

IIC Review for Acids and Bases Test

- 1) What is the hydronium ion concentration in a solution with a $[\text{OH}^-] = 2.5 \times 10^{-4} \text{ M}$?
- 2) What is the pH of a solution with a $[\text{H}_3\text{O}^+] = 4.5 \times 10^{-8} \text{ M}$?
- 3) What is the pH of a 0.001 M HBr solution?
- 4) What is the K_a for a 0.100 M HCN solution with a $[\text{H}_3\text{O}^+] = 7.85 \times 10^{-6} \text{ M}$?
- 5) What is the $[\text{H}_3\text{O}^+]$ for a 0.225 M chlorous acid solution? ($K_a = 1.1 \times 10^{-2}$)
What is the pH of the solution?
- 6) Write the balanced equation for the reaction which occurs between magnesium metal and sulfuric acid.
- 7) Write the balanced chemical equation for the neutralization of phosphoric acid with barium hydroxide.
- 8) What volume of 0.250 M phosphoric acid is needed to neutralize 30.00 mL of a 0.0500 M barium hydroxide solution?
- 9) What is the molarity of NaOH solution in 25.00 mL is required to completely neutralize 40.00 mL of a 1.5 M H_2SO_4 (aq)?
- 10) Write the correct numerical set up for calculating the concentration of Ag^+ ions in a saturated solution of Ag_2S ? ($K_{sp} = 6.31 \times 10^{-50}$)

see attached for #1-11

11) What is the $[\text{Ba}^{2+}]$ in a saturated solution of BaCrO_4 ? ($K_{sp} = 2.00 \times 10^{-10}$)

12) The only positive ion found in an aqueous solution of sulfuric acid is the

- a. Hydroxide ion
- b. Sulfate ion

- c. Hydronium ion
- d. Sulfite ion

releases H^+
 $\text{H}^+ + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+$

13) Which substance is an Arrhenius acid?

a. $\text{HC}_2\text{H}_3\text{O}_2$

b. CH_3OH
Alcohol

c. KOH
Base

d. NH_3

H^+ in front

14) Which of the following pH values indicated the highest concentration of hydronium ions in a solution?

a. pH = 1

b. pH = 2

c. pH = 3
most acidic

d. pH = 4

H_3O^+

15) When the pH of a solution changes from pH of 5 to a pH of 3, the hydronium ion concentration is

a. 0.1 of the original content

b. 10 times the original content

c. 0.01 of the original content

d. 100 times the original content

2 units
 $10 \times 10 = 100$

16) Compared to a solution with a pH of 8, a solution with a pH of 11 has a hydronium ion concentration that is

a. 3x greater

b. 3x less

c. 1000x greater

d. 1000x less

3 units
 $10 \times 10 \times 10 =$
1000x lower

b/c pH is increasing

17) A solution with an initial pH of 4.00 has a 10000 fold decrease in the $[\text{H}_3\text{O}^+]$. The new pH of the solution is

