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EB Education Revision Guide

How to work with Required Practicals: Part 7
Triple (AQA Chemistry 2022 Paper 1 & 2)

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Assessed Required Practical Activities
Paper 1
Foundation

Required practical activity 1: preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution.
Required practical activity 2: determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration.
Required practical activity 4: investigate the variables that affect temperature changes in reacting solutions such as, eg, acid plus metals, acid plus carbonates, neutralisations, displacement of metals.

Higher

Required practical activity 1: preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution.
Required practical activity 2: determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration.
Required practical activity 4: investigate the variables that affect temperature changes in reacting solutions such as, eg, acid plus metals, acid plus carbonates, neutralisations, displacement of metals.

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Hydrochloric Acid makes Metal Chlorides
Sulfuric Acid makes Metal Sulphates
Nitric Acid makes Metal Nitrates

Practical 1: Making Salts

What you need to know

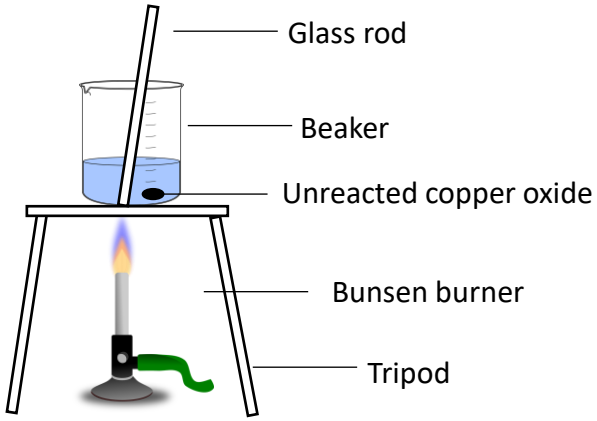
- Be able to explain how to make a pure dry sample of a soluble salt from an insoluble carbonate or oxide and why some of the steps are followed.

- You need to add an excess of metal oxide to acid to ensure that the acid has fully reacted with the metal oxide.
- You need to heat the solution gently to speed up the reaction.
- You then filter the solution to remove the excess metal oxide.
- You heat the filtered solution (filtrate) gently to slowly evaporate off some but not all of the water and stop when crystals start to form.
- Leave the solution to cool and allow the salt to crystallise (this will happen as the salt becomes insoluble in the cold highly concentrated solution.
- Filter the crystals out of the solution and leave them in a warm place to dry.

- Be able to describe the risks and safety precautions
- Be able to name the salt produced – or decide which chemicals should be reacted to make a particular salt

Acid + metal carbonate → metal salt + water + carbon dioxide
Acid + metal oxide → metal salt + water

Diagram



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Practical 2: Titration

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

What you need to know

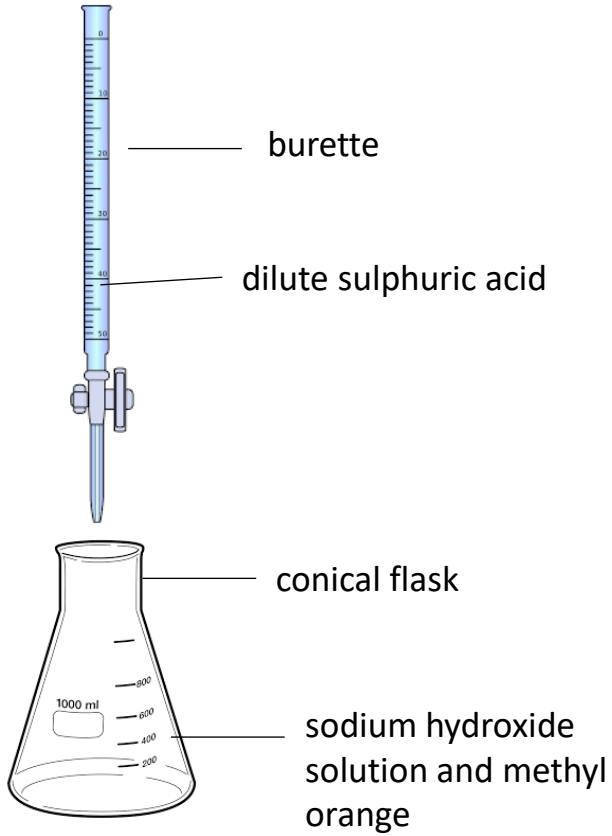
To determine the reacting volumes of solutions of a strong alkali and a strong acid by titration.

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 a 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 4: Temperature Changes

What you need to know

This practical investigates changes in temperature in different reactions.

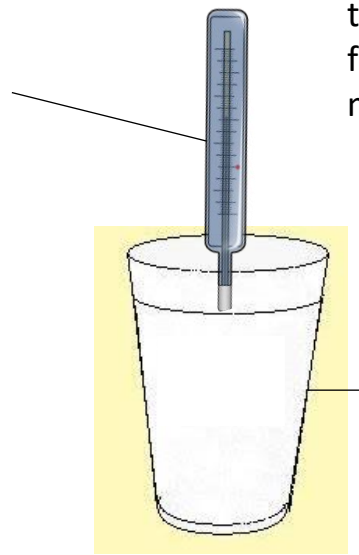
- You add different chemicals together and measure the change in temperature. Each experiment should be repeated at least 3 times, and the mean (average) calculated.
- A polystyrene cup and a lid is used to reduce the temperature loss to the surroundings. This increases the accuracy of the results.

