A-level Chemistry exemplar for required practical 1 part a

Make up a volumetric solution and carry out a simple acid-base titration:

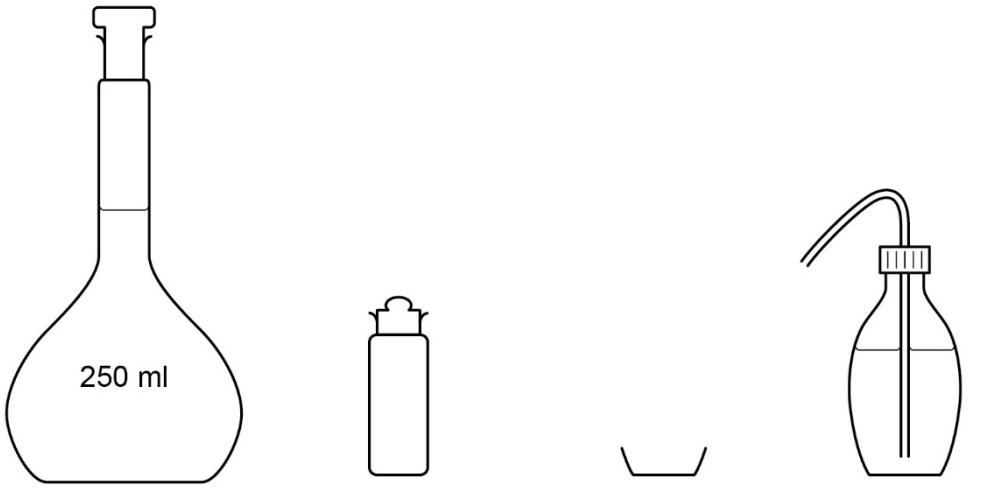
To prepare a solution of sodium hydrogensulfate that has a known concentration.

Student sheet

Requirements

You are provided with the following:

- weighing bottle or boat
- 250 cm^3 volumetric (graduated) flask
- sodium hydrogensulfate solid
- filter funnel
- spatula
- deionised or distilled water in a wash bottle
- 250 cm^3 beaker
- glass rod
- digital mass balance (reading to 2 or 3 decimal places).



Suggested method

The task is to prepare 250 cm^3 of a solution of sodium hydrogensulfate with a known concentration in the range 0.090 to 0.110 mol dm^{-3}

The procedure is as follows:

a) Calculate the mass of sodium hydrogensulfate solid needed to produce 250 cm^3 of a 0.100 mol dm^{-3} solution. Show your working. If you are using the anhydrous solid, the mass to weigh out will be between 2.7 and 3.3 g, and if you are using the monohydrate, the mass to weigh out should be between 3.1 and 3.8 g.
b) Weigh a clean dry weighing bottle (or weighing boat).
c) Place the weighing bottle on the pan of a digital balance and, using a spatula, place into the bottle **approximately** the mass of sodium hydrogensulfate that you have calculated to be necessary.
d) Weigh the weighing bottle and its contents accurately and record the **precise** mass.
e) Pour the contents of the weighing bottle into a beaker and re-weigh the weighing bottle (which may still contain traces of sodium hydrogensulfate).
f) Calculate the mass of sodium hydrogensulfate that you have transferred. Remember to record all weighings to the resolution of the balance that you have used.
g) Add approximately 100 cm^3 of deionised (or distilled) water to the beaker containing the solid and use a glass rod to stir the contents of the beaker until all of the sodium hydrogensulfate dissolves.
h) Using a funnel, pour the contents of the beaker into a 250 cm^3 volumetric (graduated) flask and then using the wash bottle rinse the beaker and funnel into the same volumetric flask. Rinse the glass rod into these washings.
i) Make the volumetric flask up to the graduated mark by carefully adding deionised water from the wash bottle. You will need to be careful so that you do not over-shoot the mark.
j) Stopper the volumetric flask and shake it thoroughly to mix the contents of the flask.
k) Calculate the exact concentration in mol dm^{-3} of your solution quoting the value to the appropriate precision. Show all of your working.

A-level Chemistry exemplar for required practical 1 part b

Make up a volumetric solution and carry out a simple acid-base titration:

To determine the concentration of a solution of sodium hydroxide by titration using a sodium hydrogensulfate solution that has a known concentration.

Student sheet

Requirements

You are provided with the following:

- burette
- stand and clamp
- 25 cm^3 pipette
- pipette filler
- two 250 cm^3 conical flasks
- two 250 cm^3 beakers
- funnel
- wash bottle
- phenolphthalein indicator
- sodium hydrogensulfate solution
- sodium hydroxide solution.