a. 4

b. 7

c. 1

d. 8

4 pH units

more basic

- 18) Which indicator is yellow in a solution with a pH of 9.8? ** Use Table M*
- a. Thymol blue yellow under 8
 - b. Bromocresol green yellow under 3.8
 - c. Bromthymol blue yellow under 6
 - d. Methyl orange yellow over 4.4
- 19) What pH level would both thymol blue and bromthymol blue indicators be blue?
- a. 8
 - b. 10
 - c. 9.6 and over
 - d. 7.6 and over
- 20) What is the pH of a solution that changes both methyl orange and litmus red?
- a. 6
 - b. 2
 - c. 8
 - d. 4
- 21) In a 0.01 M solution of HCl, litmus will be
- a. Blue and phenolphthalein will be pink
 - b. Red and phenolphthalein will be pink
 - c. Red and phenolphthalein will be colorless
 - d. Blue and phenolphthalein will be colorless
- [H₃O⁺] = 10⁻² pH = 2 Acidic*
Use Table M
- 22) Which solution will turn phenolphthalein pink? *Base (metal + OH⁻)*
- a. CH₃OH
 - b. CH₃COOH
 - c. HCl
 - d. NaOH
- 23) Which solution will thymol blue appear blue? *pH > 9.6*
- a. 0.10 M KOH
 - b. 0.10 M H₂SO₄ Acid
 - c. 0.10 M HCl Acid
 - d. 0.10 M CH₃COOH Acid
- 24) What is the pH of a solution formed by completely neutralizing 50 mL of a 0.1 M HNO₃ with 50 mL of 0.1 M NaOH? *strong acid*
- a. 1
 - b. 7
 - c. 10
 - d. 4
- 25) In the reaction: CO₃²⁻ + H₂O ↔ HCO₃⁻ + OH⁻ the carbonate ion is acting as a(n): *CO₃²⁻ gains H⁺ so it is the acceptor*
- a. Arrhenius base
 - b. Arrhenius acid
 - c. Bronsted-Lowry base
 - d. Bronsted-Lowry acid
- 26) What is the conjugate base of H₂S? *remove H⁺*
- a. H₃S⁺
 - b. OH⁻
 - c. HS⁻
 - d. S²⁻
- 27) Which of the following salts when dissolved in water will create an acidic solution? *SA w/ WB*
- a. NaCl *SB SA*
 - b. Li₂CO₃ *SB WA*
 - c. NH₄NO₃ *WB SA*
 - d. K₂SO₄ *SB SA*
- 28) Which of the following is an acidic anhydride? *nonmetal oxide*
- a. SO₂
 - b. Na₂O
 - c. CaO
 - d. Al₂O₃
- 29) Which of these solutions is most basic? *highest pH lowest [H₃O⁺]*
- a. [H₃O⁺] = 1 × 10⁻¹¹
 - b. [OH⁻] = 1 × 10⁻⁴
 - c. [H₃O⁺] = 1 × 10⁻²
 - d. [OH⁻] = 1 × 10⁻¹³
- H₃O⁺ = 1 × 10⁻¹⁰*
- 30) Among the following K_a values, which is the strongest acid? *Largest K_a*
- a. K_a = 1.2 × 10⁻³
 - b. K_a = 3.4 × 10⁻⁵
 - c. K_a = 8.7 × 10⁻⁸
 - d. K_a = 5.8 × 10⁻¹⁰

$$1) \quad [H_3O^+][OH^-] = 1 \times 10^{-14}$$

$$x \frac{[2.5 \times 10^{-4}]}{2.5 \times 10^{-4}} = \frac{1 \times 10^{-14}}{2.5 \times 10^{-4}}$$

$$x = 4 \times 10^{-4} \text{ M}$$

$$2) \quad pH = -\log [H_3O^+]$$

$$pH = -\log [4.5 \times 10^{-8}]$$

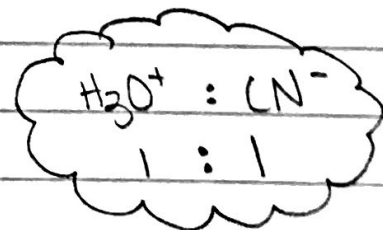
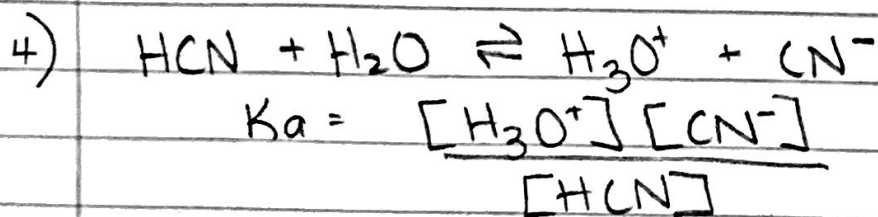
$$pH = 7.34678$$

$$pH = 7.3$$

$$3) \quad pH = -\log [H_3O^+] \quad \text{if } .001 \text{ M HBr}$$

$$pH = -\log [.001] \quad \text{then } [H_3O^+] = .001 \text{ M}$$

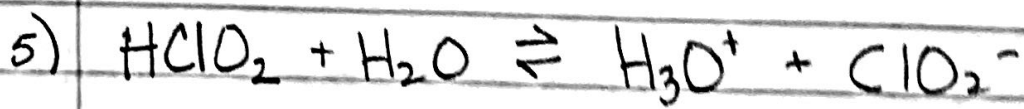
$$pH = 3 \quad \quad \quad 1 \times 10^{-3} \text{ M}$$