If there is an increase in temperature, the reaction is exothermic.

If there is a decrease in temperature the reaction is endothermic.

Displacement reactions are exothermic
Most neutralisation reactions are exothermic
Precipitation reactions are exothermic
Dissolving salts can be exothermic or endothermic.

Diagram



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Your turn:

1. Reacting metal oxides with acids produces soluble salts.

a) Name one other substance which can react with an acid to form a soluble salt.

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b) The ions Ca^{2+} and NO_3^- are found in calcium nitrate.
What is the formula of calcium nitrate?

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c) Describe how you could make pure, dry crystals of magnesium sulphate from a dilute acid and a metal oxide.

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2. Gabbie is planning a method to prepare pure crystals of copper sulphate.
Her method is below:

1. Add two spatulas of sodium carbonate to dilute nitric acid in a beaker.
2. Once the fizzing has stopped, use a Bunsen burner to heat the solution until all the liquid has evaporated.

There are a number of errors in her method.
Explain what improvements could be made to ensure that she produces pure crystals of copper sulphate.

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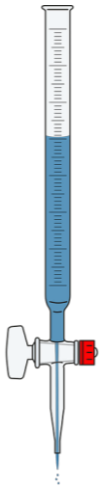
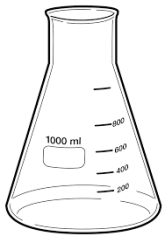
Your turn:

3. 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

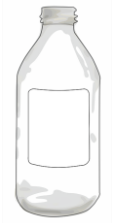


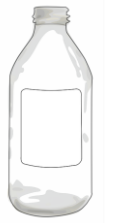
Conical flask


Pipette

White tile


Hydrochloric acid A


Hydrochloric acid B


Sodium hydroxide solution


Indicator

4. 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

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

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

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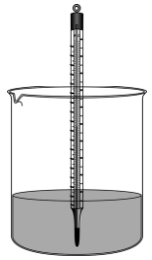
Your turn:

5. Ollie conducted an experiment to determine the energy change when hydrochloric acid reacts with sodium hydroxide. The equation for the reaction is shown below.

$HCl + NaOH \longrightarrow NaCl + H_2O$

Ollie used the apparatus in the diagram in his experiment.



He placed 50cm^3 of hydrochloric acid in a beaker and measured the temperature.
He then added 50cm^3 of sodium hydroxide solution and stirred the mixture with the thermometer. He recorded the highest temperature the mixture reached.
Ollie then repeated the experiment, calculating the temperature change each time

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Initial temperature in °C	22.0	19.0	19.2	19.0
Highest temperature in °C	29.0	26.2	26.0	23.5
Temperature change in °C	7.0	7.2	6.8	4.5

The biggest error in this experiment is loss of heat.

a) How could the apparatus be modified to reduce heat loss?

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b) Why is it important to stir the chemicals?

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c) Which one of the experiments do you think Ollie carried out on a different day to the others? Explain why.

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d) Explain why Ollie should not use Experiment 4 to calculate the average temperature change.

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e) Using the first three experiments, calculate the average temperature change.

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f) Use this equation to calculate the energy change for the reaction.
Energy change in joules = 100 x 4.2 x average temperature change

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Answers:

1. Reacting metal oxides with acids produces soluble salts.

a) Name one other substance which can react with an acid to form a soluble salt.

Metal carbonates/metal hydroxide/metal/alkali solution

b) The ions Ca^{2+} and NO_3^- are found in calcium nitrate.
What is the formula of calcium nitrate?

$Ca(NO_3)_2$

c) Describe how you could make pure, dry crystals of magnesium sulphate from a dilute acid and a metal oxide.

Use magnesium oxide and sulphuric acid to react together. Add sulphuric acid to a beaker and warm it. Add magnesium oxide in excess and stir it. Filter using a filter paper and funnel to remove the excess magnesium oxide. Heat in an evaporating basin to crystallisation point (do not evaporate all the water). Leave to crystallise and pat dry with filter paper

2. Gabbie is planning a method to prepare pure crystals of copper sulphate.
Her method is below:

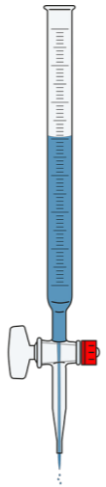
1. Add two spatulas of sodium carbonate to dilute nitric acid in a beaker.
2. Once the fizzing has stopped, use a Bunsen burner to heat the solution until all the liquid has evaporated.

There are a number of errors in her method.
Explain what improvements could be made to ensure that she produces pure crystals of copper sulphate.

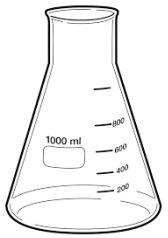
Use sulphuric acid not nitric acid
Use copper carbonate/oxide not sodium carbonate
Add solid until it is in excess/no more remains so that all of the acid reacts
Filter to remove excess solid
Heat gently/partially evaporate or leave until crystals start to appear.

Answers:

3. 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.

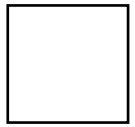


Burette



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.

