

Set 1 — Common Acids

1. Of the following, which is an acid?
(1) NaOH(aq)
(2) $\text{NH}_3\text{(aq)}$
(3) $\text{HC}_2\text{H}_3\text{O}_2\text{(aq)}$
(4) $\text{Ca(OH)}_2\text{(aq)}$ 1 _____

 2. According to the Arrhenius theory, an acid is a substance that
(1) changes litmus from red to blue
(2) changes phenolphthalein from colorless to pink
(3) produces hydronium ions as the only positive ions in an aqueous solution
(4) produces hydroxide ions as the only negative ions in an aqueous solution
 2 _____

 3. Which two formulas represent Arrhenius acids?
(1) CH_3COOH and $\text{CH}_3\text{CH}_2\text{OH}$
(2) $\text{HC}_2\text{H}_3\text{O}_2$ and H_3PO_4
(3) KHCO_3 and KHSO_4
(4) NaSCN and $\text{Na}_2\text{S}_2\text{O}_3$ 3 _____

 4. What is the possible pH of a 0.001 M HNO_3 ? ~~HNO_3~~
(1) 4 (2) 8
(2) 7 (4) 15 4 _____
5. As HCl(g) is added to water, the pH of the water solution
(1) decreases
(2) increases
(3) remains the same 5 _____

 6. What is the pH of a solution that results from the complete neutralization of an HCl solution with a KOH solution?
(1) 1 (3) 10
(2) 7 (4) 4 6 _____

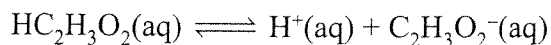
 7. Given the following solutions:
Solution *A*: pH of 10
Solution *B*: pH of 7
Solution *C*: pH of 5
Which list has the solutions placed in order of increasing H^+ concentration?
(1) *A*, *B*, *C* (3) *C*, *A*, *B*
(2) *B*, *A*, *C* (4) *C*, *B*, *A* 7 _____

 8. According to one acid-base theory, a water molecule acts as an acid when the water molecule
(1) accepts an H^+
(2) accepts an OH^-
(3) donates an H^+
(4) donates an OH^- 8 _____

Base your answer to question 9 using the information below and your knowledge of chemistry.

A beaker contains 100.0 milliliters of a dilute aqueous solution of an acid at equilibrium.

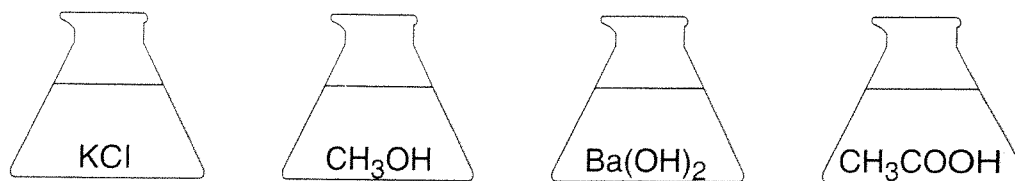
The equation below represents this system



9. a) Name this acid. _____
- b) Describe what happens to the concentration of $\text{H}^+(\text{aq})$ and to the pH when 10 drops of concentrated $\text{HC}_2\text{H}_3\text{O}_2(\text{aq})$ are added to this system.

Base your answers to question 10 using the diagrams below and your knowledge of chemistry.

10. Four flasks each contain 100 milliliters of aqueous solutions of equal concentrations at 25°C and 1 atm.



- a) Which solution is an acidic electrolyte? _____
- b) Which solution has the lowest pH? _____
- c) What causes aqueous solutions to have a low pH?
- _____
- d) Give the formulas of the two beakers that would cause a neutralization reaction.
- _____
- e) What reactants are produced in a neutralization reaction?
- _____

Set 2 — Common Acids

11. Which type of reaction will produce water and a salt?
- (1) saponification
 - (2) fermentation
 - (3) esterification
 - (4) neutralization
- 11 _____
12. Which of these pH numbers indicates the highest level of acidity?
- (1) 5
 - (2) 8
 - (3) 10
 - (4) 12
- 12 _____
13. Which technique is safest for diluting a concentrated acid with water?
- (1) add the acid to the water quickly
 - (2) add the water to the acid quickly
 - (3) add the acid to the water slowly while stirring constantly
 - (4) add the water to the acid slowly while stirring constantly
- 13 _____
14. A substance that conducts an electrical current when dissolved in water is called
- (1) a catalyst
 - (2) a metalloid
 - (3) a nonelectrolyte
 - (4) an electrolyte
- 14 _____
15. The compound HNO_3 can be described as an
- (1) Arrhenius acid and an electrolyte
 - (2) Arrhenius acid and a nonelectrolyte
 - (3) Arrhenius base and an electrolyte
 - (4) Arrhenius base and a nonelectrolyte
- 15 _____
16. One acid-base theory states that an acid is
- (1) an H^- donor
 - (2) an H^- acceptor
 - (3) an H^+ donor
 - (4) an H^+ acceptor
- 16 _____
17. Which relationship is present in a solution that has a pH of 4?
- (1) $[\text{H}^+] = [\text{OH}^-]$
 - (2) $[\text{H}^+] > [\text{OH}^-]$
 - (3) $[\text{H}^+] < [\text{OH}^-]$
 - (4) $[\text{H}^+] + [\text{OH}^-] = 0$
- 17 _____
18. Which formula represents a hydronium ion?
- (1) H_3O^+
 - (2) NH_4^+
 - (3) OH^-
 - (4) HCO_3^-
- 18 _____

Base your answers to question 16 using the information below and your knowledge of chemistry.

Three bottles of liquids labeled 1, 2, and 3 were found in a storeroom. One of the liquids is known to be drain cleaner. Drain cleaners commonly contain KOH or NaOH. The pH of each liquid at 25°C was determined with a pH meter. The table below shows the test results.

pH Test Results

Bottle	pH of Liquid
1	3.8
2	7.0
3	12.8

16. a) Explain how the pH results in this table enable a student to correctly conclude that bottle 3 contains the drain cleaner.

- b) Which bottle would have the highest concentration of OH^- ions? _____

- c) Which bottle could contain distilled water? _____

- d) Liquid from bottle 1 is gradually added to bottle 3. Explain what happens to the pH of the liquid in bottle 3.

Base your answers to question 17 using the information below and your knowledge of chemistry.

A student was studying the pH differences in two samples of liquid waste. The student measured a pH of 9 in container *A* and a pH of 12 in container *B*.

17. a) Compare the hydroxide ion concentration in container *A* to the hydroxide ion concentration in container *B*.

- b) Explain why mixing container *A* and container *B* will not produce neutralization.

- c) Identify one compound that could be used to neutralize sample *B*. _____