Experimental Title: Acid-base titration (HCL)

Purpose: Determination of sodium hydroxide molar concentration.

Introduction:

Molarity (M) or molar concentration is a common unit for expressing the concentration of solutions.
It is defined as the number of moles of solute per litter of solution (or millimoles of solute per millilitre of solution).
The concentration of a basic solution can be determined by titrating it with a volume of a standard acid solution (of known concentration) required to neutralize it. The purpose of the titration is the detection of the equivalence point, the point at which chemically equivalent amounts of the reactants have been mixed. The amount of reactants that have been mixed at the equivalence point depends on the stoichiometry of the reaction.
In the neutralization reaction of HCL and $NaOH$, the equivalence point occurs when one mole of HCL reacts with one mole of $NaOH$.

$$HCL + NaOH \rightarrow NaCL + H_2O$$

To determine when neutralization occurs, an indicator such as phenolphthalein can be used. An indicator is a substance which undergoes a distinct color change at or near the equivalence point. The point at which the indicator changes color and the titration is stopped is called the endpoint. Ideally, the endpoint should coincide with the equivalence point. Phenolphthalein is colorless in acidic solution and reddish violet in basic solution.

Standard solution

A solution, whose concentration is known, is called a standard solution. The substance used to prepare a standard solution is called the primary standard. Oxalic acid and sodium End point of a titration.

The endpoint of a titration is the point at which the reaction between the titrant and the analyte becomes complete. Generally, the endpoint of a titration is determined using indicators. In some cases, either the reactant or the product can serve as the indicator. A best example is the redox titration using potassium permanganate.

Titrations can be classified as:

- Acid-Base Titrations or Acidimetric and Alkalimeter
- Oxidation-Reduction Titrations or Redox Titrations
- Precipitation Titrations
- Complex metric Titrations m carbonate is some examples.

Equipment's and chemicals:

1- Buret
2- Pipet
3- Conical flask
4- Dropper
5- Funnel
5- Washing bottle

6- $HCL, NaOH$.

Procedure:

In this experiment, you will determine the molarity of the $NaOH$ solution which has been previously prepared. You will do this by using the $NaOH$ solution as a titrant and titrate standard acid solution until you reach the endpoint.
Two standard acid solutions (HNO_3 *and* H_2SO_4) of 0.105 M will be available. The volumes of $NaOH$ required to neutralize the acid solution will be tabulated and compared.

1- Rinse the 50 mL buret three times with deionized water, and then twice with about 5 mL of the sodium hydroxide solution.
2- Clamp the buret in position and fill the buret to just above the zero mark with the basic solution.
3- Be sure to let any bubbles out of the tip of the buret.
4- Bring the $NaOH$ solution meniscus down to or below the zero mark, read, and record the buret reading to the nearest 0.02 mL.
5- Use a graduated cylinder to add 20.0 mL portions of the standard acid solution to each of three clean Erlenmeyer flasks.
6- Add 2 to 3 drops of phenolphthalein (PTH) to each flask.
7- Set one flask under the buret, and add sodium hydroxide slowly, swirling the flask constantly.
8- As you approach the endpoint, a pink spot, indicating a local excess of the titrant, will grow in size.
9- Slow down the rate of addition of sodium hydroxide when a pink color begins to persist momentarily outside the place where the solutions mix.
10- Proceed dropwise from this point. Before the endpoint is reached, a temporary pink color will be seen where the $NaOH$ drop hits the bulk solution.
11- Stop as soon as the first permanent pale pink color appears. This is the endpoint.
12- Read the buret to the nearest 0.02 mL and record the reading. Repeat with the other two flasks.

13-Calculate the molarity of the $NaOH$ solution separately for each titration.

Results and calculations:

$t1=?$ $t2=?$

Acid Base

$$M_1 \times V_1 = M_2 \times V_2$$

$$V_2 = (t_2 - t_1)$$

Discussion and conclusions:

Questions:

1- Define titration and give an example.
2- What is the end point? What is the equivalent point? Sow the difference.
3- What is the indicator which are used in this experiment?
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