

Name: AK practice test

All Questions 4 Marks Each

1. An acid dissolved in water decreases the concentration of \_\_\_\_\_

- A) hydrogen ions
- B) hydronium ions
- C) water molecules
- D) hydroxide ions



hydrogen ions  
hydronium ions

2. A 0.12 mol/L solution of acetic acid  $CH_3COOH$  has a pH of 2.83.

Calculate the  $K_a$  of acetic acid.

Grade 10

$$pH = -\log [H^+] \quad [H^+] = 1.5 \times 10^{-3} \frac{mol}{L}$$

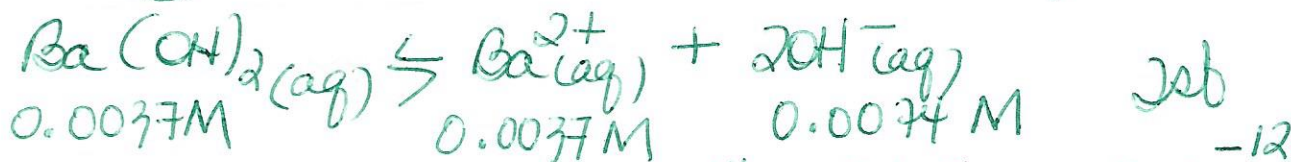


$$K_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]} = \frac{(1.5 \times 10^{-3} M)(1.5 \times 10^{-3} M)}{(0.12 M)}$$

$$K_a = 1.9 \times 10^{-5}$$

Answer:  $K_a = 1.9 \times 10^{-5}$

3. What is the pH of a 0.0037 mol/L solution of  $Ba(OH)_2(aq)$ ?



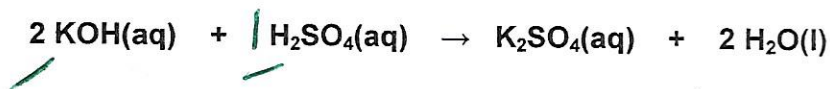
$$K_w = [H^+][OH^-] = \frac{1 \times 10^{-14}}{0.0074 M} = [H^+] = 1.4 \times 10^{-12} M$$

$$pH = -\log [H^+]$$

Answer: pH 11.85

pH 11.85  
↑  
does not count      2sb

4. It requires 66.20 mL of a 0.273 mol/L KOH solution to titrate 25.00 mL of H<sub>2</sub>SO<sub>4</sub>(aq) of unknown concentration.



What is the concentration of the sulfuric acid?

$$66.20 \text{ mL B} \times \frac{0.273 \text{ mol B}}{\text{L}} \times \frac{1 \text{ mol A}}{2 \text{ mol B}} \times \frac{1}{25.00 \text{ mL A}} =$$

$$0.361 \frac{\text{mol}}{\text{L}} \text{ A}$$

Answer: 0.361 mol H<sub>2</sub>SO<sub>4</sub>  
L

5. Calculate the percent ionization of a 0.020 mol/L carbonic acid solution with a pH of 3.45.

$$\% \text{ ionization} = \frac{[\text{H}^+]}{[\text{HX}]} \times 100$$

— Conc HX gives H<sup>+</sup>

$$\text{pH } 3.45 \rightarrow [\text{H}^+] = 3.5 \times 10^{-4} \frac{\text{mol}}{\text{L}} \text{ H}^+ \times 100$$

$$\frac{0.020 \frac{\text{mol}}{\text{L}}}{3.5 \times 10^{-4} \frac{\text{mol}}{\text{L}}} = 1.75\%$$

Answer: 1.75% → 1.8%

2sb

6. What effect is produced by adding a strong base to water?

Find the false statement.

A) Increase in pH

A → B  
0 → 14

B) ~~The sum of the H<sup>+</sup> and the OH<sup>-</sup> ions in water remains constant~~

C) The value of the product of [H<sup>+</sup>] [OH<sup>-</sup>] will not change ✓ T

D) An increase in electrical conductivity ✓ ✓

more ions  $K_w = [H^+][OH^-] = 1 \times 10^{-14}$

Given the system below, determine which way the equilibrium lies and why using English and Math.



only 1 class has learned this

stress = ↑ OH<sup>-</sup>  
want = ↓ OH<sup>-</sup>  
shift ←

only a T change will change the value of K<sub>w</sub>

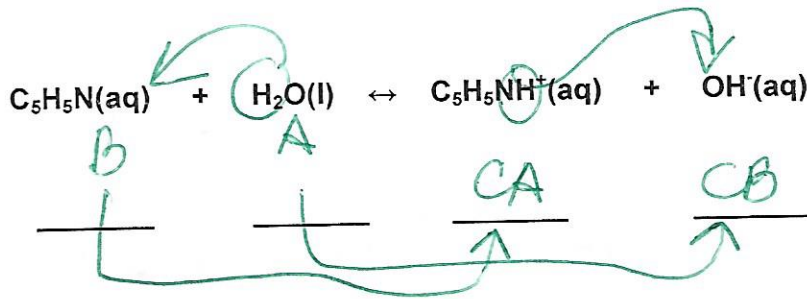
Answer:

