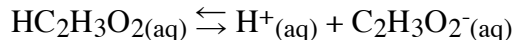


Acid Dissociation Constant, K_a

Purpose

To determine the acid dissociation constant, K_a for a weak acid. The acid to be used is acetic acid, $\text{HC}_2\text{H}_3\text{O}_2$, and its dissociation equation is:



Prelab Questions

1. Write the acid dissociation constant, K_a , for the dissociation of acetic acid, $\text{HC}_2\text{H}_3\text{O}_2$. (Use Box 3 in the Data and Calculations table of this experiment.)
2. You have been assigned two different $\text{HC}_2\text{H}_3\text{O}_2$ solution concentrations by your teacher. Determine the volume, in mL, of 2.00 M $\text{HC}_2\text{H}_3\text{O}_2$ required to prepare each. Also calculate the volume of water you will need to add to this to give a total volume of 100.0 mL. (Show your calculations and answers in Space 4 of the Data and Calculations table.)

Procedure

1. Obtain and wear safety goggles.
2. Prepare the CBL pH system for data collection.
 - Plug the pH amplifier into the adapter cable in Channel 1 of the CBL System. The pH electrode is already connected to the pH amplifier.
 - Use the link cable to connect the CBL System to the TI Graphing Calculator.
3. Turn on the CBL unit and the calculator. Start the CHEMBIO program and proceed to the MAIN MENU.
4. Set up the calculator and CBL for pH measurement.
 - Select SET UP PROBES from the MAIN MENU.
 - Enter "1" as the number of probes.
 - Select PH from the SELECT PROBE menu.
 - Enter "1" as the channel number.
 - Select USE STORED from the CALIBRATION menu.
5. Set up the calculator and CBL for data collection.
 - Select COLLECT DATA from the MAIN MENU.
 - Select MONITOR INPUT from the DATA COLLECTION menu.
 - Press **ENTER** after the system has warmed up for 30 seconds. The pH reading is displayed on the screens of the CBL and the TI calculator. No readings are stored when using the MONITOR INPUT mode.
6. Put the necessary amount of distilled water into a 100-mL graduated cylinder. Use a pipet to add drops if necessary.
7. Use a pipet to add the required volume of 2.00 M acetic acid (calculated in Pre-Lab Step 2) into the graduated cylinder. Then transfer to a clean beaker and mix thoroughly. **CAUTION:** *Use care when handling the acetic acid. It can cause painful burns if it comes in contact with your skin or gets into your eyes.*
8. Use a utility clamp to secure the pH electrode to a ring stand.
9. Determine the pH of your solution as follows:
 - Use about 40 mL of distilled water in a 100-mL beaker to rinse the electrode.
 - Pour about 30 mL of your solution into a clean 100-mL beaker and use it to thoroughly rinse the electrode.
 - Repeat the previous step by rinsing with a second 30-mL portion of your solution.
 - Use the remaining 40-mL portion to determine pH. Swirl the solution vigorously. (Note: Readings may drift without proper swirling!) Record the measured pH reading in your data table (round to the nearest 0.01 pH unit).
 - When done, place the pH electrode in the storage solution.
 - Discard the acetic acid solution as directed by your teacher.
10. Repeat Steps 6-9 for your second assigned solution. When you are finished, rinse the pH electrode and return it to the storage solution. Press **+** to quit MONITOR INPUT.

Name _____

Period _____

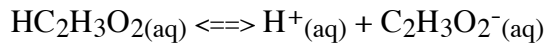
Name _____

Period _____

Partner _____

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- Determine the $[H^+]_{eq}$ from the pH values for each solution.
- Use the obtained value for $[H^+]_{eq}$ and the equation:



to determine $[C_2H_3O_2^-]_{eq}$ and $[HC_2H_3O_2]_{eq}$.

- Substitute these calculated concentrations into the K_a expression you wrote in Step 1 of the Pre-Lab.
- Compare your results with those of other students. What effect does initial $HC_2H_3O_2$ concentration seem to have on K_a ?

1. Assigned concentration	_____ M	_____ M
2. Measured pH	_____	_____
3. K_a expression		
4. Volume of 2 M acetic acid and volume of water to make 100.0 mL's Use $C_1V_1=C_2V_2$	_____ mL acid _____ mL water	_____ mL acid _____ mL water
5. $[H^+]_{eq}$	_____ M	_____ M
6. $[C_2H_3O_2^-]_{eq}$	_____ M	_____ M
7. $[HC_2H_3O_2]_{eq}$	_____ M	_____ M
8. K_a calculation	_____	_____