Answers:

4. 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

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

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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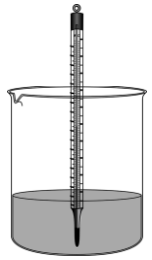
Answers:

5. Ollie conducted an experiment to determine the energy change when hydrochloric acid reacts with sodium hydroxide. The equation for the reaction is shown below.

$HCl + NaOH \longrightarrow NaCl + H_2O$

Ollie used the apparatus in the diagram in his experiment.



He placed 50cm^3 of hydrochloric acid in a beaker and measured the temperature.
He then added 50cm^3 of sodium hydroxide solution and stirred the mixture with the thermometer. He recorded the highest temperature the mixture reached.
Ollie then repeated the experiment, calculating the temperature change each time

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Initial temperature in °C	22.0	19.0	19.2	19.0
Highest temperature in °C	29.0	26.2	26.0	23.5
Temperature change in °C	7.0	7.2	6.8	4.5

The biggest error in this experiment is loss of heat.

a) How could the apparatus be modified to reduce heat loss?

Use a plastic beaker/lid/insulation

b) Why is it important to stir the chemicals?

So all the substances react fully/to distribute heat

c) Which one of the experiments do you think Ollie carried out on a different day to the others? Explain why.

Experiment 1 – as it has a different starting temperature

d) Explain why Ollie should not use Experiment 4 to calculate the average temperature change.

It is anomalous – the temperature change does not fit the pattern

e) Using the first three experiments, calculate the average temperature change.

7°C

f) Use this equation to calculate the energy change for the reaction.

Energy change in joules = 100 x 4.2 x average temperature change

100 x 4.2 x 7 = 2940 J

Answers:

g) Which of these energy level diagrams represents the energy change for this reaction?
Explain why.

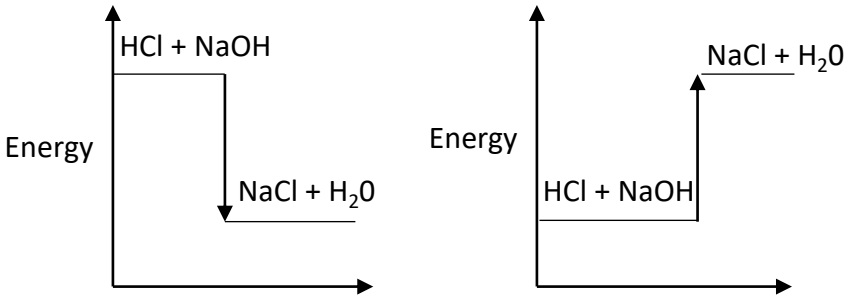


Diagram A

Diagram B

Diagram A as the reaction is exothermic/temperature increases. There is more energy in the bonds of the reactants than that of the bonds of the products

Assessed Required Practical Activities
Paper 2
Foundation

Required practical activity 5: investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity. This should be an investigation developing a hypothesis.
Required practical activity 6: investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.
Required practical activity 7: use of chemical tests to identify the ions in unknown single ionic compounds covering the ions from sections Flame tests through to Sulfates.
Required practical activity 8: analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.

Higher

Required practical activity 5: investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity. This should be an investigation developing a hypothesis.
Required practical activity 7: use of chemical tests to identify the ions in unknown single ionic compounds covering the ions from sections Flame tests through to Sulfates.

Practical 5: Rates of Reaction

What you need to know

Be able to investigate how changes in concentration affect the rates of reactions

Method 1:

Measure the volume of gas produced. This can be done by adding different concentrations of hydrochloric acid to a piece of magnesium ribbon and measuring the volume of gas produced over time.

Method 2:

