

EXPERIMENT: 01

AIM:

TO PREPARE AND STANDARDIZE 0.1N SOLUTION OF SODIUM HYDROXIDE

¹Dr. KAPIL KUMAR

¹Associate Professor,
School of Pharmaceutical Sciences,
Apeejay Stya University, Gurgaon, Haryana

²Dr. NARENDER YADAV

²Assistant Professor,
School of Pharmaceutical Sciences,
Apeejay Stya University, Gurgaon, Haryana

Ch.Id:-ASU/NSP/EB/ APHFTA /2022/Ch-01

ISBN- 978-93-91842-51-2

DOI: <https://doi.org/10.52458/9789391842512.nsp2022.eb.asu.ch-01>

REQUIREMENTS

A. Glassware & Instruments

1. Clean and calibrated burette
2. Pipette
3. Conical flask
4. Burette stand
5. Measuring cylinder

B. Chemicals & Reagents

1. Analyte- Sodium Hydroxide (0.1 N)
2. Titrant- Potassium hydrogen phthalate
3. Indicator- Phenolphthalein

THEORY

Potassium hydrogen phthalate

KHP is an acidic salt compound that is also known by its chemical name, potassium hydrogen phthalate. Because it is solid and air-stable as well as white powder and colourless crystals, precise weighing may be accomplished with relative ease. KHP is an important standard that is used in the analysis of NaOH and total organic carbon (TOC). The vast majority of TOC analyzers work by converting organic substances into carbon dioxide and water through an oxidation process, which is then followed by the measurement of the amount of carbon dioxide produced. The most common method for obtaining standard solutions for titrimetric analysis is demonstrated by this experiment. [Citation needed] Direct titration with a primary standard is used to establish the concentration of a solution after it has been prepared with an

approximate concentration that corresponds to that which is intended. We are going to calibrate the 0.1 N NaOH solutions (which will serve as the titrant) with potassium hydrogen phthalate by utilising phenolphthalein as the indicator (KHP, $\text{KC}_8\text{H}_8\text{O}_2\text{H}$).

Acid Base titration

The acid-base titration is a quantitative analysis technique used to estimate the acid or base concentration of by neutralising it with a known-concentration standard solution of base or acid. In some circles, this strategy is also referred to as the "dilution method." Utilizing a pH indicator allows one to monitor how far along the acid-base interaction has completed so that one can keep track of how far along the process they are.

Neutralization reaction

It is a kind of chemical reaction when a base and an acid react quantitatively with one another. When a chemical reaction takes place in water, neutralisation ensures that the resulting solution does not include an excessive amount of hydrogen or hydroxide ions.

Indicator used : Phenolphthalein Acid : Colourless Base : Pink

Colour change in following experiment: Pink to Colourless.

PRINCIPLE

It consists of an acid-base titration. Sodium Hydroxide is a variable-strength alkali that can be accurately standardised using the KHP primary standard. Sodium Hydroxide interacts with KHP in the presence of the indicator phenolphthalein. At the end, the colour fades from pink to colourless.

PROCEDURE

Preparation of 0.1N NaOH

Molecular Weight of NaOH = 40g

40g of NaOH in 1000ml =1N

4g of NaOH in 1000ml =0.1N

Preparation of KHP Sample

- Using deionized water, wash and rinse three conical flasks (125 ml). With a pencil, mark the three flasks 1, 2, and 3.
- In the three labelled flasks, weigh out three KHP samples with precision using the difference method. The weight of each individual specimen must be between 0.3 and 0.4 grammes.

Preparation of NaOH solution of required concentration

- Use distilled water to wash out and clean your conical flask (250 ml).
- Use a clean graduated cylinder with a 10 ml capacity to measure between 8 and 8.5 ml of 6M NaOH. You can find 6M NaOH reagent the bottle on your workbench.
- First, add the sodium hydroxide solution to the conical flask (250 ml), and then add sufficient DW water to fill the flask up to its neck. First, transfer the solution into a clean but not necessarily dry beaker (400 ml), and then transfer the contents of that beaker back into the conical flask (250 ml). To ensure that the solution is properly incorporated, it is necessary to perform this step many times.
- Label and put a rubber stopper on the Conical flask (250 ml).

Burette Preparation

- Take a 25 ml burette from the storeroom.
- The burette should first be rinsed with tap water, and then it should be rinsed with distilled water. Using approximately three ml of the sodium hydroxide solution that you have just made, perform the final rinse of the burette. Ensure that the solution is drained via the stopcock.
- Attach a burette with a closed stopcock to a burette clamp fixed to a ring stand. The sodium hydroxide solution should be added to the burette upto zero mark. Allow excess NaOH solution to drain by opening the stopcock. This will assist in eliminating the air pocket that is located at the tip of the stopcock. Ensure that the burette's tip is filled with titrant and air bubbles absent.

