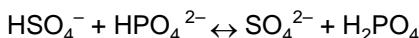


Practice Test: Acids & Bases

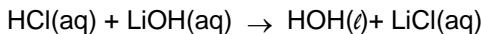
____ 1. Given the reaction:



Which pair represents an acid and its conjugate base?

- (A) HSO_4^- and SO_4^{2-}
- (B) HSO_4^- and HPO_4^{2-}
- (C) SO_4^{2-} and H_2PO_4^-
- (D) SO_4^{2-} and HPO_4^{2-}

____ 2. Given the reaction:



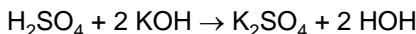
The reaction is best described as

- (A) neutralization
- (C) decomposition
- (B) synthesis
- (D) oxidation-reduction

____ 3. Which reaction occurs when equivalent quantities of H^+ (or H_3O^+) and OH^- are mixed?

- (A) oxidation
- (C) hydrolysis
- (B) reduction
- (D) neutralization

____ 4. Given the neutralization reaction:



Which compound is a salt?

- (A) KOH
- (B) H_2SO_4
- (C) K_2SO_4
- (D) HOH

____ 5. An acid solution exactly neutralized a base solution according to the equation acid + base \rightarrow salt + water. If the neutralized mixture contained the salt KCl, the pH of the aqueous mixture would be closest to

- (A) 9
- (C) 3
- (B) 7
- (D) 11

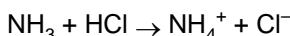
____ 6. Given reactions A and B:

- (A) $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{Cl}^- + \text{H}_3\text{O}^+$
- (B) $\text{HCl} + \text{HS}^- \rightarrow \text{Cl}^- + \text{H}_2\text{S}$

In which of the reactions does HCl donate a proton and thus act as an acid?

- (A) A, only
- (C) both A and B
- (B) B, only
- (D) neither A nor B

____ 7. In the reaction:



The NH_3 acts as

- (A) a Brønsted acid, only
- (B) a Brønsted base, only
- (C) both a Brønsted acid and a Brønsted base
- (D) neither a Brønsted acid nor a Brønsted base

____ 8. In the reaction:



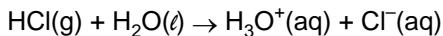
The two acids are

- (A) H_2O and HNO_3
- (B) H_2O and NO_3^-
- (C) H_2O and H_3O^+
- (D) HNO_3 and H_3O^+

____ 9. Which equation illustrates H_2O acting as a proton acceptor?

- (A) $\text{H}^+(\text{aq}) + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+(\text{aq})$
- (B) $\text{CH}_3\text{COO}^-(\text{aq}) + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{COOH}(\text{aq}) + \text{OH}^-(\text{aq})$
- (C) $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2$
- (D) $\text{C} + \text{H}_2\text{O} \rightarrow \text{CO} + \text{H}_2$

____ 10. Given the reaction:



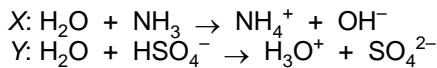
Which reactant acted as a Brønsted-Lowry acid?

- (A) HCl(g) , because it reacted with chloride ions
- (B) $\text{H}_2\text{O(l)}$, because it produced hydronium ions
- (C) HCl(g) , because it donated protons
- (D) $\text{H}_2\text{O(l)}$, because it accepted protons

____ 11. A compound that can act as an acid or a base is referred to as

- (A) a neutral substance
- (B) an amphoteric substance
- (C) a monomer
- (D) an isomer

____ 12. Given the reactions X and Y below:



Which statement describes the behavior of the H_2O in these reactions?

- (A) Water acts as an acid in both reactions.
- (B) Water acts as a base in both reactions.
- (C) Water acts as an acid in reaction X and as a base in reaction Y.
- (D) Water acts as a base in reaction X and as an acid in reaction Y.

