

Figure 9-1. The pH chart.

QUESTIONS

Answer the following questions using Figure 9-1 above.

- 1. What is the pH of a solution whose H⁺ ion concentration is 0.0001 mole per liter?
 - (1) 1
- (2) 10
- (3) 14
- (4) 4
- 2. What is the concentration of H⁺ ions, in moles per liter, of a 0.0001 M HCl solution?
 - $(1) 1 \times 10^{-1}$
- (2) 1×10^{-2}
- $(3) 1 \times 10^{-3}$
- $(4)1 \times 10^{-4}$
- 3. What is the pH of a solution that has a hydrogen ion concentration of 1×10^{-10} mole per liter?
 - (1) 1
- (2) 10
- (3) 14
- (4) 4

| 4. | What is the hydroxide ion concentration of a solution that has a hydronium io concentration of 1×10^{-9} mole per liter at 298 K? | | | | | | |
|-----|--|--|--|-------------------------|--|--|--|
| | (1) 1×10^{-5} mole per liter (2) 1×10^{-7} mole per liter (3) 1×10^{-9} mole per liter (4) 1×10^{-14} mole per liter | | | | | | |
| 5. | Which concentration indicates a basic solution at 298K? | | | | | | |
| , | (1) $[OH^-] > 1.0 \times 1$ (3) $[H_3O^+] > 1.0 \times 1$ | | (2) $[OH^-] = 1.0 \times$ (4) $[H_3O^+] = 1.0 \times$ | | | | |
| 6. | What is the H ⁺ ion concentration of an aqueous solution that has a pH of 11? | | | | | | |
| | (1) $1.0 \times 10^{-11} \text{ mol/L}$ (3) (1) $3.0 \times 10^{-1} \text{ mol/L}$ | | (2) $1.0 \times 10^{-3} \text{ mol/L}$ (4) $11 \times 10^{-1} \text{ mol/L}$ | | | | |
| 7. | . If a solution has a hydronium ion concentration of 1×10^{-9} M, the solution is | | | | | | |
| | (1) basic and has a pH of 9(3) acidic and has a pH of 9 | | (2) basic and has a pH of 5(4) acidic and has a pH of 5 | | | | |
| 8. | When equal volumes of 0.5 M HCl and 0.5 M NaOH are mixed, the pH of the resulting solution is | | | | | | |
| | (1) 1 | (2) 2, | (3) 7 | (4) 4 | | | |
| 9. | Adding 0.1 M NaOH to a 0.1 M solution of HCl will cause the pH of the solution to | | | | | | |
| | (1) decrease | (2) increase | (3) remain the same | er N | | | |
| 10. | The [H ⁺] of a solution is 1×10^{-2} at 298 K. What is the [OH ⁻] of this solution? | | | | | | |
| | $(1) 1 \times 10^{-14}$ | $(2) 1 \times 10^{-12}$ | $(3) 1 \times 10^{-7}$ | $(4) 1 \times 10^{-2}$ | | | |
| 11. | As a solution of NaOH is diluted from 0.1 M to 0.001 M, the pH of the solution | | | | | | |
| | (1) decreases | (2) increases | (3) remains the same | e · | | | |
| 12. | Which 0.1M solution | hich 0.1M solution has the highest concentration of H ₃ O+ions? | | | | | |
| | (1) CH ₃ COOH | (2) NaCl | (3) KBr | (4) Ba(OH) ₂ | | | |
| 13. | Which could be the pH of a solution whose H ⁺ ion concentration is less than the OH ⁻ ion concentration? | | | | | | |
| | (1) 9 | (2) 2 | (3) 3 | (4) 4 | | | |