Standardization of Sodium Hydroxide Solution

- At your bench add about 50 ml of distilled water to KHP sample #1. Add 2 drops of phenolphthalein indicator. Swirl to dissolve the KHP completely.
- On the report sheet, record the initial reading of the NaOH solution in the burette to the nearest 0.02 ml. Ask your instructor to check your reading and initial your report.
- Place a white sheet of paper under Conical flask #1 to facilitate the detection of the end point when noting the colour change of the indicator. Titrate KHP acid solution sample #1 by slowly adding NaOH from the burette and constantly swirling the flask until you have reached the end point. This is indicated by the appearance of a faint pink colour of phenolphthalein that persists for 30 seconds or more after swirling the flask. Take the final burette reading to the nearest 0.02 ml and record it on your report sheet.

- Refill the burette. Repeat the titration for the remaining two KHP samples. Record your data on your report sheet.

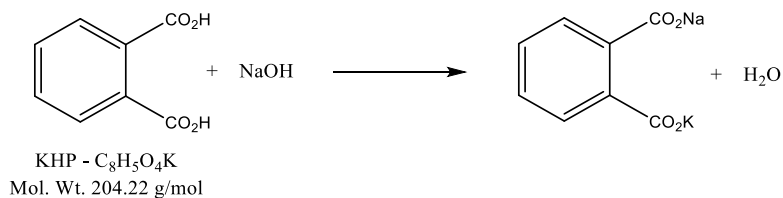
PREPARATION OF 0.1N KHP

Molecular Weight of KHP=204.24g

204.24g of KHP in 1000ml=1N

20.4g of KHP in 1000ml=0.1N

REACTION



CALCULATION

Observation table

S. No.	Volume of KHP solution taken (ml)	Burette reading of NaOH		Volume of NaOH consumed (ml)
		IR	FR	
1.				
2.				
3.				
4.				

mEq. of Potassium Hydrogen Phthalate = mEq. of NaOH at the end point

$$N_1 V_1 = N_2 V_2$$

Where N_1 = Normality of $C_8H_5KO_4$

V_1 = Volume of $C_8H_5KO_4$

N_2 = Normality of NaOH

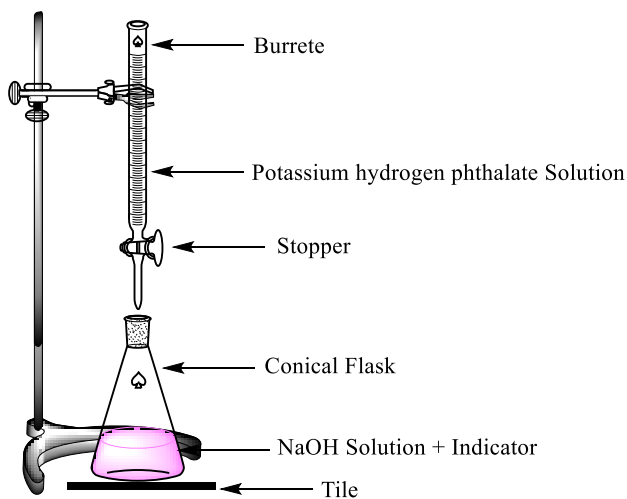
V_2 = Volume of NaOH

$$N_1 V_1 = N_2 V_2$$

$(0.1N) (10ml) = (\text{unknown } (N_2)) \times \text{Volume of NaOH consumed (from burette)}$

$$N_2 = (0.1 \times 10) / \text{Volume of NaOH consumed (from burette)}$$

Diagram



APPLICATION

1. It is a primary component of products that are used to clean ovens and drains.

2. It is utilised in the production of chemicals, the refinement of oil, hydraulic fracturing, the treatment of water, and the processing of metals.
3. It is utilised in the production of a variety of products including cloth, paper, plastic wrap, and soap.
4. Pure sodium hydroxide, often known as NaOH, is a solid that is colourless and odourless. when it is at room temperature. The alkaline substance sodium hydroxide is corrosive. As it dissolves, it interacts with the moisture in the air and may produce heat as a side effect. This heat has the potential to start a fire if it is in close proximity to flammable objects.

RESULTS

Based on the results of the experiment described above, it is clear that KHP can be used to standardise Sodium Hydroxide in an efficient manner. After carrying out the necessary calculations, the strength of the potassium permanganate solution that had been created was determined to be.....N.

VIVA QUESTIONS

1. How you will prepare 0.1 N NaOH?
2. How you will prepare 0.1N oxalic acid?
3. What is the normality of 10% NaOH in water?
4. What is the %age concentration of 2N NaOH in water?
5. What is the molecular weight of oxalic acid dehydrate?
6. What do you understand by the term indicator?
7. Define the term neutralization curve.
8. Current experiment comes under which type of titration?