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EB Education Revision Guide

How to work with Required Practicals: Part 7
Triple (AQA Chemistry)

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Practical 1: Neutralisation

Concentration (mol/dm^3) = number of moles ÷ volume of solution (dm^3)

What you need to know

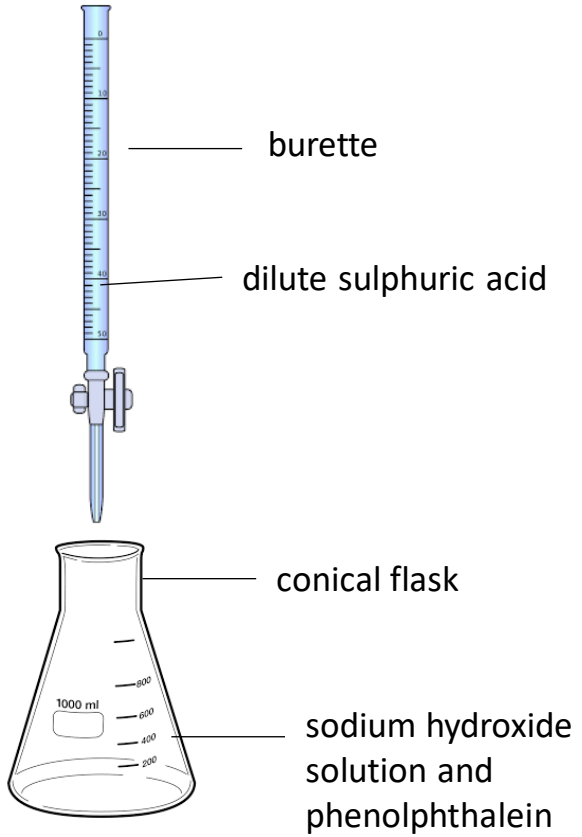
To determine the reacting volumes of solutions of a strong alkali and a strong acid by titration.

You may need to describe how to use the correct equipment:

- Use the pipette and pipette filler to put an exact volume of sodium hydroxide solution into the conical flask on a white tile.
- Fill the burette with acid, ensuring the tap is closed. This should be done at a low level to makes that you are not pouring acid from above head height.
- Add drops of phenolphthalein indicator into the conical flask. Swirl to mix and place under the burette with the tile.
- Carefully open the tap so that sulfuric acid flows into the flask at a drop by drop rate. Constantly swirl the flask when adding the acid. Look for a colour change from pink to colourless in the indicator. There will be signs that the colour change is close to being permanent. When this happens use the tap to slow the drops down. You need to be able to shut the tap immediately after a single drop of acid causes it to be permanently colourless.
- Record the volume of acid you added, repeat twice and calculate the mean volume needed. Concordant results should be used (you have at least two titres within 0.20 cm^3 of each other).

You will need to use the volume of acid/alkali and concentration of alkali to calculate the concentration of the acid.

Diagram



Practical 2: Identifying ions

What you need to know

To explain how to use to identify ions.

- Flame Tests

Dip nichrome wire into chloride solutions, then hold the tip of the wire in a blue Bunsen burner flame.

Result: Li – crimson, Na –yellow, K – lilac, Ca- orange/red, Cu – green

- Carbonate test

Add hydrochloric acid to sodium solutions. If it bubbles – use a pipette to transfer the gas produced to limewater.

Result: If limewater goes cloudy, carbon dioxide is present – indicating carbonate ions are present.

- Sulphate test

Add a few drops of dilute hydrochloric acid to each sodium solution. Then add 1cm depth of barium chloride solution.

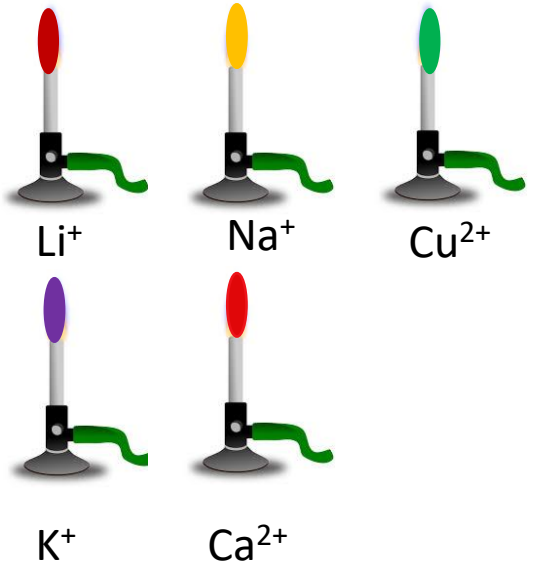
Result: A white precipitate forms if sulphate ions are present (as barium sulphate is formed)

- Halide test

Add a few drops of dilute nitric acid to each solution. Then add 1cm depth of silver nitrate solution.

Result :Precipitates will form (Chloride – white, Bromide - cream, Iodide – yellow)

Diagram



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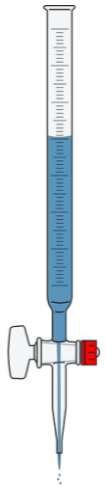
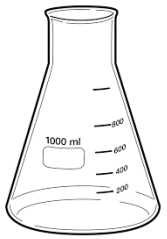
Your turn:

1. Elle has two samples of hydrochloric acid and needs to check to see if they are the same concentration.

Using the apparatus and solutions provided below, describe how Elle could carry out titrations.


Burette

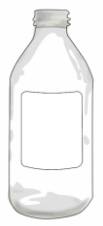


Conical flask


Pipette

White tile


Hydrochloric acid A


Hydrochloric acid B


Sodium hydroxide solution


Indicator

2. George added 25.0 cm^3 of sodium hydroxide solution of an unknown concentration to a conical flask using a pipette.
He then carried out a titration to determine the volume of 0.1 mol/dm^3 sulphuric acid that was needed to neutralise the sodium hydroxide.

a) Describe how he should complete the titration, including a suitable indicator, and the colour change that he would see.

b) George's results are shown in the table below.

