

**COMPONENT 2 - Applications in Chemistry**

**FOUNDATION TIER**

**MARK SCHEME**

**GENERAL INSTRUCTIONS**

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

### Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

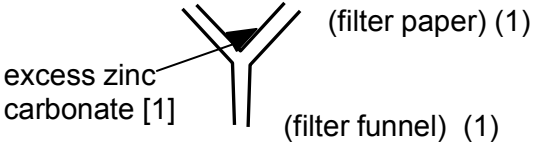
### Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao	=	correct answer only
ecf	=	error carried forward
bod	=	benefit of doubt

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
<b>1</b>	(a)			All connected correctly (2) Any two lines drawn correctly (1)	2			2		
	(b)	(i)		Distillation	1			1		
		(ii)		Chromatography	1			1		
		(iii)		Filtration	1			1		
				<b>Question 1 total</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>5</b>

Question				Marking details				Marks Available					
								AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Detergent 13/14 alkali both needed for [1] Distilled water green neutral both needed for [1] Soap blue alkali both needed for [1]	1	2		3		3			
	(b)	(i)		final temperature 42 [1] temperature rise 26 [1]		2		2		2			
		(ii)		Plotting - All correct [2] any five correct [1] $\pm 0.02$ Allow e.c.f for point 12 cm  Line - straight line of best fit ( ruler) Judgement by eye Allow - e.c.f. for point 12 cm		3		3	3				
		(iii)		10.5 $\pm$ 1 e.c.f.		1		1	1				
	(iv)		Temperature rises are lower $\checkmark$ (1)  Weaker acid / lower pH (1) Do not accept 'less concentrated'	1	1		2						
			<b>Question 2 total</b>	<b>2</b>	<b>9</b>	<b>0</b>	<b>11</b>	<b>4</b>	<b>5</b>				

Question		Marking details		Marks available							
				AO1	AO2	AO3	Total	Maths	Prac		
3	(a)			solid (left at bottom of beaker / zinc carbonate left at bottom of beaker)		1			1		1
	(b)			to neutralise all the acid / to cancel out all the acid		1			1		1
	(c)			 (filter paper) (1) (filter funnel) (1)		3			3		3
	(d)			1 week ✓			1		1		1
				<b>Question 3 total</b>		<b>5</b>	<b>1</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		98.7 (3) If answer is incorrect award  1.48/1.5 x 100 (1)  98.66 (1)		3		3	3	
	(b)		Yes - any sensible decision e.g. 'only 1.3%' / 'difference due to procedural errors' / 'poor experimental method' Accept 'no' with sensible decision e.g. '1.3%'			1	1		1
	(c)		not all manganese oxide recovered during filtering (1)..... .....wash beaker out with water (to retrieve all manganese oxide) (1)			2	2		2
			<b>Question 4 total</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>3</b>	<b>3</b>

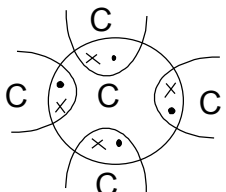
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			carbonate present/ $\text{CO}_3^{2-}$ present (1)			1	3		3
				sodium present / $\text{Na}^+$ present (1)			1			
				sodium carbonate (allow ecf) (1)			1			
	(b)			Remove barium: Add solution of sodium sulfate (1) Filter off precipitate of barium sulfate (1)			1 1	4		4
				Test for magnesium ions by adding sodium carbonate solution Also allow sodium/potassium hydroxide solution in place of sodium carbonate solution (1)	1		1			
				White precipitate if $\text{Mg}^{2+}$ present (1)						
				<b>Question 5 total</b>	<b>1</b>	<b>0</b>	<b>6</b>	<b>7</b>	<b>0</b>	<b>7</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				mass = $1.06 \times 25/1000$ (1) =0.0265 g and 26.5 mg (accept ecf for answer in mg) Must give units in <b>both</b> cases for 2 marks. No units in either or both cases then only 1 mark for each correct numerical answer	1	3		4	2	4
				<b>Question 6 total</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>4</b>



Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
7			<p><b>Indicative content:</b>  <b>AO1 allocation -</b>            Description of method:                dissolve salts in water                add each metal to solution of other two aqueous metal solutions            Expected observations                copper to solutions of iron &amp; magnesium salts no change                iron and copper(II) sulfate – solution turns colourless, coppery coloured deposit. No change with Mg salt                magnesium to iron(II) and copper salts. Solutions turn colourless. Coppery coloured deposit with copper(II) solution</p> <p><b>AO2 allocation -</b>            Explanation                in terms of displacement reactions; order metals in reactivity series                relevant equations</p> <p><b>5 – 6 marks:</b>            Explanation of displacement, correct observations; correct conclusion; three relevant equations  <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument</i></p> <p><b>3 – 4 marks:</b>            All reactions to be done given; some outcomes correct; conclusion given  <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.</i></p>	4	2		6		6

				<p><b>1 – 2 marks:</b> Some reactions to be done given; few outcomes correct; conclusion attempted <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.</i> <b>0 marks:</b> No attempt made or no response worthy of credit.</p>						
				<b>Question 7 total</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
8	(a)		Covalent bonding (1) Each carbon atom shares electron pairs with four other carbon atoms (1)  (1)	1			3		
				1					
					1				
	(b)	(i)	Three valence electrons of carbon are used up in forming the covalent bonds (1) The fourth electron is delocalised and able to move (1)	2			2		
		(ii)	In graphite, the carbon atoms are arranged in flat parallel layers attracted to adjacent layers by <u>weak</u> forces (1) This allows each layer to slide over the other easily (1)	2			2		
		(iii)	0.047 nm <sup>3</sup> Both answer and unit required		1		1	1	

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)		Number carbon atoms = $720/12$ (1) Molecular formula $C_{60}$ (1) (allow error carried forward)		1	1	2		
	(d)	(i)	$3\ 620/1.44$ (1) $= 2\ 514$ (1) Estimate of approx. $251/252$ (also allow error carried forward - accept value if it is clearly 10:1 ratio of specific strength)		3		3	3	
		(ii)	Carbon nanotubes have a much higher strength-to-weight ratio (1) So will be stronger and lighter (1)			2	2		
			<b>Question 8 total</b>	<b>6</b>	<b>6</b>	<b>3</b>	<b>15</b>	<b>4</b>	<b>0</b>