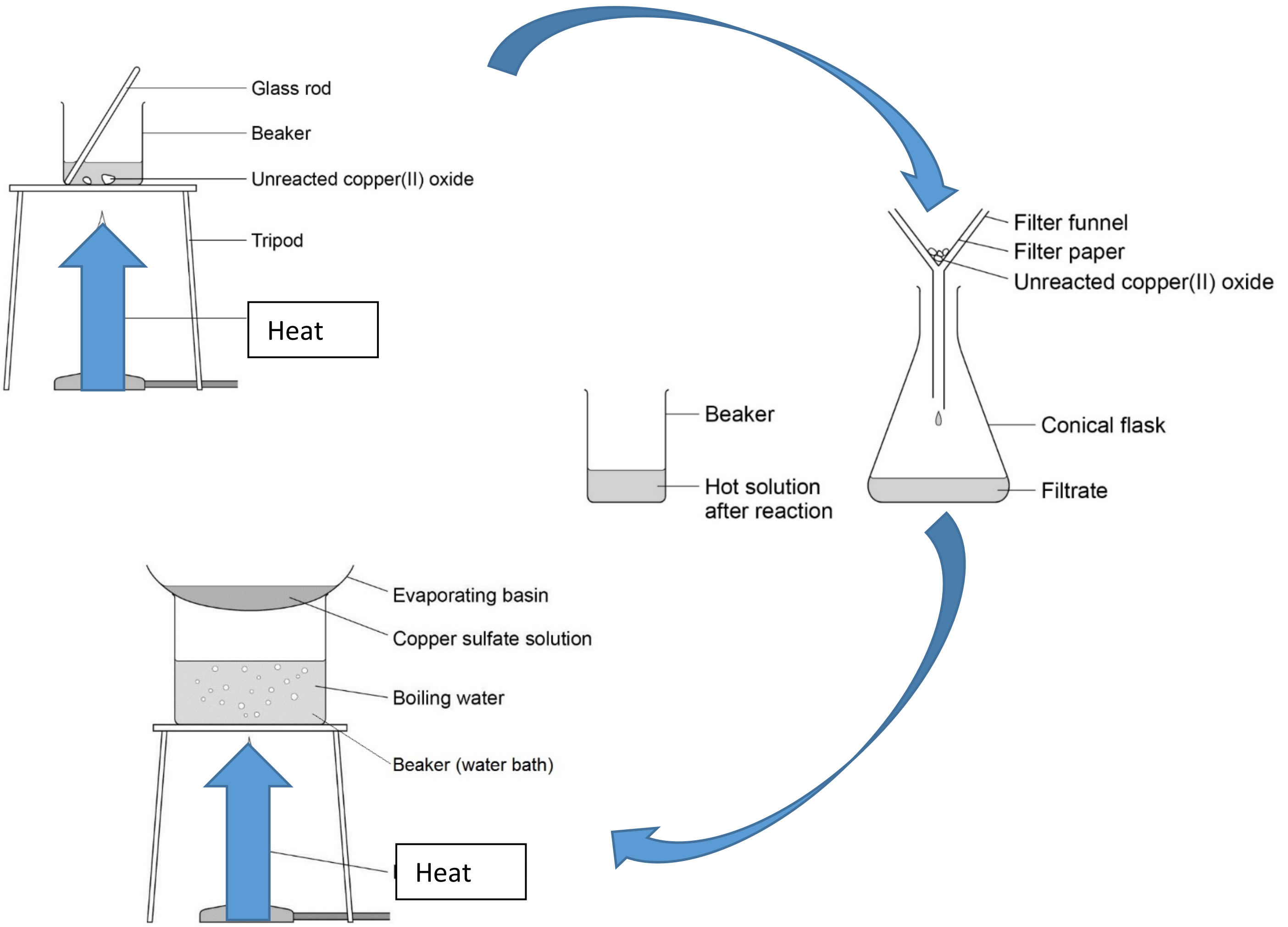
Required Practical Review

Chemistry Practical – making a salt

Free science lessons: https://www.youtube.com/watch?v=9GH95172Js8
GCSEpod: https://members.gcsepod.com/shared/podcasts/title/12343