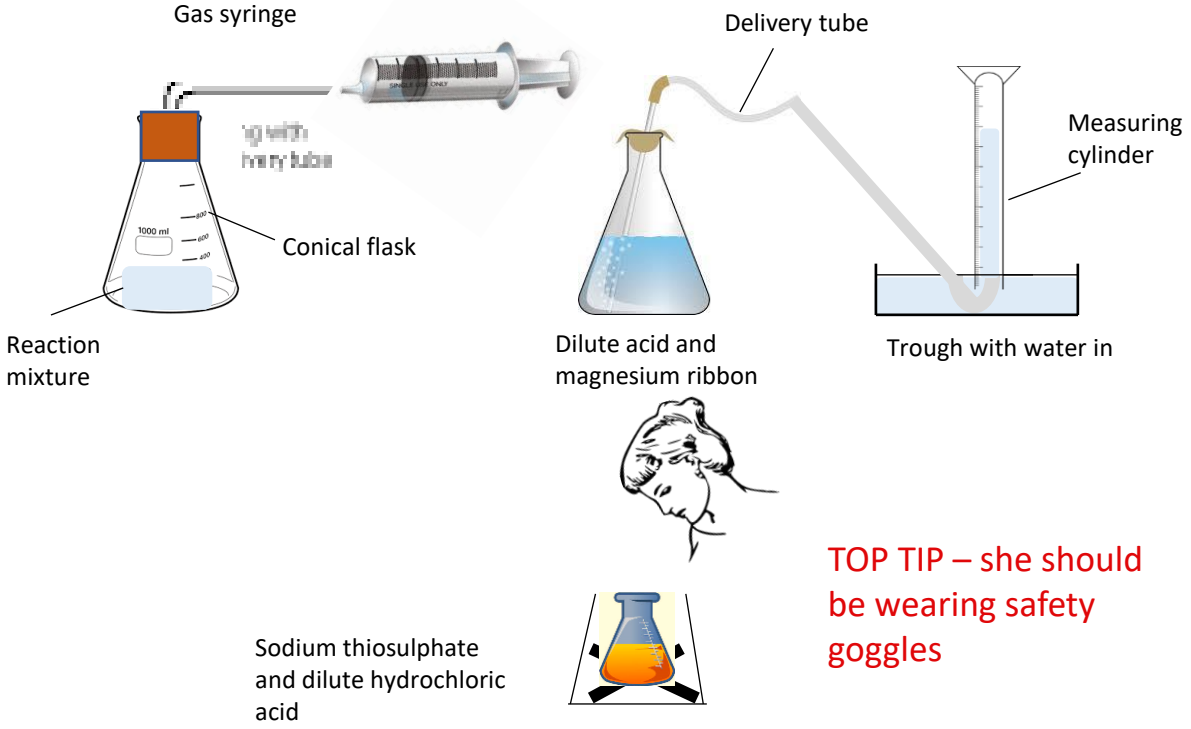
Measure changes in colour. This can be done by reacting different concentrations of sodium thiosulphate with hydrochloric acid placed on a cross. The solution will change from clear to cloudy as solid sulphur is produced, and the time taken for the cross to disappear can be measured.

You may be asked about:

- Control variables and why you need to keep them the same. Temperature needs to remain the same, as an increase in temperature will lead to an increase in reaction rate.
- Ways to reduce errors/reasons for anomalous results. You can discuss the difficulty of using the human eye to judge when the cross has disappeared, placing the bung quickly into the conical flask and starting the timer as soon as the reactants have been mixed.

Increasing the concentration will increase the rate of reaction. As the number of particles increase there will a greater chance of more successful collisions.

Diagram



TOP TIP – she should be wearing safety goggles

Practical 6: Chromatography

TOP TIP:
The stationary phase is the paper, and the mobile phase is the solvent.

What you need to know

To explain how paper chromatography can be used to separate and identify coloured substances.

You may be asked to explain why you carry out certain procedures in the method:

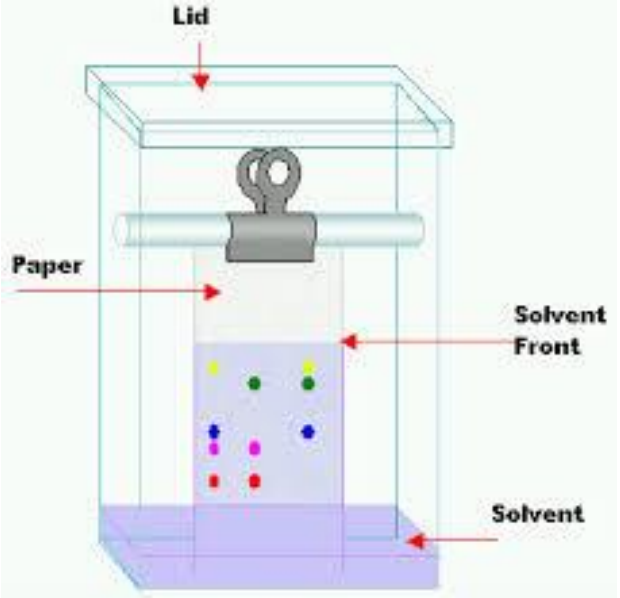
- The start line is drawn in pencil, because unlike ink, will not run in the solvent.
- A lid can be placed on top to prevent the solvent from evaporating.
- The paper should be removed once the solvent has travelled ¾ of the way up the paper. This will enable you to calculate an accurate R_f value.
- If a substance has not moved from the start line it may be insoluble in water – and another solvent such as alcohol should be used.

A paper chromatogram can be used to distinguish between pure and impure substances:

- a pure substance produces one spot on the chromatogram
- an impure substance produces two or more spots

A paper chromatogram can also be used to identify substances by comparing them with known substances. Two substances are likely to be the same if:

- they produce the same number of spots, and these match in colour
- the spots travel the same distance up the paper (have the same R_f value)



$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Practical 7: 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 – red, Na –yellow, K – lilac, Ca- orange/red, Ba – green , Cu – blue/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.

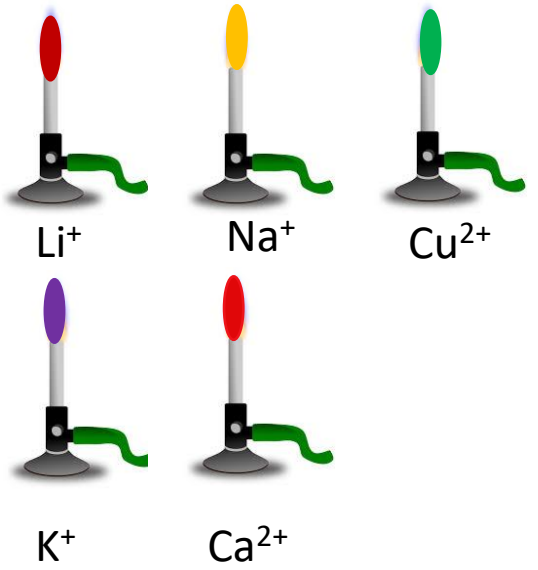
Result: A white precipitate forms if sulphate ions are present (as barium sulphate is formed)

- 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



Practical 8: Water purification

What you need to know

To describe how to analyse and purify water from different sources.

