Acid-base equilibria - lab report example

Science, Chemistry

Acid-Base Equilibria

Vinegar Analysis Lab Report By and Partner May 7, Lab Objectives This laboratory experiment is conducted with the aimof achieving two objectives. These Objectives are:

1. To determine the concentration of weak acid reacted with vinegar.

2. To determine the Ka or the equilibrium constant of the weak acid.

Procedure

1. The Goggles were put on

2. The molarity of NaOH was obtained from the label on the bottle and this molarity was recorded on the data sheet.

3. A burette was cleaned by rinsing with tap water. The water was then discarded and the buret was rinsed again with two 5 mL NaOH standard solution portions. The NaOH was discarded after each rinse. discarding the NaOH after each rinse.

4. The burette was filled with NaOH standard solution to slightly above the 0 mark and the burette was set.

5. NaOH solution was drained from the buret with the purpose of removing all the air bubbles from the tip of burette. This reading was recorded on the data sheet as the initial volume for NaOH.

6. Steps 2-4 were repeated for the vinegar burette.

7. 10 ml of the vinegar was drained from the burette into a clean Erlenmeyer flask. The final volume for vinegar was recorded on the data sheet.

8. 20 ml of distilled water as well as 4 drops of phenolphthalein indicator solution were added to the vinegar sample.

9. The flask containing the indicator and vinegar was placed under

burette. NaOH from the burette was slowly added to the flask, as the flask was being swirled until the solution in the flask was a faint permanent pink. The final volume for NaOH was recorded on the data sheet.

10. A second titration was performed by refilling the NaOH burette and repeating above steps.

11. Molarity of NaOH 0. 1800M

DATA SHEET VINEGAR ANALYSIS

TITRATION #1

NaOH

VINEGAR

Initial Volume

0

0

Final Volume

45. 87

10

Volume Used

45. 87

10

TITRATION #2

NaOH

VINEGAR

0

0

45. 87

10

45. 87

10

Titration curve

At equivalence point, enough base has been added to reaction to react with all the acid present exhibiting a sharp increase in PH. At half-equivalence point, half of the acetic acid has been converted or turned to acetate ion, a conjugate base. At this point pKa = pH.

Calculation

The number of moles of base needed to reach the endpoint:

0. 1800 mmoles/mL*45. 87 mL = 8. 257 mmol OH-

Because vinegar and NaOH react in a 1 to 1 ratio, it means that the number of moles of vinegar that reacted with the base.

8. 257 mmol OH- x 1 H3O+ / 1 OH- = 8. 257 mmol H3O+

The concentration of acetic acid in vinegar therefore:

8. 257 mmol H3O+ / 10. 0 mL = 0. 826 M

Molarity = Moles of Acetic Acid / Volume of Vinegar (in L) = 8. 257 mmol H3O+ / 10. 0 mL = 0. 826 M

Mass % = [Mass of Acetic Acid / Mass of Vinegar] x 100

Mass of vinegar = 9. 69 grams

NaOH + CH3COOH → CH3COONa + H2O

To calculate the number of grams of acetic acid

Molarity NaOH (1mole NaOH/1mole CH3COOH)(60g CH3COOH/1mole)(vol. NaOH liters) = g CH3COOH

. 18M NaOH (1mol NaOH/1mol CH3COOH)(60g CH3COOH/1mole)(0.

04587L)* = 0. 4953g CH3COOH

% acetic acid = (mass of acetic acid/mass of vinegar) x 100

% acetic acid = (0. 4953g CH3COOH / 9. 69g vinegar) x 100

5. 11 % acetic acid in vinegar

Error Analysis

Theoretically, Vinegar contains about 5% (by mass) of a weak acid with a molar mass of 60. Therefore, this experimental value is close to that. The error may have resulted from inaccurate measurements or poor reading.