

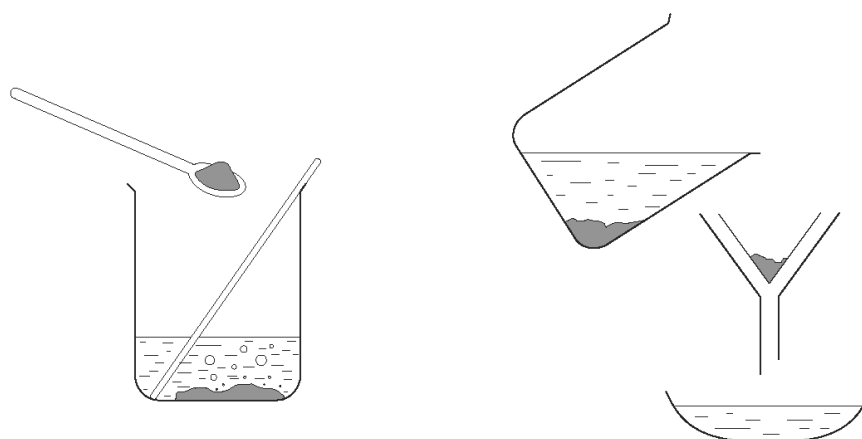
PAG C7 Production of Salts

Question	Maximum Mark	Mark Awarded
1	6	
2	5	
3	6	
4	6	
5	6	
Total Mark		

1.

Copper sulfate crystals can be prepared by reacting copper carbonate with dilute sulfuric acid.

The unlabelled diagrams below show two of the three stages involved.



Describe the preparation of copper sulfate crystals by this method.
Include in your answer what you would expect to see at each stage.

[6 QWC]

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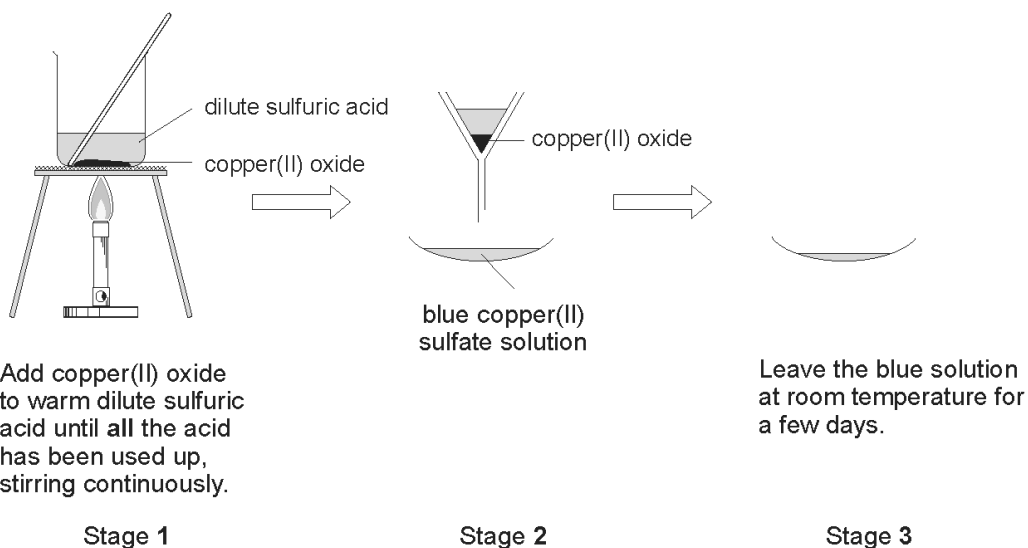
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2.

One method of preparing a salt is by reacting a base with a dilute acid. The information below shows the stages a pupil follows to make a salt.



Use the information in the diagrams to answer the following questions.

(a) State what the pupil can see when all the acid has been used up. [1]

(b) (i) Name the process used in stage 2. [1]

(ii) Name the substance removed during stage 3. [1]

(c) (i) Give the name of the base used in this experiment. [1]

(ii) Give the name of the salt formed in this experiment. [1]

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3.

Copper(II) sulfate was made by reacting copper(II) carbonate with an acid.