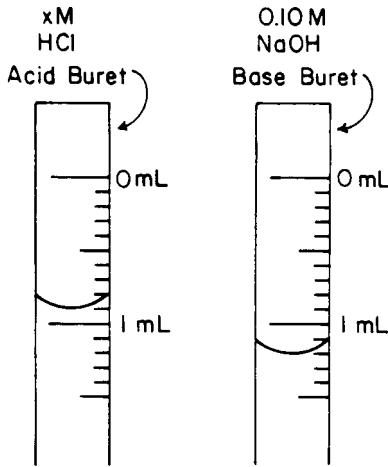
____ 13. How many milliliters of 0.010 M NaOH are required to exactly neutralize 20.0 milliliters of 0.020 M HCl?

- (A) 10. mL
- (C) 30. mL
- (B) 20. mL
- (D) 40. mL

____ 14. If 50. milliliters of a 1.0 M NaOH solution is needed to exactly neutralize 10. milliliters of an HCl solution, the molarity of the HCl solution is

- (A) 1.0 M
- (C) 5.0 M
- (B) 0.20 M
- (D) 10. M

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If the solution level in each buret was 0.00 milliliter at the start of the titration, what is the molarity of the unknown HCl solution?

- _____ 23. Given the following solutions:

- Solution A: pH of 10
- Solution B: pH of 7
- Solution C: pH of 5

Which list has the solutions placed in order of increasing H^+ concentration?

- (A) A, B, C (C) C, A, B
 (B) B, A, C (D) C, B, A

24. As an aqueous solution becomes more acidic, the hydroxide ion concentration

_____ 25. Which relationship is present in a solution that has a pH of 7?

- (A) $[H^+] = [OH^-]$ (C) $[H^+] < [OH^-]$
 (B) $[H^+] > [OH^-]$ (D) $[H^+] + [OH^-] = 7$

26. A solution at 25°C with a pH of 7 contains

- (A) more H_3O^+ ions than OH^- ions
 - (B) fewer H_3O^+ ions than OH^- ions
 - (C) an equal number of H_3O^+ ions and OH^- ions
 - (D) no H_3O^+ ions or OH^- ions

27. The pH of a 0.001 M HCl solution is closest to

28. A solution has a hydroxide ion concentration of 1×10^{-5} M. What is the hydrogen ion concentration of the solution?

- (A) 1×10^{-1} M (C) 1×10^{-9} M
 (B) 1×10^{-5} M (D) 1×10^{-14} M

29. What is the pH of a 0.001 M KOH solution?

30. In an acid solution, the $[H^+]$ ion is found to be 1×10^{-2} mole per liter. What is the $[OH^-]$ ion in moles per liter?

- _____ 31. Which concentration indicates a basic solution at 298 K?

- (A) $[\text{OH}^-] > 1.0 \times 10^{-7}$
 (B) $[\text{OH}^-] = 1.0 \times 10^{-7}$
 (C) $[\text{H}_3\text{O}^+] > 1.0 \times 10^{-7}$
 (D) $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-7}$

- _____32. What is the ionization constant for water at 298 K?

- (A) 1.0×10^{-14} (C) 1.0×10^7
 (B) 1.0×10^{-7} (D) 1.0×10^{14}

- _____33. What is the pH of a 0.10 M solution of NaOH?