You test salt water for the presence of sodium and chloride ions. You then distil the water and test the water again. If the ions have been removed the water is now safe to drink.

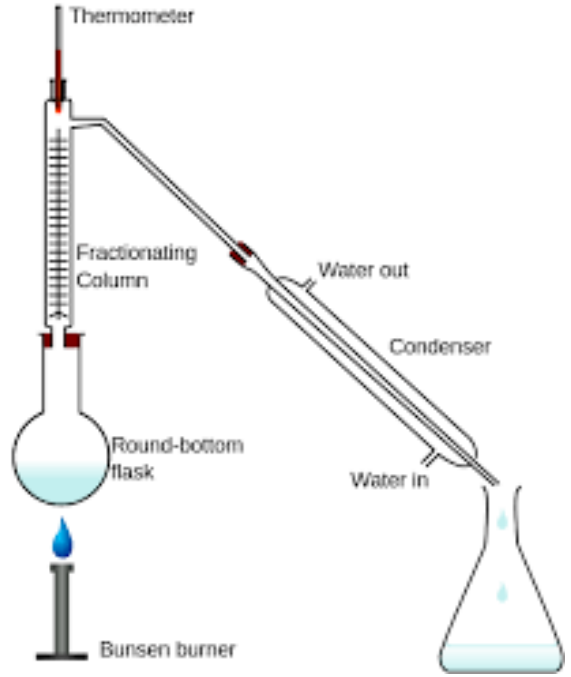
- Test for sodium ions by dipping nichrome wire into the saltwater solution and hold the tip of the wire in a blue Bunsen burner flame. A yellow flame produced confirms the presence of sodium ions.
- Test for chloride ions by adding a few drops of dilute nitric acid to the solution. Add some silver nitrate solution. A white precipitate confirms the presence of chloride ions.

The salt water can then be purified by distilling it using the apparatus shown. A mixture of ice and water is placed in the beaker to condense the steam.

The solution collected in the test tube can then be tested again for the presence of ions.

You may be asked to:

- Explain how distillation works. The water will evaporate at 100°C, then it condenses back into liquid as it cools down. The salts have a higher boiling point so will not evaporate.
- Explain that some water from the solution does not evaporate, some will stay in the tube, so not all water is collected from the solution.
- Explain that water is not purified using this method on a large scale. It would not be economical to do so, as it would cost too much to heat the water.



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Your turn:

1. Sodium thiosulphate reacts with dilute hydrochloric acid. State and explain the effect that increasing the temperature of the sodium thiosulphate solution has on the rate of reaction.

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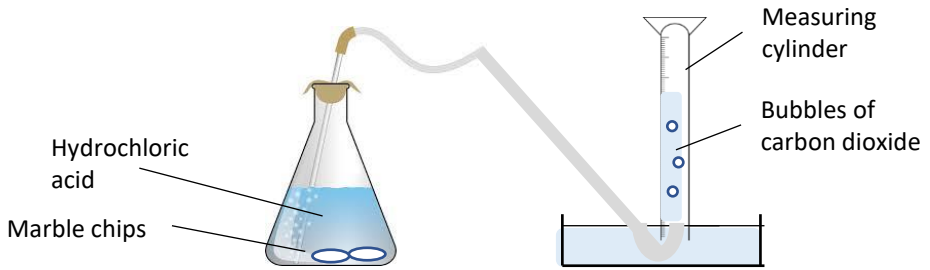
2. Libby decided to investigate the rate of reaction between marble chips (calcium carbonate) and hydrochloric acid.
The apparatus she used is shown below.



a) Explain why and how the rate of reaction changes during this reaction, in terms of particles.

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Your turn:

b) Libby also investigated how the rate of reaction changed when she changed the concentration of hydrochloric acid.
Write a method that Libby could used, including how you would carry out the investigation, the measurements you would make, and how to make it a fair test.

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3. Tom investigated the rate of reaction between sodium thiosulphate and dilute hydrochloric acid. He placed a conical flask on a cross and added the reactants.

The reaction produced a precipitate which made the mixture turn cloudy.
Tom measured how long it took until he could no longer see the cross.
He then calculated the rate of reaction.

a) The equation for the reaction is:

$Na_2S_2O_3$ (aq) + 2 HCl (aq) → 2NaCl (aq) + SO_2 (g) + H_2O (l)

Name the product that made the mixture go cloudy.
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b) Tom investigated how changing the temperature of the sodium thiosulphate solution changed the rate of reaction.
He plotted his results on a graph.