	Titration 1	Titration 2	Titration 3	Titration 4
Volume of 0.1 mol/dm^3 sulphuric acid in cm^3	28.25	27.85	27.05	27.15

The equation for the reaction is

$$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$$

Calculate the concentration of the sodium hydroxide and give your answer to 3 significant figures.

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Your turn:

3. Alfie and Lewis tested compound F, which was green. They added water to the compound, but it did not dissolve.
They then added a solution of ethanoic acid to it.
A gas was produced which turned limewater milky.

Alfie concluded that compound F was sodium carbonate.
Lewis concluded that compound F was copper chloride.

Which, if either of them, was correct? Explain why.

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4. Brooke has solutions of three compounds, A, B and C.
She uses some tests to try and identify the ions present in the compounds.
Her results are shown below.

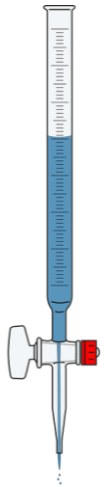
	Test			
Compound	**Flame test**	**Add sodium hydroxide solution**	**Add hydrochloric acid and barium chloride solution**	**Add nitric acid and silver nitrate solution**
A	no colour	green precipitate	white precipitate	no reaction
B	yellow flame	no reaction	no reaction	yellow precipitate
C	no colour	brown precipitate	no reaction	cream precipitate

Identify the two ions present in each compound, A, B and C.
A……
B……
C……

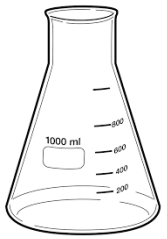
Answers:

1. Elle has two samples of hydrochloric acid and needs to check to see if they are the same concentration.

Using the apparatus and solutions provided below, describe how Elle could carry out titrations.

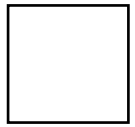


Burette



Conical flask

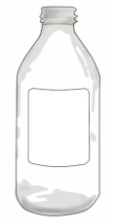
Pipette



White tile

Hydrochloric acid A

Hydrochloric acid B



Sodium hydroxide solution

Indicator

Wear safety goggles.
Alkali in burette, acid in conical flask.
Use a pipette to place known volume into a conical flask.
Add a few drops of named indicator (NOT Universal Indicator) into conical flask.
Place on a white tile.
Add alkali drop by drop into flask, swirling and watching for a colour change.
When a sudden colour change occurs stop adding alkali and record the volume in the burette.
Repeat this twice.
Repeat for each acid. If they are the same concentration the same volume of alkali will neutralise them.

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Answers:

2. George added 25.0 cm^3 of sodium hydroxide solution of an unknown concentration to a conical flask using a pipette.
He then carried out a titration to determine the volume of 0.1 mol/dm^3 sulphuric acid that was needed to neutralise the sodium hydroxide.

Describe how he should complete the titration, including a suitable indicator, and the colour change that he would see.

- Add indicator, for example phenolphthalein/methyl orange/ litmus to the sodium hydroxide (in the conical flask) do not accept universal indicator
- Add acid from a burette with swirling, **or** dropwise towards the end point **or** until the indicator just changes colour
- Add until the indicator changes from pink to colourless (for phenolphthalein) or yellow to red (for methyl orange) or blue to red (for litmus)

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Answers:

b) George's results are shown in the table below.

	Titration 1	Titration 2	Titration 3	Titration 4
Volume of 0.1 mol/dm^3 sulphuric acid in cm^3	28.25	27.85	27.05	27.15

The equation for the reaction is

$$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$$

Calculate the concentration of the sodium hydroxide and give your answer to 3 significant figures.

Moles H_2SO_4 = conc × vol

Volume H_2SO_4 (27.05 + 27.15 /2 = 27.1 cm^3. Only use concordant result, within 0.2cm^3. Change into dm^3 27.1/1000 = 0.0271)
0.1 x 0.0271 = 0.00271

Ratio NaOH: H_2SO_4: is 2:1
Moles NaOH = Moles H_2SO_4 × 2 = 0.00542

Concentration NaOH = mol/vol = 0.00542/0.025 = 0.2168
(Volume NaOH is 25/1000 = 0.025)

0.217 mol/dm^3

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Your turn:

3. Alfie and Lewis tested compound F, which was green. They added water to the compound, but it did not dissolve.
They then added a solution of ethanoic acid to it.
A gas was produced which turned limewater milky.

Alfie concluded that compound F was sodium carbonate.
Lewis concluded that compound F was copper chloride.

Which, if either of them, was correct? Explain why.

Student A was incorrect because sodium compounds are white not green OR because sodium carbonate is soluble, so cannot contain sodium.

Student B was incorrect because adding acid to carbonate produces carbon dioxide, and the limewater turned cloudy, so it must contain carbonate ions not chloride ions

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4. Brooke has solutions of three compounds, A, B and C.
She uses some tests to try and identify the ions present in the compounds.
Her results are shown below.

	Test			
Compound	**Flame test**	**Add sodium hydroxide solution**	**Add hydrochloric acid and barium chloride solution**	**Add nitric acid and silver nitrate solution**
A	no colour	green precipitate	white precipitate	no reaction
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C	no colour	brown precipitate	no reaction	cream precipitate

Identify the two ions present in each compound, A, B and C.

A Fe^{2+} SO_4^{2-}

B Na^{+} I^{-}

C Fe^{3+} Br^{-}

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For more help and resources, or to work with us as a tutor, please contact us

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