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34. What is the OH^- ion concentration of an aqueous solution with a pH of 5?
- (A) 1×10^{-5} M (C) 1×10^{-9} M
 (B) 1×10^{-7} M (D) 1×10^{-14} M
35. What is the hydronium ion concentration of a solution that has a hydroxide ion concentration of 1×10^{-3} mole per liter at 25°C ?
- (A) 1×10^{-3} mole per liter (C) 1×10^{-11} mole per liter
 (B) 1×10^{-7} mole per liter (D) 1×10^{-14} mole per liter
36. Which equation correctly represents the K_w for water?
- (A) $K_w = [\text{H}^+] \div [\text{OH}^-]$
 (B) $K_w = [\text{H}^+][\text{OH}^-]$
 (C) $K_w = [\text{OH}^-] \div [\text{H}^+]$
 (D) $K_w = [\text{H}^+] - [\text{OH}^-]$
37. The H_3O^+ ion concentration of a solution is 1×10^{-4} mole per liter. This solution is
- (A) acidic and has a pH of 4
 (B) acidic and has a pH of 10
 (C) basic and has a pH of 4
 (D) basic and has a pH of 10
38. As the hydrogen ion concentration of an aqueous solution increases, the hydroxide ion concentration of this solution will
- (A) decrease (C) remain the same
 (B) increase
39. What is the pH of a 0.01 M solution of HNO_3 ?
- (A) 1 (C) 13
 (B) 2 (D) 14
40. The pH of a solution is 1. The hydrogen ion concentration of this solution, in moles per liter, is
- (A) 1 (C) 0.01
 (B) 10 (D) 0.1
41. The results of testing a colorless solution with three indicators are shown in the table below.

Indicator	Result
red litmus	blue
blue litmus	blue
phenolphthalein	pink

Which formula could represent the solution tested?

- (A) NaOH(aq)
 (B) HCl(aq)
 (C) $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq})$
 (D) $\text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{aq})$

42. A solution with a pH of 11 is first tested with phenolphthalein and then with litmus. What is the color of each indicator in this solution?
- (A) Phenolphthalein is colorless and litmus is blue.
 (B) Phenolphthalein is colorless and litmus is red.
 (C) Phenolphthalein is pink and litmus is blue.
 (D) Phenolphthalein is pink and litmus is red.

43. The table below was compiled from experimental laboratory data.

INDICATOR	CHANGE	pH RANGE AT WHICH CHANGE OCCURS
Bromthymol Blue	yellow \rightarrow blue	6.2 – 7.6
Thymol Blue	red \rightarrow yellow	1.2 – 2.8
Methyl Orange	red \rightarrow yellow	3.1 – 4.4

At what pH would all three indicators appear as yellow?

- (A) 1.9 (C) 4.7
 (B) 2.9 (D) 8.7

44. Which particle in a water solution of NaOH causes red litmus to turn blue?

- (A) Na^+
 (B) H_3O^+
 (C) OH^-
 (D) H_2O

45. In a 0.01 M solution of HCl , litmus will be

- (A) blue and phenolphthalein will be colorless
 (B) blue and phenolphthalein will be pink
 (C) red and phenolphthalein will be colorless
 (D) red and phenolphthalein will be pink

Practice Test: Acids & Bases
Answer Key

- | | |
|--------------|--------------|
| 1. <u>A</u> | 32. <u>A</u> |
| 2. <u>A</u> | 33. <u>C</u> |
| 3. <u>D</u> | 34. <u>C</u> |
| 4. <u>C</u> | 35. <u>C</u> |
| 5. <u>B</u> | 36. <u>B</u> |
| 6. <u>C</u> | 37. <u>A</u> |
| 7. <u>B</u> | 38. <u>A</u> |
| 8. <u>D</u> | 39. <u>B</u> |
| 9. <u>A</u> | 40. <u>D</u> |
| 10. <u>C</u> | 41. <u>A</u> |
| 11. <u>B</u> | 42. <u>C</u> |
| 12. <u>C</u> | 43. <u>C</u> |
| 13. <u>D</u> | 44. <u>C</u> |
| 14. <u>C</u> | 45. <u>C</u> |
| 15. <u>B</u> | |
| 16. <u>B</u> | |
| 17. <u>B</u> | |
| 18. <u>D</u> | |
| 19. <u>A</u> | |
| 20. <u>D</u> | |
| 21. <u>C</u> | |
| 22. <u>D</u> | |
| 23. <u>A</u> | |
| 24. <u>A</u> | |
| 25. <u>A</u> | |
| 26. <u>C</u> | |
| 27. <u>C</u> | |
| 28. <u>C</u> | |
| 29. <u>B</u> | |
| 30. <u>C</u> | |
| 31. <u>A</u> | |