| 2. Willow Substance | c is an electrolyte? | | | | | |
|--|---|---|---|--|--|--|
| (1) C_2H_5OH | (2) $C_6 H_{12} O_6$ | $(3)_{12}H_{22}O_{11}$ | (4) CH ₃ COOH | | | |
| 2. Which of the fo | hich of the following is the best conductor of electricity? | | | | | |
| (1) NaCl(s) | (2) NaCl (aq) | (3) CHANGS | (4) CH4O(09) | | | |
| 3. Which of the following 0.1 M solutions is the best conductor of electricity? | | | | | | |
| (1) H2S(aq) | (2) HCl(aq) | (3) $C_6 H_{12} O_6 (aq)$ | (4) C ₁₂ H ₂₂ O ₁₁ (ag) | | | |
| 4. Which type of reaction will occur when equal volumes of 0.1 M HCl and 0.1 are mixed? | | | | | | |
| (1) neutralization | () TOTHERMON | (3) electrolysis | (4) hydrolysis | | | |
| 5. The OH ⁻ ion cond of | centration is greater th | nan the H ₃ O ⁺ ion conce | entration in a water solution | | | |
| (1) CH ₃ OH | (2) Ba(OH) ₂ | (3) HCl | (4) H ₂ SO ₄ | | | |
| 6. Which is a charact | teristic of an aqueous | solution of HNO ₃ ? | . 4 | | | |
| (1) It conducts ele | (1) It conducts electricity.(3) It turns litmus blue. | | (2) It forms OH ⁻ ions. (4)[H ⁺] is less than [OH ⁻] | | | |
| 7. Which solution will change litmus from blue to red? | | | | | | |
| (1) NaOH(aq) | | (3) CH ₃ OH(aq) | (4) CH ₃ COOH(aq) | | | |
| 8. Which solution will turn litmus from red to blue? | | | | | | |
| (1) H2S(aq) | (2) NH ₄ OH(aq) | (3) H ₂ SO ₃ (aq) | (4) CO ₂ (aq) | | | |
| 9. Which substance is always produced in the reaction between hydrochloric acid and so-dium hydroxide? | | | | | | |
| (1) water | (2) hydrogen gas | (3) oxygen gas | (4) a precipitate | | | |
| 10. Which compound re | acts with an acid to fe | orm a salt and water? | | | | |
| (1) CH ₃ CI | (2) CH ₃ COOH | (3) KCl | (4) KOH | | | |
| 11. Which equation repre | esents a neutralization | n reaction? | | | | |
| (1) $H^{+}(aq) + OH^{-}(2) Ag^{+}(aq) + I^{-}(aq)$ (2) $Zn(s) + 2HCl(s)$ (4) NaCl(aq) + Agl | $(aq) \rightarrow H_2O(1)$ $(q) \rightarrow AgI(s)$ $(aq) \rightarrow 7nC1(ag)$ | II (a) | | | | |

| * | 12. | According to the Arrhenius theory, when a base is dissolved in water it will produce a solution containing only one kind of negative ion. To which ion does the theory refer? | | | | | |
|-----|----------------|---|---|-----------------------------------|-----------------------------------|--|--|
| | | (1) hydride | (2) hydroxide | (3) hydrogen | (4) hydronium | | |
| | 13. | When an Arri | nenius acid is dissolved | in water, it produces | | | |
| | | (2) NH_4^+ as the (3) OH^- as the | only positive ion in solute only positive ion in solute only negative ion in soluthe only negative ion in | olution olution | | | |
| | 14. | Which species | s is classified as an Arrh | enius base | | | |
| | | (1) CH ₃ OH | (2) LiOH | (3) PO ₄ ³⁻ | (4) CO ₃ ²⁻ | | |
| | 15. | Given the read | ction: | | | | |
| | | | $HX + H_2O \rightarrow$ | $H_3O^+(aq) + X^-(aq)$ | | | |
| | | Based on the | equation, HX would be | classified as | | | |
| | | (2) a base, bed (3) an acid, be | cause it donates a proton cause it accepts a proton cause it donates a proton cause it accepts a proton | n | | | |
| | 16. | Which equation | on illustrates H ₂ O acting | as a hydrogen acceptor? | | | |
| | | (2) CH ₃ COO | $H_2O \rightarrow H_3O^+$ (aq) $\neg (aq) + H_2O \rightarrow CH_3O$ $H_2O \rightarrow 2NaOH$ (aq) $+$ $\rightarrow CO + H_2$ | | | | |
| • | 17. | How many mi of 0.1 M HCl? | | $H)_2$ are required to exactl | y neutralize 40 milliliters | | |
| | | (1) 10 | (2) 20 | (3) 40 | (4) 80 | | |
| | 18. | | lliliters of a 4.0-molar so of a 3.2-molar solution of | | i to completely neutralize | | |
| 19. | In the | e reaction H ₂ O | $+ H_2O \rightarrow H_3O^+ + OI$ | H-, the water is acting as | | | |
| | (2) a (3) b | • | - | | | | |

(1) 1.0 M

(2) 0.25 M

solution, what is the molarity of the base?

(3) 0.50 M

20. If 50. milliters of 0.50 M HCl is used to completely neutralize 25 milliliters of KOH

(4) 2.5 M