

14 AP Hydrolysis of Salts Lab (2141620)

Question

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Description

Introduction

Most salts are strong electrolytes and exist as ions in aqueous solutions. Some ions, however, react with water to form either H_3O^+ or OH^- . Such a reaction with water is called hydrolysis. Whether a solution of a salt will be acidic, neutral, or basic can be predicted on the basis of the strengths of the acid and base from which the salt was formed. Generally, these rules help us predict the nature of the solution:

1. Salt of a strong acid and a strong base yield a neutral solution, $\text{pH} = 7$.
2. Salt of a strong acid and a weak base yield a cation that hydrolyzes, forming H^+ ions, $\text{pH} < 7$.
3. Salt of a weak acid and a strong base yield an anion that hydrolyzes, forming OH^- ions, $\text{pH} > 7$.
4. Salt of a weak acid and a weak base yield both ions that hydrolyze. The pH of the solution is determined by the relative extent (K_a , K_b) to which each ion hydrolyzes.

In this experiment, we will test the pH of several aqueous salt solutions to determine whether these solutions are acidic, basic, or neutral. In each case, the salt solution will be 0.10M. Knowing the concentration of the salt solutions and the measured pH of each solution will allow us to calculate K_a or K_b for the ion that hydrolyzes.

Instructions

Materials

9 tiny test tubes, 9 caps, 1 test tube rack, Universal indicator, distilled water, 0.10 M solutions of 8 salt solutions: ZnSO_4 , NH_4Cl , Na_2CO_3 , KNO_3 , $\text{Cu}(\text{NO}_3)_2$, NaCl , $\text{NaC}_2\text{H}_3\text{O}_2$, MgCl_2

Procedure

1. Obtain a test tube rack and nine tiny (10 mL) test tubes. Add approximately 5 mL (about half full) of each of the salt solutions to a test tube, individually. Add approximately 5 mL of distilled water to the last test tube.
2. Add three drops of universal indicator to each tube, cap the tube and mix the contents by inverting the tube three times. Use the pH color chart to determine the approximate pH of each solution. Estimate the pH to one place past the decimal. Observe the pH of the distilled water. Adjust the pH of the other solutions to account for the pH of distilled water.
3. Empty the test tubes and rinse with distilled water before placing them upside down in rack to dry.

Questions: From the pH value that you obtained for the $\text{NaC}_2\text{H}_3\text{O}_2$ solution, calculate the hydrogen and hydroxide ion concentrations and K_b .

From the pH value that you obtained for $\text{Cu}(\text{NO}_3)_2$, calculate the hydrogen and hydroxide ion concentrations and K_a for Cu^{2+} .

5. Given that the K_b for CO_3^{2-} is 2.1×10^{-4} , calculate the expected pH of the Na_2CO_3 solution. Compare this to your observed pH.

1. Question Details

Objective and procedure summary [3413760]

Restate the objective in your own words using complete sentences. Summarize the steps in your procedure. (Be sure and include any safety concerns).



2. Question Details

Upload Lab Photo [3413757]

Upload a photo of the lab apparatus with your face in the photo as you perform some part of the lab. Title the image with a unique file name before you upload it. (Maybe use your initials and part of the lab title) no file selected It must be less than 5 MB in size.

3. Question Details

AP hydrolysis of Salts pH distilled water [1929865]

Why is the pH of distilled water not 7?



4. Question Details

AP Hydrolysis of Salts [1928593]

- Enter the observed pH of the distilled water.
- Enter the observed pH of the ZnSO₄ solution.
- Enter the observed pH of the NH₄Cl solution.
- Enter the observed pH of the Na₂CO₃ solution.
- Enter the observed pH of the KNO₃ solution.
- Enter the observed pH of the Cu(NO₃)₂ solution.
- Enter the observed pH of the NaCl solution.
- Enter the observed pH of the NaC₂H₃O₂ solution.
- Enter the observed pH of the MgCl₂ solution.

Click submit before entering the adjusted values below.

- Enter the adjusted pH of the ZnSO₄ solution.
- Enter the adjusted pH of the NH₄Cl solution.
- Enter the adjusted pH of the Na₂CO₃ solution.
- Enter the adjusted pH of the KNO₃ solution.
- Enter the adjusted pH of the Cu(NO₃)₂ solution.
- Enter the adjusted pH of the NaCl solution.
- Enter the adjusted pH of the NaC₂H₃O₂ solution.
- Enter the adjusted pH of the MgCl₂ solution.

From the pH value that you obtained for the NaC₂H₃O₂ solution, calculate the hydrogen and hydroxide ion concentrations and K_b.

Use three sig figs.

- [H⁺] = M
- [OH⁻] = M
- K_b =

From the pH value that you obtained for Cu(NO₃)₂, calculate the hydrogen and hydroxide ion concentrations and K_a for Cu²⁺.

Use three sig figs.

- [H⁺] = M
- [OH⁻] = M
- K_a =

Given that the K_b for CO₃²⁻ is 2.1 × 10⁻⁴, calculate the expected pH of the Na₂CO₃ solution. Compare this to your adjusted pH.

- pH =

5. Question Details

AP Hydrolysis of Salts Net Ionic Eqns [1929930]

Use hydronium ions instead of hydrogen ions where appropriate.

Write the balanced net ionic equation for the hydrolysis of ZnSO₄. Hint: A complex ion forms: ZnOH⁺.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

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Use hydronium ions instead of hydrogen ions where appropriate.

Write the balanced net ionic equation for the hydrolysis of NH_4Cl . If no hydrolysis takes place, put "no hydrolysis" in the answer blank.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

Write the balanced net ionic equation for the hydrolysis of Na_2CO_3 . If no hydrolysis takes place, put "no hydrolysis" in the answer blank.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

Use hydronium ions instead of hydrogen ions where appropriate.

Write the balanced net ionic equation for the hydrolysis of KNO_3 . If no hydrolysis takes place, put "no hydrolysis" in the answer blank.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

Write the balanced net ionic equation for the hydrolysis of $\text{Cu}(\text{NO}_3)_2$. Hint: A complex ion forms: CuOH^+ .

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

Write the balanced net ionic equation for the hydrolysis of NaCl . If no hydrolysis takes place, put "no hydrolysis" in the answer blank.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

Write the balanced net ionic equation for the hydrolysis of $\text{NaC}_2\text{H}_3\text{O}_2$. If no hydrolysis takes place, put "no hydrolysis" in the answer blank.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

Write the balanced net ionic equation for the hydrolysis of MgCl_2 . If no hydrolysis takes place, put "no hydrolysis" in the answer blank.

(Use the lowest possible coefficients. Omit states-of-matter in your answer.)

6. Question Details

Observations, Skills utilized and learning [3413764]

What observations did you make during the lab? What chemistry concepts, laws, and/or skills were necessary to complete this lab? What did you learn or re-learn? Use complete sentences.



Assignment Details

Name (AID): **14 AP Hydrolysis of Salts Lab (2141620)**Submissions Allowed: **5**Category: **Homework**

Code:

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