2H_3O_2 + OH^- \rightleftharpoons C_2H_3O_2^- + H_2O$
 (D) $H_2O + NH_2^- \rightleftharpoons NH_3 + OH^-$
 (E) $HCN + C_2H_3O_2^- \rightleftharpoons HC_2H_3O_2 + CN^-$

8. Which of the following salts when dissolved in water forms a basic solution?

- (A) NaCl
 (B) $(NH_4)_2SO_4$
 (C) $CuSO_4$
 (D) K_2CO_3
 (E) NH_4NO_3

9. All of the following reactions can be defined as Lewis acid-base reactions EXCEPT

- (A) $Al(OH)_3 + OH^- \rightarrow Al(OH)_4^-$
 (B) $Cl_2 + H_2O \rightarrow HOCl + H^+ + Cl^-$
 (C) $SnCl_4 + 2 Cl^- \rightarrow SnCl_6^{2-}$
 (D) $NH_4^+ + NH_2^- \rightarrow 2 NH_3$
 (E) $H^+ + NH_3 \rightarrow NH_4^+$

10. In the titration of a weak acid of unknown concentration with a standard solution of a strong base, a pH meter was used to follow the progress of the titration. Which of the following is true for this experiment?

- (A) The pH is 7 at the equivalence point.
 (B) The pH at the equivalence point depends on the indicator used.
 (C) The graph of pH versus volume of base added rises gradually at first and then much more rapidly.
 (D) The graph of pH versus volume of base added shows no sharp rise.
 (E) The $[H^+]$ at the equivalence point equals the ionization constant of the acid.

14. In the system



the Bronsted-Lowry acids are

- a. acetic acid and acetate ion
- b. acetic acid and hydronium ion
- c. acetic acid and water
- d. water and hydronium ion
- e. water and acetate ion

15. Which one of the following species can act as a Lewis acid but not as a Bronsted-Lowry acid?

- a. HCl
- b. H₂O
- c. HCO₃⁻
- d. NH₄⁺
- e. Zn²⁺

16. A 0.20-molar solution of a weak monoprotic acid, HA, has a pH of 3.00. The ionization constant of this acid is

- (A) 5.0×10^{-7}
- (B) 2.0×10^{-7}
- (C) 5.0×10^{-6}
- (D) 5.0×10^{-3}
- (E) 2.0×10^{-3}

17. Which of the following is the correct equilibrium expression for the hydrolysis of CO₃²⁻?

- (A) $K = \frac{[HCO_3^-]}{[CO_3^{2-}][H_3O^+]}$
- (B) $K = \frac{[HCO_3^-][OH^-]}{[CO_3^{2-}]}$
- (C) $K = \frac{[CO_3^{2-}][OH^-]}{[HCO_3^-]}$
- (D) $K = \frac{[CO_3^{2-}]}{[CO_2][OH^-]}$
- (E) $K = \frac{[CO_3^{2-}][H_3O^+]}{[HCO_3^-]}$

18. A weak base

- a. contains hydroxide ions
- b. forms solutions in which there is a higher conjugate acid concentration than that of the weak base
- c. generates hydroxide ions by reaction with water
- d. forms a solution with a pH of 13.5

19. How many of the following salts give neutral (pH = 7) water solutions?

sodium sulfate ammonium chloride zinc nitrate
potassium carbonate aluminum chloride

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

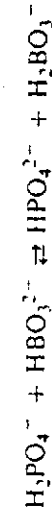
20. How many of the following cations are derived from strong bases?

K⁺ NH₄⁺ Al³⁺ Ba²⁺ Na⁺

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

21. All of the following species can function as Bronsted-Lowry bases in solution EXCEPT

- (A) H₂O
- (B) NH₃
- (C) S²⁻
- (D) NH₄⁺
- (E) HCO₃⁻



The equilibrium constant for the reaction represented by the equation above is greater than 1.0. Which of the following gives the correct relative strengths of the acids and bases in the reaction?

- | Acids | | Bases | | | | |
|---|---|---|-----|--------------------------------|---|--------------------------------|
| (A) H ₂ PO ₄ ⁻ | > | H ₂ BO ₃ ⁻ | and | HBO ₃ ²⁻ | > | HPO ₄ ²⁻ |
| (B) H ₃ BO ₃ ⁻ | > | H ₂ PO ₄ ⁻ | and | HBO ₃ ²⁻ | > | HPO ₄ ²⁻ |
| (C) H ₂ PO ₄ ⁻ | > | H ₃ BO ₃ ⁻ | and | HPO ₄ ²⁻ | > | HBO ₃ ²⁻ |
| (D) H ₃ BO ₃ ⁻ | > | H ₂ PO ₄ ⁻ | and | HPO ₄ ²⁻ | > | HBO ₃ ²⁻ |
| (E) H ₂ PO ₄ ⁻ | = | H ₃ BO ₃ ⁻ | and | HPO ₄ ²⁻ | = | HBO ₃ ²⁻ |

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When phenolphthalein is used as the indicator in a titration of an HCl solution with a solution of NaOH, the indicator undergoes a color change from clear to red at the end point of the titration. This color change occurs abruptly because

- (A) phenolphthalein is a very strong acid that is capable of rapid dissociation
- (B) the solution being titrated undergoes a large pH change near the end point of the titration
- (C) phenolphthalein undergoes an irreversible reaction in basic solution
- (D) OH⁻ acts as a catalyst for the decomposition of phenolphthalein
- (E) phenolphthalein is involved in the rate-determining step of the reaction between H₃O⁺ and OH⁻