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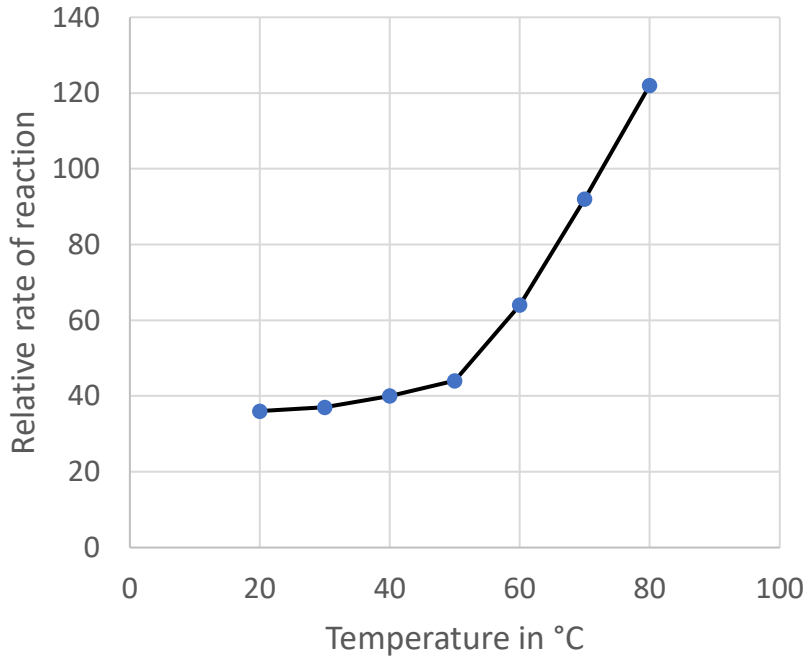
Your turn:



Describe the trends shown in Tom's results.

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c) Tom then investigated how changing the concentration of sodium thiosulphate altered the rate of reaction.

i) State two variables that he would have to control to make sure his results were valid.

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ii) He concluded correctly from his investigation:

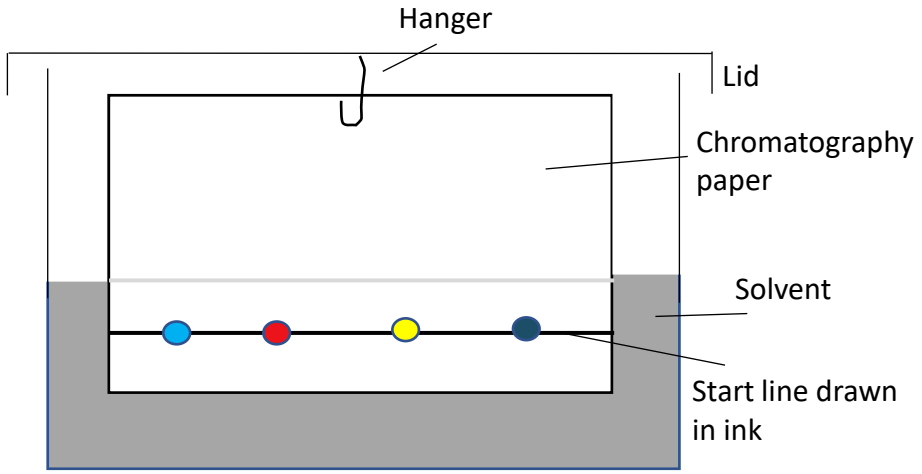
"As the concentration of sodium thiosulphate doubles, the rate of reaction also doubles"

Explain his conclusion in terms of particles.

……
……
……
……

Your turn:

4. Kaylee used paper chromatography to investigate the colours in different inks.
The apparatus she used is shown below.

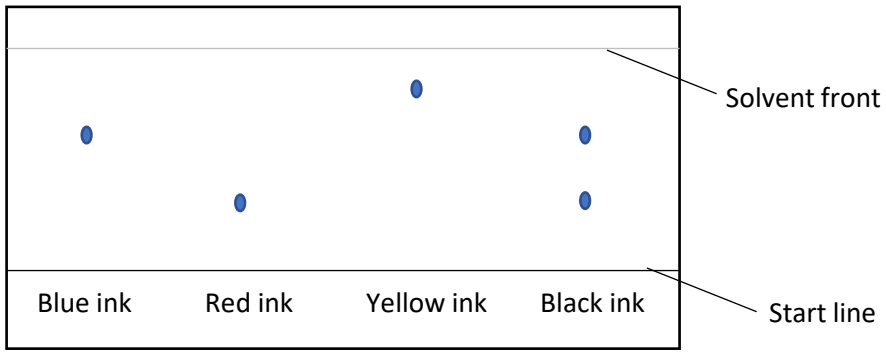


She made two mistakes when she set up the apparatus.
a) State the two mistakes, and describe the problem each mistake would cause.

Mistake 1 ……
Problem
……
……

Mistake 2 ……
Problem
……
……

b) She repeated the experiment without making any mistakes.



What colours are in the black ink?
……
c) Which ink is the most soluble in the solvent and explain your reason?
……
……

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Your turn:

5 . 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.

……
……
……
……
……
……
……
……
.