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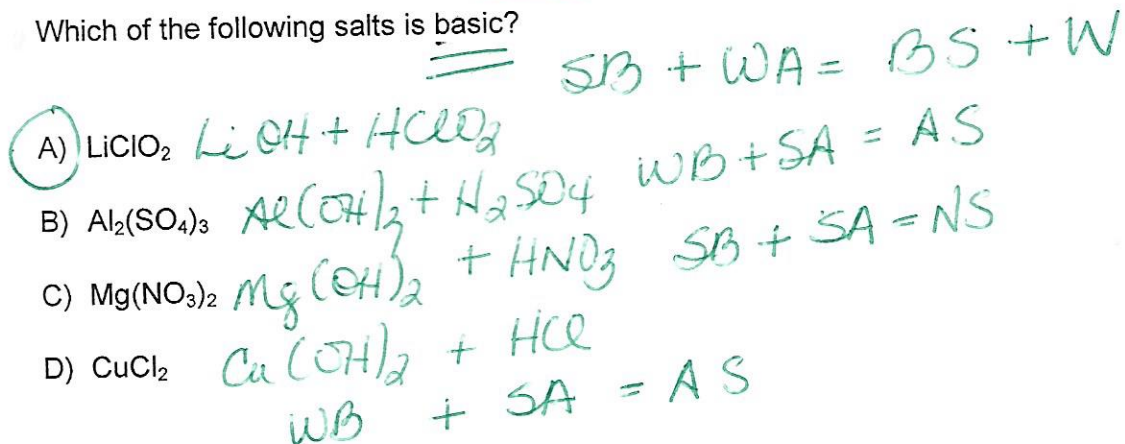
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8. Pyridine was discovered in 1849 by the Scottish chemist Thomas Anderson as one of the constituents of bone oil. Two years later, Anderson isolated pure pyridine through fractional distillation of the oil. It is a colorless, highly flammable, water-soluble liquid with a distinctive, unpleasant fish-like smell. <https://en.wikipedia.org/wiki/Pyridine>

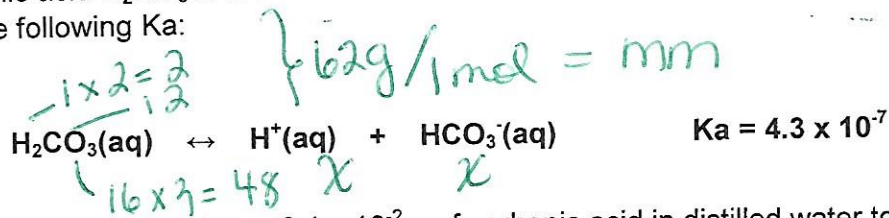
Indicate the acid base pairs.



9. Which of the following salts is basic?



10. Carbonic acid  $\text{H}_2\text{CO}_3$  is a weak acid. It ionizes according to the following equation and has the following  $K_a$ :



A chemistry student places  $3.1 \times 10^{-2}$  g of carbonic acid in distilled water to make  $5.0 \times 10^2$  mL of solution.

What is the pH of the solution? =  $[\text{H}^+]?$

$$\textcircled{1} \frac{3.1 \times 10^{-2} \text{ g H}_2\text{CO}_3}{5.0 \times 10^2 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \text{ mol H}_2\text{CO}_3}{62 \text{ g}} = 0.0010 \frac{\text{mol}}{\text{L}} \text{ H}_2\text{CO}_3$$

$$\textcircled{2} K_a = \frac{[\text{H}^+][\text{HCO}_3^-]}{[\text{H}_2\text{CO}_3]} = \frac{x^2}{[ \text{H}_2\text{CO}_3 ]} = 4.3 \times 10^{-7}$$

$$x = 2.0 \times 10^{-5} \frac{\text{mol}}{\text{L}} = [\text{H}^+]$$

Answer: pH 4.70

decrease count ↑  
256

$$\text{pH} = -\log[\text{H}^+]$$

pH 4.70

11. What is the pH of a buffer made by adding 0.15 mol/L  $\text{NH}_3$  and 0.20 mol/L  $\text{NH}_4\text{Cl}$ ?

haven't  
done  
it  
yet!

Answer: \_\_\_\_\_

12. Indicate the balanced chemical equation for the formation of  $\text{Be}_3(\text{PO}_4)_2$  by neutralization.

