ANSWER KEY -

Set 1 — Common Acids

1. Of the following, which is an acid?

(1) NaOH(aq)
(2) $NH_3(aq)$
(3) $HC_2H_3O_2(aq)$
(4) $Ca(OH)_2(aq)$

TABLE K + L

1 3

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

H^+

TABLE M

2 3

3. Which two formulas represent Arrhenius acids?

(1) CH_3COOH and CH_3CH_2OH
(2) $HC_2H_3O_2$ and H_3PO_4
(3) $KHCO_3$ and $KHSO_4$
(4) NaSCN and $Na_2S_2O_3$

3 2

TABLE K

pH = 3-4

4. What is the possible pH of a 0.001 M ~~NHO_3~~ HNO_3?

(1) 4
(2) 7
(3) 8
(4) 15

4 1

5. As HCl(g) is added to water, the pH of the water solution

(1) decreases
(2) increases
(3) remains the same

5 1

ACID ⟷ BASE
0 ⟷ 14
7

6. What is the pH of a solution that results from the complete neutralization of an HCl solution with a KOH solution?

(1) 1
(2) 7
(3) 10
(4) 4

6 2

HCl + KOH → HOH + KCl
A B WATER SALT

7. Given the following solutions:

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

↓ STRONGER ACID

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

(1) *A*, *B*, *C*
(2) *B*, *A*, *C*
(3) *C*, *A*, *B*
(4) *C*, *B*, *A*

7 1

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 3

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

$$HC_2H_3O_2(aq) \rightleftharpoons H^+(aq) + C_2H_3O_2^-(aq)$$

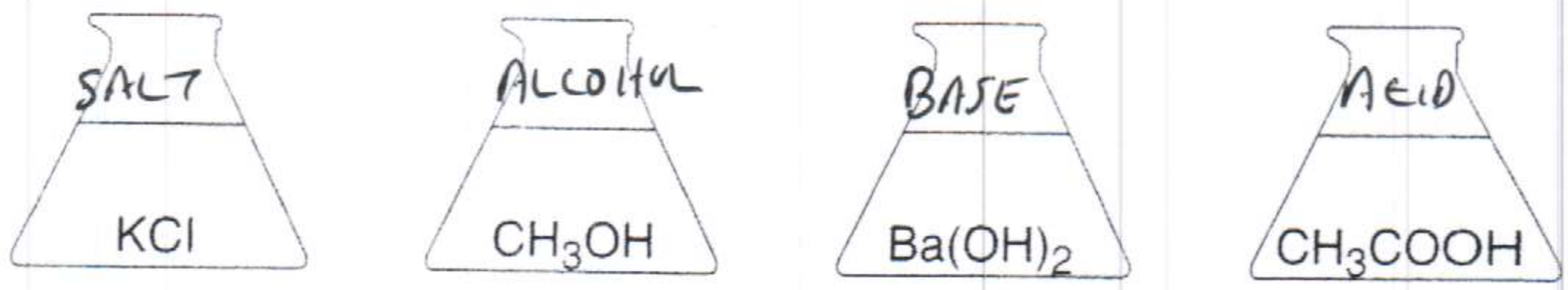
9. *a*) Name this acid. ETHANOIC ACID / VINEGAR TABLE K

b) Describe what happens to the concentration of $H^+(aq)$ and to the pH when 10 drops of concentrated $HC_2H_3O_2(aq)$ are added to this system.

H^+ INCREASES pH DROPS

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? CH_3COOH : ETHANOIC ACID

b) Which solution has the lowest pH? CH_3COOH

c) What causes aqueous solutions to have a low pH?

ACID

d) Give the formulas of the two beakers that would cause a neutralization reaction.

$Ba(OH)_2$ + CH_3COOH

e) What reactants are produced in a neutralization reaction?

SALT + WATER TABLE I

11. Which type of reaction will produce water and a salt?

(1) saponification
(2) fermentation
(3) esterification
(4) neutralization

11 4

12. Which of these pH numbers indicates the highest level of acidity? LOWEST NUMBE

(1) 5
(2) 8
(3) 10
(4) 12

12 1

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 3

ALWAYS DO THIS

14. A substance that conducts an electrical current when dissolved in water is called

(1) a calalyst
(2) a metalloid
(3) a nonelectrolyte
(4) a electrolyte

14 4

15. The compound HNO_3 can be described as an

(1) Arrhenius acid and an electrolyte
(2) Arrhenius acid and an nonelectrolyte
(3) Arrhenius base and an electrolyte
(4) Arrhenius base and an nonelectrolyte

15 1

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 3

17. Which relationship is present in a solution that has a pH of 4?

(1) $[H^+] = [OH^-]$
(2) $[H^+] > [OH^-]$
(3) $[H^+] < [OH^-]$
(4) $[H^+] + [OH^-] = 0$

17 2

18. Which formula represents a hydronium ion?

(1) H_3O^+
(2) NH_4^+
(3) OH^-
(4) HCO_3^-

18 1