$$K_a = \frac{[7.85 \times 10^{-6}][7.85 \times 10^{-6}]}{.100}$$

$$K_a = 6.16225 \times 10^{-10}$$

$$K_a = 6.16 \times 10^{-10}$$



$$K_a = \frac{[\text{H}_3\text{O}^+][\text{ClO}_2^-]}{[\text{HClO}_2]}$$

$$1.1 \times 10^{-2} = \frac{x \cdot x}{.225}$$

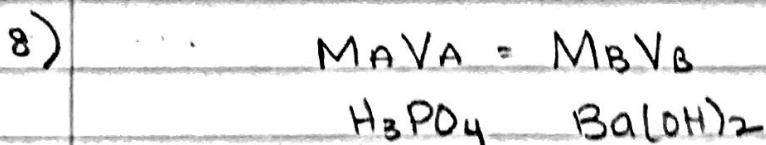
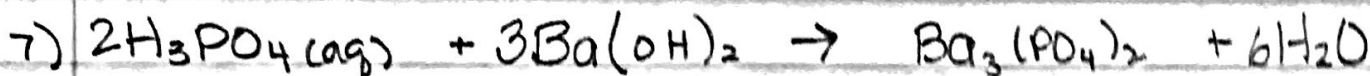
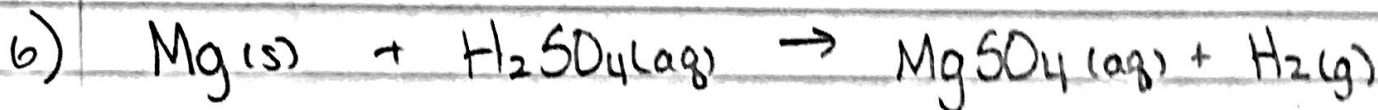
$$x^2 = .002475$$

$$x = \sqrt{.002475}$$

$$x = 4.97 \times 10^{-2} \text{ M}$$

$$\text{pH} = -\log [4.97 \times 10^{-2}]$$

$$\boxed{\text{pH} = 1.3}$$



$$M_A = .250 \text{ M}$$

$$V_A = x$$

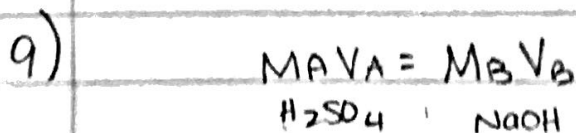
$$M_B = 0.0500 \text{ M}$$

$$V_B = 30.00 \text{ mL}$$

$$(3)(.250 \text{ M})(x) = (.0500 \text{ M})(30)(2)$$

$$\frac{.750x}{.750} = \frac{3}{.750}$$

$$\boxed{x = 4 \text{ mL}}$$



$$M_A = 1.5 \text{ M}$$

$$V_A = 40.00 \text{ mL}$$

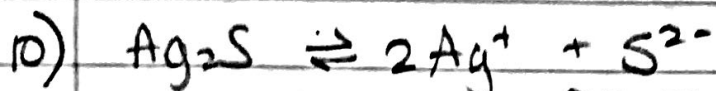
$$M_B = x$$

$$V_B = 25.00 \text{ mL}$$

$$(2)(1.5 \text{ M})(40 \text{ mL}) = (x)(25 \text{ mL})(1)$$

$$\frac{120}{25} = \frac{25x}{25}$$

$$\boxed{4.8 \text{ M}}$$



$$K_{sp} = [\text{Ag}^+]^2 [\text{S}^{2-}]$$

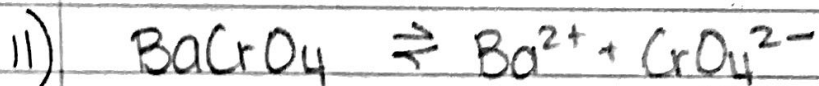
$$6.31 \times 10^{-50} = [2x]^2 [x]$$

$$6.31 \times 10^{-50} = 4x^3$$

$$x^3 = 1.5775 \times 10^{-50}$$

$$x = 2.51 \times 10^{-17}$$

$$[\text{Ag}^+] = 2x = 2(2.51 \times 10^{-17}) = \boxed{5.02 \times 10^{-17}}$$



$$K_{sp} = [\text{Ba}^{2+}] [\text{CrO}_4^{2-}]$$

$$2.00 \times 10^{-10} = x \cdot x$$

$$2.00 \times 10^{-10} = x^2$$

$$\boxed{x = 1.41 \times 10^{-5} \text{ M}}$$