The sodium hydrogensulfate solution may be the solution which you prepared in part a of this experiment or it could be a solution provided to you by your teacher.

Suggested method

a) Pour approximately 100 cm^3 of the sodium hydrogensulfate solution into a clean, dry beaker that is labelled 'sodium hydrogensulfate'. Use a small volume of this solution to rinse the burette before filling it with the sodium hydrogensulfate solution.

b) Pour approximately 100 cm^3 of the sodium hydroxide solution into a second clean, dry beaker labelled 'sodium hydroxide'.

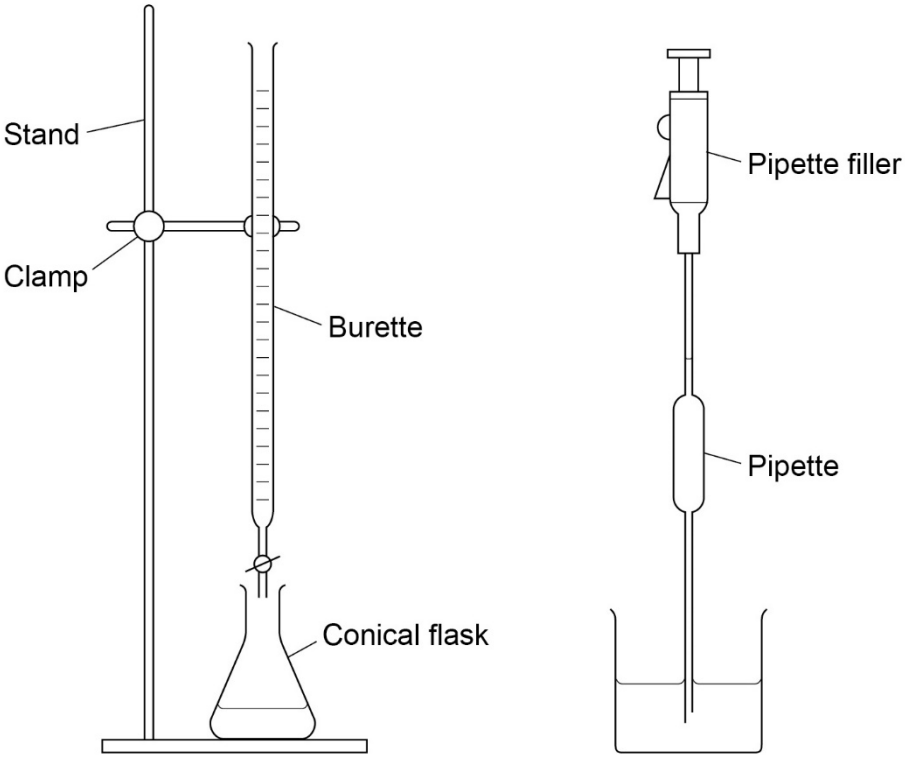
c) Rinse a 25 cm^3 pipette with the sodium hydroxide solution provided and then, using a pipette filler, pipette exactly 25.0 cm^3 of sodium hydroxide solution into a 250 cm^3 conical flask (which has been rinsed with deionised water).

d) Add **two to three drops** of phenolphthalein indicator to the solution in the conical flask and note the colour of the indicator in alkali.

e) **Before you start** to titrate, construct a table ready to record your results.

f) Record the initial burette reading. Make sure that all your burette readings are to the appropriate precision.

g) Titrate the contents of the conical flask by adding sodium hydrogensulfate solution to it from the burette. Add the sodium hydrogensulfate solution slowly, swirling the flask gently to mix the solution. Add the sodium hydrogensulfate solution dropwise near the end-point until the indicator undergoes a definite colour change; this is the end-point of the titration. Record the colour change in your results. Record the final burette reading in your table of results.



h) Calculate and record in your table of results the volume of sodium hydrogensulfate solution used.

i) Repeat the titration until you obtain two results which are concordant. You should normally carry out at least three titrations. Record all of the results that you obtain.

j) Calculate and record the mean volume of sodium hydrogensulfate solution used in the titration. Show your working.

k) Use your results to calculate the concentration of the sodium hydroxide. Show your working.

Sample results

The following table is a sample results table using results from the trial of this experiment.

	Titre 1/cm^3	Titre 2/cm^3	Titre 3/cm^3
Initial reading	0.10	0.00	0.10
Final reading	24.95	25.10	25.10
Titre	24.85	25.10	25.00
		✓	✓

All titre readings to 2 decimal places.

Concordant results should be within 0.10 cm^3 of each other. In this case, titre 2 and titre 3 are concordant.

The average titre is 25.05 cm^3

Photographs of an exemplar set-up of this practical can be found in our set-up guide, which is available on our A-level Practicals page.