Know it

1. Heat sulfuric acid gently.
2. Add small amounts of copper (II) oxide. Stir.
3. Continue to add copper (II) oxide until some of it remains after stirring.
4. Allow apparatus to cool.
5. Filter the solution to remove the excess copper oxide.
6. Transfer to evaporating basin.
7. Evaporate this gently using a water bath. Stop heating once crystals start to form.
8. Transfer to the crystallising dish. Leave this in a cool place for at least 24 hours.
9. Carefully remove the crystals with a spatula.
10. Gently pat the crystals of copper (II) sulfate dry between two pieces of filter paper.



Review it

Complete the tasks below in your book:

Up to grade 4

- What safety precautions should you take when carrying out this experiment & why?
- Why was it necessary to warm the sulfuric acid?
- What colour was the copper sulfate solution that formed

Grade 5-7

- Why was it necessary to add copper oxide until it was present in excess?
- How did you know when the copper oxide was present in excess?
- How did you separate the excess copper oxide from the copper sulfate solution?
- What is meant by the filtrate?
- What is meant by the residue?

Grade 7+

- What is the filtrate in this experiment?
- What is the residue in this experiment?
- Why is a water bath used to evaporate the water from the copper sulfate solution instead of heating the evaporating basin directly with a Bunsen burner?
- Why should you not evaporate all of the water from the copper sulfate solution?

Test it & Mark it

Answer the exam questions below in your book:

1 Rock salt contains sodium chloride and sand.

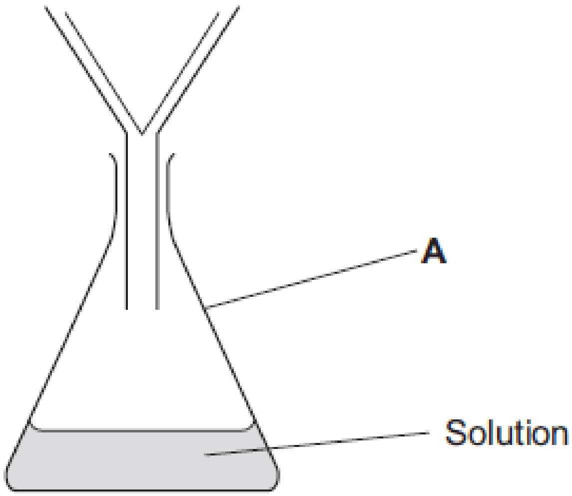
A student tried to obtain pure sodium chloride from rock salt.

This is the method he used:

Step 1 Add the rock salt to water to dissolve the sodium chloride.

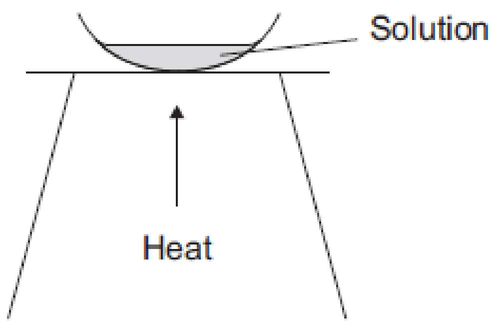
Step 2 Pour the mixture into the apparatus as shown in **Figure 1**.

Figure 1



Step 3 Heat the solution obtained using the apparatus shown in **Figure 2**.

Figure 2



1 (a) Give **two** ways the student could speed up the dissolving in **Step 1**.

[2 marks]

1 ____

2 ____

1 (b) (i) What is the name of the process shown in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

Dissolving ☐

Filtration ☐

Funnelling ☐

1 (b) (ii) What is the name of the apparatus labelled **A** in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

Flask ☐

Funnel ☐

Sieve ☐

1 (b) (iii) What **two** substances are in the solution labelled in **Figure 1**?

[1 mark]

______________________ and ______________________

1 (c) What is the name of the process shown in **Figure 2**?

[1 mark]

Tick (✓) **one** box.