(a) Give the name of the acid used. [1]

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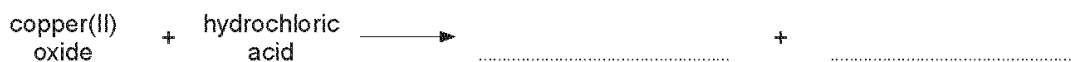
(b) The first stage of the preparation is the addition of excess copper(II) carbonate to the acid. Give two observations that show a reaction is taking place. [2]

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(c) Describe how you would prepare copper(II) sulfate crystals from the mixture in part (b). [2]

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(d) A different salt can be made by reacting copper(II) oxide with dilute hydrochloric acid. Complete the word equation for the reaction that takes place. [1]



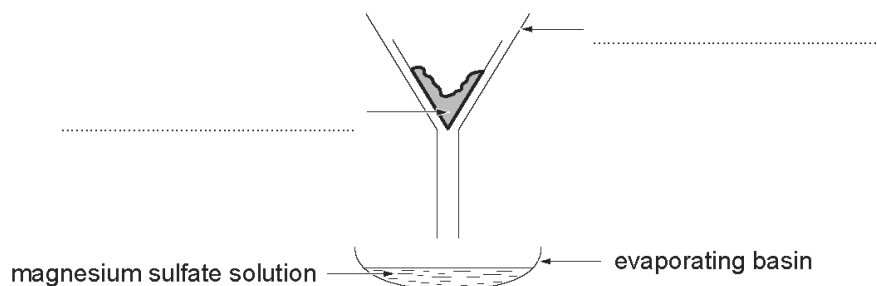
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4. Magnesium sulfate can be made by adding excess magnesium oxide to sulfuric acid. Magnesium oxide is insoluble in water.

(a) State why excess magnesium oxide is added. [1]

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(b) The following apparatus could be used to remove the excess magnesium oxide from the solution. Complete the labelling of the diagram. [2]



(c) State how you can obtain crystals from the solution. [1]

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(d) Complete the word equation for the reaction. [1]



(e) If the reaction was carried out with hydrochloric acid, instead of sulfuric acid, magnesium chloride would be formed.

Write the chemical formula for magnesium chloride. [1]

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5.

Sodium chloride is made when sodium hydroxide solution reacts with dilute hydrochloric acid.



Describe a laboratory method for making **crystals** of pure sodium chloride from sodium hydroxide solution and dilute hydrochloric acid. [6 QWC]

Diagrams may be used as part of your answer.

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Marking Scheme

1.

Question Number		Mark	
FT	HT		
10	4	6	<p>Indicative content: a description of the reaction between the carbonate and the acid – apparatus named, effervescence, exothermic, the formation of blue coloured copper sulfate solution and the addition of excess of the copper carbonate. The removal of the excess copper carbonate by filtration. Obtaining the crystals by evaporation. Either allowing the solution to evaporate at room temperature or by heating the solution and allowing the remaining solution to evaporate naturally to dryness. Credit to be given for word/symbol equation.</p> <p>5 – 6 marks: The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3 – 4 marks: The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1 – 2 marks: The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

2.

Question Number		Sub-section	Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT						
1		(a)		copper oxide / (black) solid remains copper oxide / (black) solid stops reacting		an excess blue solution	
		(b)	(i)	1	filter / filtration / filtering		
			(ii)	1	water / H ₂ O (ignore incorrect formula if given with correct name)		
		(c)	(i)	1	copper oxide / CuO (ignore incorrect formula if given with correct name)		
			(ii)	1	copper sulfate / CuSO ₄ (ignore incorrect formula if given with correct name)	water	

3.

Question Number		Sub-section	Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT						
	5	(a)	1	sulfuric	H ₂ SO ₄		
		(b)	2	any 2 of 3 points for (1) each bubbles / fizzing / effervescence (1) blue solution / colour change (1) temperature increases (1)			
		(c)	2	filter (1) evaporate water / evaporate some of solution / evaporate overnight / evaporate in warm place (1)	leave for length of time in warm place		
		(d)	1	copper(II) chloride + water	CuCl ₂ + H ₂ O		

4.

Question Number		Sub-section	Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT						
4		(a)	1	to use up / to neutralise / remove (all) the acid	to react with all the acid		to use it all up
		(b)	2	(filter) funnel (1) magnesium oxide (1)	MgO	filter solid	
		(c)	1	mark credited for process or how it is carried out i.e. evaporate or leave on window sill / in a warm place / leave for a length of time	heat / boil	leave it	
		(d)	1	magnesium sulfate + water	MgSO ₄ + H ₂ O		
		(e)	1	MgCl ₂			

5.

Question Number			Mark	Answer
FT	HT			
	9	6	<p>Indicative content appropriate apparatus required, measured amount of alkali (or acid) in conical flask, add indicator <i>e.g. phenolphthalein</i>, add acid (alkali), drop-wise near end point/colour change, record volume of acid (alkali) added, repeat without indicator adding recorded volume of acid (alkali), boil off some of the water, leave solution to evaporate, dry crystals obtained</p> <p><i>Credit awarded for sequenced labelled diagrams as part of the response.</i></p> <p>5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	