6 . 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……

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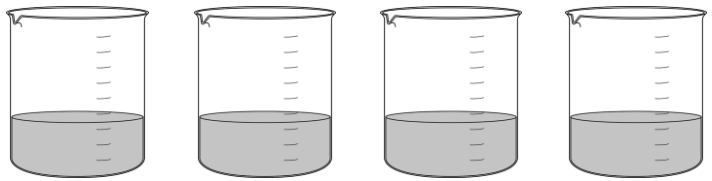
Your turn:

7. Harry was give four different colourless solutions in beakers.



He knew that the solutions were:

- Sodium iodide
- Sodium chloride
- Potassium carbonate
- Sodium carbonate

He planned a method he could use to identify each solution using the following reagents.

- Dilute nitric acid
- Silver nitrate solution

He also used a flame test to identify the positive ions. Describe a method he could use. Include the results of all the tests in your method.

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Answers:

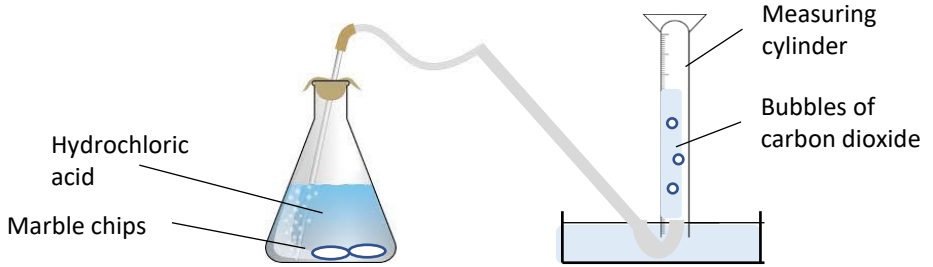
1. Sodium thiosulphate reacts with dilute hydrochloric acid. State and explain the effect that increasing the temperature of the sodium thiosulphate solution has on the rate of reaction.

Rate of reaction increases because particles move faster (or particles have more energy)

so frequency of collisions increases/particles are more likely to collide or there is more chance of collisions

more particles/collisions have energy greater than (or equal to) the activation energy

2. Libby decided to investigate the rate of reaction between marble chips (calcium carbonate) and hydrochloric acid.
The apparatus she used is shown below.



a) Explain why and how the rate of reaction changes during this reaction, in terms of particles.

The acid/marble/reactant is used up so the concentration decreases/surface area of marble decreases

so less frequent collisions /fewer collisions per second

so rate decreases/reaction slows down

Answers:

b) Libby also investigated how the rate of reaction changed when she changed the concentration of hydrochloric acid.
Write a method that Libby could used, including how you would carry out the investigation, the measurements you would make, and how to make it a fair test.

- add magnesium to acid
- time reaction / 'count bubbles' / measure volume of gas
- change concentration of acid

Control Variables:

- amount / mass / length / same 'size' of magnesium
- volume / amount of acid

3. Tom investigated the rate of reaction between sodium thiosulphate and dilute hydrochloric acid. He placed a conical flask on a cross and added the reactants.

The reaction produced a precipitate which made the mixture turn cloudy.
Tom measured how long it took until he could no longer see the cross.
He then calculated the rate of reaction.

a) The equation for the reaction is:

$$Na_2S_2O_3\ (aq) + 2\ HCl\ (aq) \quad 2NaCl\ (aq) + SO_2\ (g) + H_2O\ (l)$$

Name the product that made the mixture go cloudy.

sulphur

b) Tom investigated how changing the temperature of the sodium thiosulphate solution changed the rate of reaction.
He plotted his results on a graph.

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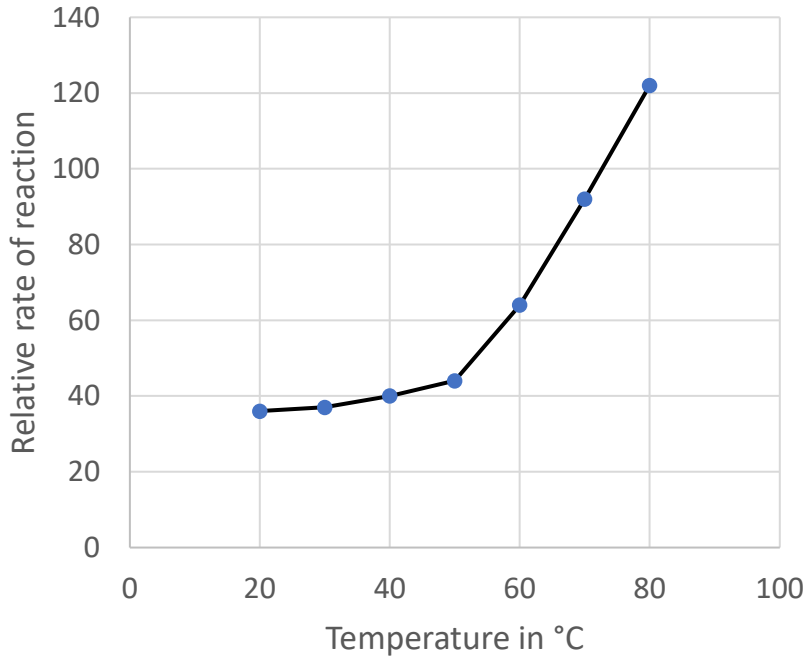
Answers:



Describe the trends shown in Tom's results.