Distillation ☐

Electrolysis ☐

Evaporation ☐

1 (d) **Figure 3** shows the result of the student's experiment.

Figure 3

What are the crystals shown in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

Ice ☐

Rock salt ☐

Sand ☐

Sodium chloride ☐

1(a)	any **two** from: • heat • stir • grind up the rock salt	allow increase/raise temperature allow shake/swirl allow use smaller bits or use rock salt with a larger surface area ignore changing volume of water or changing amount of rock salt	2	AO1 14.2a
1(b)(i)	Filtration		1	AO1 14.2a
1(b)(ii)	Flask		1	AO1 14.2a
1(b)(iii)	sodium chloride and water	accept correct formulae allow salt do not allow rock salt either order	1	AO2 14.2a
1(c)	Evaporation		1	AO1 14.2a
1(d)	Sodium chloride		1	AO2 14.2a

5 (b) A student made a solution of copper chloride.

This is the method he used.

- Put 25 cm^3 of dilute hydrochloric acid into a beaker.
- Add one spatula of solid copper oxide.
- Heat until all the copper oxide has reacted.

5 (b) (i) What **two** further steps should the student do to make sure that all the hydrochloric acid had reacted and to obtain only copper chloride solution?

[2 marks]

Step 1 ____

____

Step 2 ____

____

5 (b) (ii) What technique could the student use to obtain solid copper chloride from a solution of copper chloride?

[1 mark]

Tick (✓) **one** box.

Chromatography ☐

Crystallisation ☐

Precipitation ☐

5 (c) Hydrochloric acid neutralises potassium hydroxide, as shown in the equation.

$$HCl(aq) + KOH(aq) \longrightarrow KCl(aq) + H_2O(l)$$

5 (c) (i) Write the ionic equation for a neutralisation reaction.

[1 mark]

___

5 (c) (ii) Calculate the percentage by mass of potassium in potassium hydroxide (KOH).

Relative atomic masses (A_r): H=1; O=16; K=39

[2 marks]

___

___

Percentage = ____________ %

5(b)(i)	add excess copper oxide then filter	allow add copper oxide until no more reacts mp 2 depends on mp 1 allow keep adding copper oxide and test with universal indicator until it turns green or is neutralised for **1** mark	1 1	AO3 5.1a, b 5.2a
5(b)(ii)	Crystallisation		1	AO1 5.2b, 14.2a
5(c)(i)	$H^+ + OH^- \rightarrow H_2O$	ignore state symbols even if incorrect	1	AO1 5.1g
5(c)(ii)	69.6(%)	correct answer with or without working gains **2** marks if answer is incorrect, allow **1** mark for either of the steps below: M_r of KOH = 56 39 / incorrect M_r × 100 allow **1** mark if student has correctly calculated the percentage of the wrong element	2	AO2 1.3d

3 (c) Barium sulfate is an insoluble salt.

Barium sulfate can be made by adding barium hydroxide solution to dilute sulfuric acid.

The balanced chemical equation for the reaction is:

