



# Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE in  
Chemistry (4CH1)  
Paper 1C

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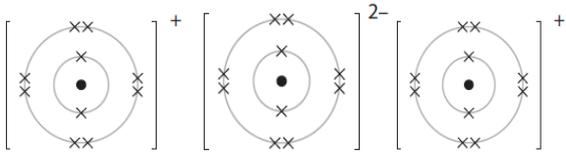
## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 (a)	(i) argon / helium	ACCEPT Ar / He	1
	(ii) nitrogen	ACCEPT N <sub>2</sub>	1
	(iii) carbon dioxide	ACCEPT CO <sub>2</sub>	1
	(iv) carbon dioxide	ACCEPT CO <sub>2</sub>	1
(b)	(i) $S + O_2 \rightarrow SO_2$		1
	(ii) acid rain	ACCEPT an adverse effect of acid rain e.g. kills fish, damages plants, corrodes limestone/marble buildings/statues etc.  IGNORE toxic/pollutant	1
			<b>Total 6</b>

Question number	Answer	Notes	Marks										
2 (a)	<table border="1" data-bbox="419 320 1046 810"> <tr> <td data-bbox="419 320 895 421">name of the part of the atom labelled Z</td> <td data-bbox="895 320 1046 421">nucleus</td> </tr> <tr> <td data-bbox="419 421 895 521">number of protons in this atom</td> <td data-bbox="895 421 1046 521">12</td> </tr> <tr> <td data-bbox="419 521 895 622">number of the group that contains this element</td> <td data-bbox="895 521 1046 622">2</td> </tr> <tr> <td data-bbox="419 622 895 723">number of the period that contains this element</td> <td data-bbox="895 622 1046 723">3</td> </tr> <tr> <td data-bbox="419 723 895 810">charge on the ion formed from this atom</td> <td data-bbox="895 723 1046 810">2+</td> </tr> </table>	name of the part of the atom labelled Z	nucleus	number of protons in this atom	12	number of the group that contains this element	2	number of the period that contains this element	3	charge on the ion formed from this atom	2+	ACCEPT +2 / Mg <sup>2+</sup>	5
name of the part of the atom labelled Z	nucleus												
number of protons in this atom	12												
number of the group that contains this element	2												
number of the period that contains this element	3												
charge on the ion formed from this atom	2+												
(b)	<ul style="list-style-type: none"> <li>• calculate sum of mass numbers multiplied by percentage abundances</li> <li>• divide answer by 100</li> <li>• give answer to one decimal place</li> </ul> <p>Example calculation</p> <p><b>M1</b> <math>(24 \times 79.2) + (25 \times 10.0) + (26 \times 10.8)</math> OR 2431.6</p> <p><b>M2</b> <math>2431.6 \div 100</math> OR 24.316</p> <p><b>M3</b> 24.3</p>	<p><b>REJECT</b> if correct working given but incorrectly evaluated</p> <p><b>ALLOW</b> ECF from M1</p> <p><math>(24 \times 0.792) + (25 \times 0.100) + (26 \times 0.108)</math>  <b>OR</b> 24.316 with or without working scores <b>M1</b> and <b>M2</b></p> <p><b>ALLOW</b> ECF from M2 if calculated answer is to 1dp</p>	3										
			<b>Total 8</b>										

Question number	Answer	Notes	Marks
3 (a)	galvanising	ACCEPT galvanisation	1
(b) (i)	rust		1
(ii)	M1 oxygen / air  M2 water	ACCEPT O <sub>2</sub> IGNORE O  ACCEPT H <sub>2</sub> O/moisture  ACCEPT in either order	2
(c) (i)	(a reaction which) gives out / produces / releases heat (energy) / thermal energy	IGNORE energy without mention of heat or thermal	1
(ii)	An explanation that links the following two points  M1 aluminium/Al is more reactive than iron/Fe	ACCEPT aluminium/Al is higher in reactivity series than iron/Fe  ACCEPT reverse argument	2
(iii)	An explanation that links the following three points  M1 aluminium is oxidised and iron/iron oxide is reduced  M2 aluminium gains oxygen  M3 iron oxide/iron loses oxygen	ALLOW replaces/takes place of  ALLOW both oxidation and reduction occur  ALLOW aluminium/Al loses electrons  ALLOW iron <u>ions</u> /Fe <sup>3+</sup> gains electrons  ALLOW correct references to changes in oxidation number for M2 and M3	3
			<b>Total 10</b>

