

**UNIT 3: PRACTICAL ASSESSMENT****INVESTIGATING THE REACTION BETWEEN ZINC AND COPPER SULFATE SOLUTION****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.

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

## SECTION A

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
1	(a)	<p>Copper sulfate risk: copper sulfate could get onto skin when being added to cup <b>and</b>            Copper sulfate control measure: wash hands immediately if any copper sulfate gets on to them/ wear laboratory gloves  <b>OR</b>            Copper sulfate risk: copper sulfate could get transferred from hands to eyes <b>and</b>            Copper sulfate control measure: wear eye protection (1)</p>	1			1		1
	(b)	<p>All data recorded and logically organised (1)            Headings – number of spatulas/ temperature/ temperature increase (1)            Units – °C (1)            Temperature rise calculated correctly (1)            Temperature rise means calculated correctly (1)</p>	1 1 1	1 1		5	2	5
<b>Section A total</b>			<b>4</b>	<b>2</b>	<b>0</b>	<b>6</b>	<b>2</b>	<b>6</b>

## SECTION B

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	Independent variable - Number of spatulas (1) Dependent variable - Temperature rise (1)	2			2		2
		(ii)	<b>Any 2 x (1) from:</b> <ul style="list-style-type: none"> <li>• Zinc + 1 microspatula</li> <li>• Copper sulfate volume + 50 cm<sup>3</sup></li> <li>• Copper sulfate concentration + 0.5 M</li> </ul>	2			2		2
	(b)		Axes labelled correctly with units (1) Scales & use of at least ½ of graph paper (1) All plots correctly plotted with ± ½ small square tolerance (2) 1 error (1) >1 error (0) Smooth curve of best fit within ± ½ small square division of all points (1) Don't accept thick, double, wispy line	1 1	2		5	5	5
	(c)		As more zinc is added there is an increase in temperature (1) To a given value (corresponding to graph) (1)		2		2		2
	(d)		To reduce heat losses to the surroundings		1		1		1
	(e)	(i)	Put a lid on the polystyrene cup/increase the insulation (1) Stirring (1)			2	2		2
		(ii)	Any 2 suitable inaccuracies (1) + improvement (1) masses of zinc on spatula vary (1) weigh out equal amounts of the zinc (1) <b>OR</b> thermometer only accurate to nearest °C (1) thermometer/ digital thermometer with higher resolution/ smaller divisions (1) <b>OR</b> measuring cylinder only accurate to nearest cm <sup>3</sup> (1) measuring cylinder with higher resolution/ smaller divisions (1)			4	4		4
	(f)		Exothermic	1			1		1

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(g)			Energy is needed to break bonds and energy is released when bonds are made (1) In this reaction <b>more</b> energy is released when bonds are made than is needed to break bonds (1)		2		2		2
	(h)			Correct calculation of $\Delta T$ (1) Correct substitution of figures (1) Correct calculation of $E$ (1)	1	1		3	3	3
				<b>Section B total</b>	<b>8</b>	<b>10</b>	<b>6</b>	<b>24</b>	<b>8</b>	<b>24</b>

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