As the temperature increases, the rate of reaction increases

The rate of increase increases (starts slowly then increases more rapidly)

c) Tom then investigated how changing the concentration of sodium thiosulphate altered the rate of reaction.

i) State two variables that he would have to control to make sure his results were valid.

temperature (of the reactants)

concentration of hydrochloric acid

volume of hydrochloric acid/sodium thiosulfate/total volume of solution

the (size/darkness/thickness of the) cross

ii) He concluded correctly from his investigation:

"As the concentration of sodium thiosulphate doubles, the rate of reaction also doubles"

Explain his conclusion in terms of particles.

As the concentration increases the number of particles per unit volume increases or particles are closer together.

(therefore) the frequency of (successful) collisions increases

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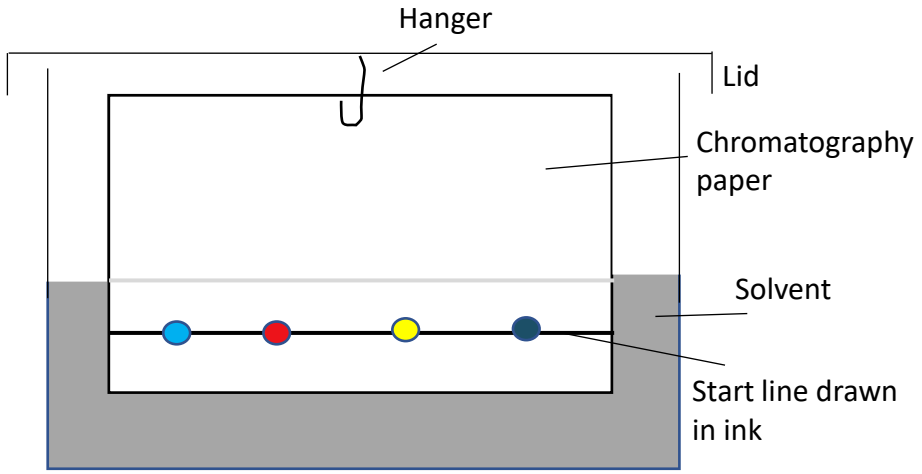
Answers:

4. Kaylee used paper chromatography to investigate the colours in different inks.
The apparatus she used is shown below.

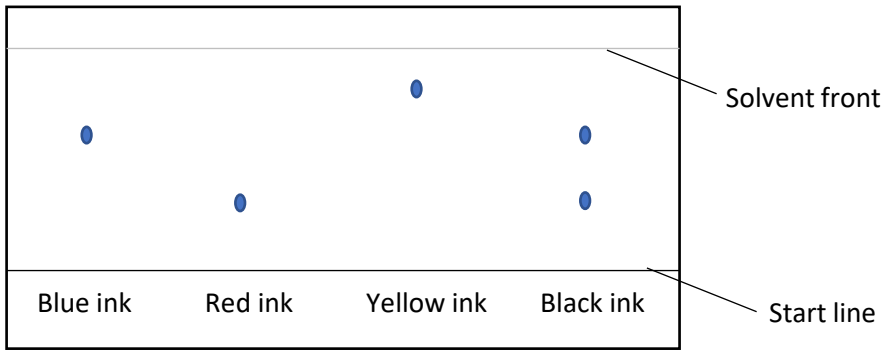


She made two mistakes when she set up the apparatus.
a) State the two mistakes, and describe the problem each mistake would cause.

Mistake 1 ..Start line is below solvent level.....
Problem
.....Samples would wash off.....
.....

Mistake 2 ..Start line drawn in ink.....
Problem
.....The ink would run.....
.....

b) She repeated the experiment without making any mistakes.



What colours are in the black ink?
.....Red and blue.....

c) Which ink is the most soluble in the solvent and explain your reason?
.....Yellow.....
.....Travels furthest up the paper.....

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Answers:

5 . 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

.

6. 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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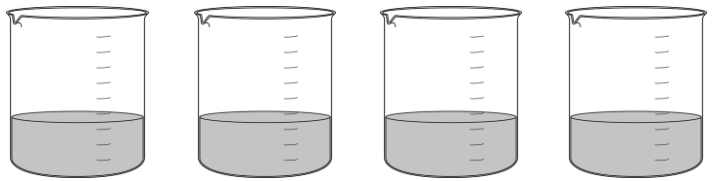
Answers:

7. Harry was give four different colourless solutions in beakers.



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- Sodium iodide
- Sodium chloride
- Potassium carbonate
- Sodium carbonate

He planned a method he could use to identify each solution using the following reagents.

- Dilute nitric acid
- Silver nitrate solution

He also used a flame test to identify the positive ions. Describe a method he could use. Include the results of all the tests in your method.

Test: add nichrome wire (for the flame test)
(any method of introducing the solution into the flame, eg a splint soaked in the solution or sprayed from a bottle)
Result: the sodium compounds result in a yellow / orange / gold flame or the potassium compound results in a lilac / purple / mauve flame

Test: add dilute nitric acid to all four solutions [allow any acid]
Result: sodium carbonate and potassium carbonate will effervesce or sodium chloride and sodium iodide will not effervesce

Test: add dilute nitric acid followed by silver nitrate
Result: sodium chloride and sodium iodide produce a precipitate or sodium chloride produces a white precipitate and sodium iodide produces a yellow precipitate
accept sodium carbonate and potassium carbonate do not produce a precipitate

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