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School of Maths & Science  
Science Practical

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**Standardisation of a Sodium hydroxide  
solution using Succinic Acid**

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◆ **Aim**

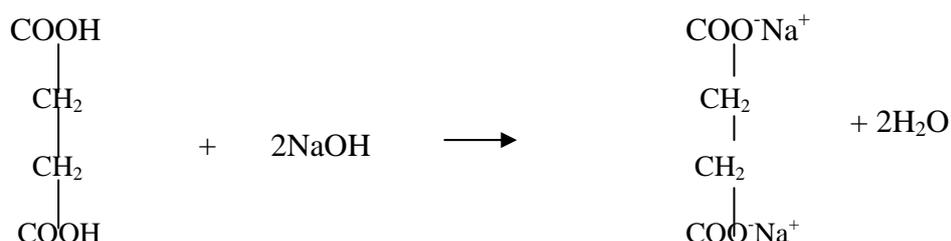
*At the end of this experiment you should be able to:*

1. Prepare a standard solution
2. Perform a standardisation to an acceptable degree of accuracy
3. Calculate the concentration of a sodium hydroxide solution
4. Comment on the possible sources of errors and evaluate your answer

◆ **Introduction**

Succinic acid (CH<sub>2</sub>COOH)<sub>2</sub> is a dibasic acid which can be used as a primary standard for standardising solutions of alkali. It reacts with sodium hydroxide as follows:

*Dibasic* means there are two acidic hydrogens per molecule



Since succinic acid is a primary standard we can use it to standardise a solution of sodium hydroxide. In this experiment we will prepare a solution of succinic acid of a suitable concentration to standardise a solution of sodium hydroxide

## ◆ Safety



### Control Measures

- The wearing of safety **glasses** and a **laboratory coat at all times** will be sufficient to take account of most hazards and significant risks
- All waste is to be placed in the labeled container immediately after use
- You are reminded of the need of good laboratory practice in order to maintain a safe working environment.



### Hazards

(Highly) Flammable

Phenolphthalein



Corrosive

Sodium hydroxide solution



Harmful! Irritant

Succinic acid

## ◆ Procedure

1. Weigh out **accurately** to **3** decimal places between 1.4 and 1.5g of succinic acid using the method of 'weighing by difference'. Record the mass readings.
2. Place the succinic acid into a small beaker and add about 30-40 cm<sup>3</sup> of deionised water. Dissolve the acid by careful stirring.
3. Once the acid has dissolved transfer the solution to a 250.0cm<sup>3</sup> volumetric flask. Ensure that the beaker is washed out with deionised water several times to ensure that all the acid is transferred. Now make up to the mark by adding deionised water.
4. Pipette 25cm<sup>3</sup> of the succinic acid solution into conical flask and add three-four drops of phenolphthalein indicator, and titrate with the given sodium hydroxide solution. Near the endpoint add the sodium hydroxide dropwise and swirl the mixture. Record the titre once there is a permanent pink tinge.
5. Repeat the titration until three consistent titres are obtained.

## ◆ Calculations

**IMPORTANT:** THE WORK ON THIS PAGE MUST BE COMPLETED AND RETURNED BEFORE THE NEXT PRACTICAL PERIOD TOGETHER WITH YOUR RESULTS SHEET.

1. Calculate the concentration of succinic acid used using the following equations;

$$\text{Moles} = \frac{\text{mass}}{\text{Molar mass}} \qquad \text{Conc} = \frac{\text{moles}}{\text{Volume}}$$

Molar mass succinic acid = 118 g mol<sup>-1</sup>

*Record the value to 3 sig. figs. but keep more accurate value in calculator for use in part 2.*

2. Calculate the concentration of sodium hydroxide. *Record the concentration of sodium hydroxide to three significant figures.*
3. Now calculate the error. We will assume that the burette is the most significant source of error.

$$\% \text{ error due to burette} = \frac{0.14}{\text{average titre}} \times 100$$

*Record this to 2 sig figs.*

### **Error in units of mol dm<sup>3</sup>:**

$$\text{Error} = \frac{\% \text{ error}}{100} \times \text{concentration of sodium hydroxide}$$

*Record the error to the same no of decimal places as on have in your concentration  
Finally record your concentration in the form 0.0987 +/- 0.0006 mol dm<sup>-3</sup>*

## ◆ Questions

1. What is meant by a 'primary standard'?
2. What do you understand by the term 'standard solution'?
3. State three sources of error other than operator error.
4. How could you improve the accuracy of the experiment (*without replacing the operator*)?