$$H_2SO_4(aq) + Ba(OH)_2(aq) \longrightarrow BaSO_4(s) + 2\,H_2O(l)$$

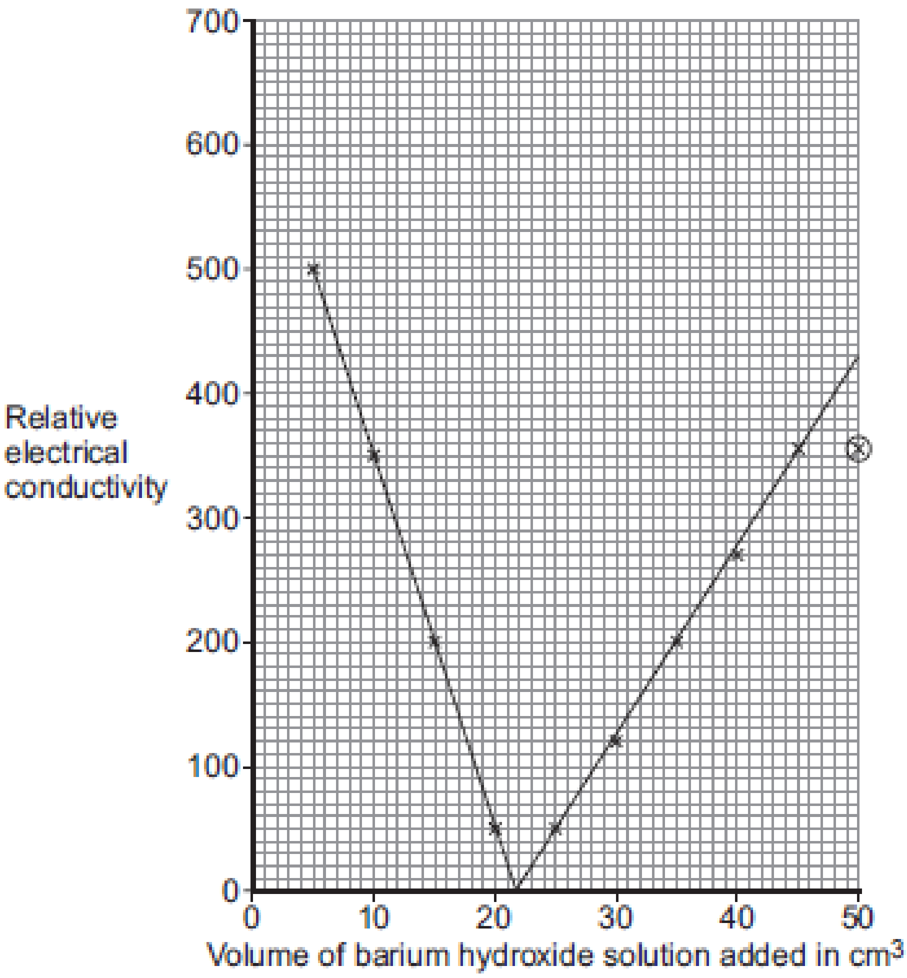
A student investigated how the electrical conductivity of dilute sulfuric acid changed as barium hydroxide solution was added.

This is the method she used.

Step 1 Place 25.0 cm^3 of dilute sulfuric acid in a conical flask.
Step 2 Add 5.0 cm^3 of barium hydroxide solution.
Step 3 Stir the mixture.
Step 4 Use a conductivity meter to measure the electrical conductivity of the mixture.
Step 5 Repeat Step 2, Step 3 and Step 4 until 50 cm^3 of barium hydroxide solution have been added.

The student's results are shown on the graph in **Figure 6**.

Figure 6



3 (c) (i) The ringed point on the graph is anomalous.

What could have happened to cause the anomalous point?

Tick (✓) **one** box.

[1 mark]

No more barium hydroxide solution was added. ☐

Too much barium hydroxide solution was added. ☐

Too much dilute sulfuric acid was used. ☐

3 (c) (ii) Use the graph in **Figure 6** to estimate the relative electrical conductivity of the dilute sulfuric acid before any barium hydroxide solution was added.

Show your working on the graph.

[2 marks]

Relative electrical conductivity = ...

3 (c) (iii) Explain why dilute sulfuric acid conducts electricity.

[2 marks]

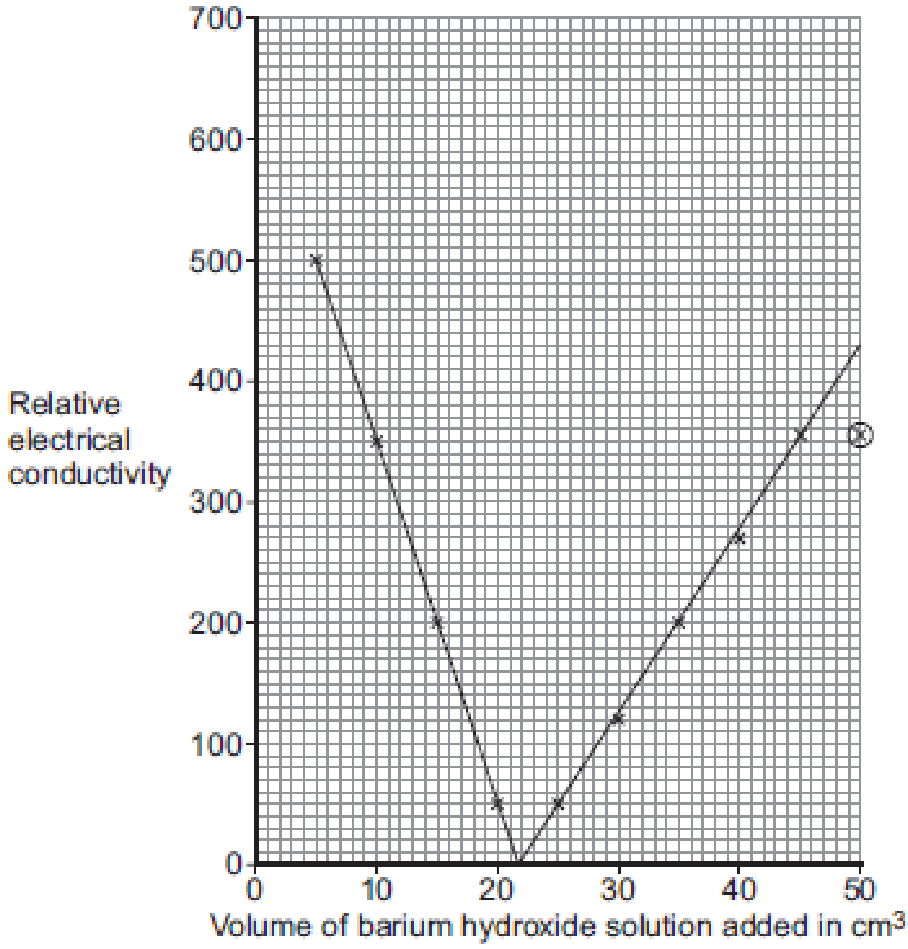
....

....

....

....

3 (d) **Figure 6** has been reprinted here to help you to answer the questions.



3 (d) (i) What was the volume of barium hydroxide solution added when the relative electrical conductivity of the mixture was zero?

[1 mark]

Volume of barium hydroxide solution = ... cm^3

3 (d) (ii) Suggest why the relative electrical conductivity became zero.

[1 mark]

....

....

....

3 (e) The student did another experiment using the same solutions as she used before.

She used the same volume (25.0 cm^3) of dilute sulfuric acid in the conical flask.

She then added an unknown volume of barium hydroxide solution.

She found that the relative electrical conductivity of the mixture was 260.

This is the student's conclusion:

13 cm^3 of barium hydroxide solution must have been added.

3 (e) (i) Why may the student's conclusion **not** be correct?

[1 mark]

....

....

3 (e) (ii) The student said that she could check whether she was correct by adding something to the mixture.

What could she add to the mixture? How would this tell her whether she was correct?

[3 marks]

....

....

....

....

....

....

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(c)(i)	No more barium hydroxide solution was added		1	AO3 5.2c
3(c)(ii)	correct extrapolation shown on graph 640	correct answer with no extrapolation shown gains **1** mark	1 1	1AO1/ 1AO2 5.2c
3(c)(iii)	contains <u>ions</u> which are able to move	second mark dependent on having ions	1 1	AO1 2.2b
3(d)(i)	21.5 (cm^3)	accept 21 to 22	1	AO2 2.2b
3(d)(ii)	no dissolved (ionic) substance **or** ions cannot move **or** liquid is water **or** no ions <u>in solution</u>		1	AO2 2.2b, 2.2e
3(e)(i)	could have added 39 cm^3 **or** another volume gives the same conductivity		1	AO3 2.2b, 2.2e
3(e)(ii)	add (more) barium hydroxide a small volume if she is correct this will cause the conductivity to drop **or** allow add a named indicator correct acid colour for this indicator some acid remains in solution	if specified the volume must be less than 26 cm^3	1 1 1	AO3 2.2b, 2.2e