Question number	Answer	Notes	Marks																
4 (a) (i)	<table border="1"> <thead> <tr> <th></th> <th>Mg<sup>2+</sup></th> <th>Al<sup>3+</sup></th> <th>NH<sub>4</sub><sup>+</sup></th> </tr> </thead> <tbody> <tr> <th>S<sup>2-</sup></th> <td>MgS</td> <td>Al<sub>2</sub>S<sub>3</sub></td> <td>(NH<sub>4</sub>)<sub>2</sub>S</td> </tr> <tr> <th>NO<sub>3</sub><sup>-</sup></th> <td>Mg(NO<sub>3</sub>)<sub>2</sub></td> <td>Al(NO<sub>3</sub>)<sub>3</sub></td> <td>NH<sub>4</sub>NO<sub>3</sub></td> </tr> <tr> <th>CO<sub>3</sub><sup>2-</sup></th> <td>MgCO<sub>3</sub></td> <td>Al<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub></td> <td>(NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub></td> </tr> </tbody> </table>		Mg <sup>2+</sup>	Al <sup>3+</sup>	NH <sub>4</sub> <sup>+</sup>	S <sup>2-</sup>	MgS	Al <sub>2</sub> S <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> S	NO <sub>3</sub> <sup>-</sup>	Mg(NO <sub>3</sub> ) <sub>2</sub>	Al(NO <sub>3</sub> ) <sub>3</sub>	NH <sub>4</sub> NO <sub>3</sub>	CO <sub>3</sub> <sup>2-</sup>	MgCO <sub>3</sub>	Al <sub>2</sub> (CO <sub>3</sub> ) <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	1 mark for each correct formula	3
	Mg <sup>2+</sup>	Al <sup>3+</sup>	NH <sub>4</sub> <sup>+</sup>																
S <sup>2-</sup>	MgS	Al <sub>2</sub> S <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> S																
NO <sub>3</sub> <sup>-</sup>	Mg(NO <sub>3</sub> ) <sub>2</sub>	Al(NO <sub>3</sub> ) <sub>3</sub>	NH <sub>4</sub> NO <sub>3</sub>																
CO <sub>3</sub> <sup>2-</sup>	MgCO <sub>3</sub>	Al <sub>2</sub> (CO <sub>3</sub> ) <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>																
(ii)	ammonium nitrate		1																
(b) (i)	M1 electrostatic (force of) attraction  M2 between oppositely charged ions	ALLOW electrostatic force  ACCEPT between positive and negative ions ACCEPT between cations and anions	2																
(ii)	 <p>M1 correct electron arrangement of both sodium ions M2 correct electron arrangement of the oxide ion</p> <p>M3 correct charges on all ions (with or without brackets)</p>	If only outer shells shown correctly scores 1 mark  ACCEPT dots in place of crosses or any combination of dots and crosses for M1 and M2	3																
<b>Total 9</b>																			

Question number	Answer	Notes	Marks
5 (a) (i)	S		1
(ii)	T and U		1
(iii)	U		1
(b)	<p>A description that makes reference to the following three points</p> <p><b>M1</b> (add) bromine water</p> <p><b>M2</b> no change / stays orange</p> <p><b>M3</b> (bromine water) decolourised / changes (from orange) to colourless</p>	<p><b>ACCEPT</b> Br<sub>2</sub> (aq)</p> <p><b>ALLOW</b> no reaction</p> <p>If initial colour of bromine water is given in M2 or M3 it must be correct -<b>ALLOW</b> any combination of orange/yellow/brown - but penalise once only</p> <p>If bromine given for M1 then in M2 and M3 allow any combination of red/orange/brown/yellow</p> <p><b>M2</b> and <b>M3</b> dep on bromine water/bromine in M1</p> <p>If no reagent and correct M2 and M3 - score 1</p> <p>if incorrect reagent and correct M2 and M3 score 0</p> <p><b>IGNORE</b> clear</p> <p><b>REJECT</b> discoloured</p> <p><b>ALLOW</b> M1 acidified potassium manganate(VII)</p> <p><b>M2</b> no change/stays purple</p> <p><b>M3</b> decolourised / goes colourless</p>	3

Question number	Answer	Notes	Marks
5 (c)	<p>Any <b>two</b> of the following points</p> <p><b>M1</b> (can be represented by a) general formula</p> <p><b>M2</b> each member differs from the next by a CH<sub>2</sub> group OWTTE</p> <p><b>M3</b> (each member has) same functional group</p> <p><b>M4</b> (each member has) similar/same chemical properties / similar/same (chemical) reactions</p> <p><b>M5</b> trend in physical properties (between successive members)</p>	<p><b>ACCEPT</b> react in similar/same way</p> <p><b>ACCEPT</b> named physical property, e.g. boiling point</p> <p><b>REJECT</b> similar/same physical properties</p>	2
(d) (i)	but-1-ene	<b>ALLOW</b> 1-butene	1
(ii)	<p><b>Either</b></p> $  \begin{array}{cccc}  & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   \\  \text{H} & - \text{C} & - \text{C} & = \text{C} & - \text{C} - \text{H} \\  &   & & &   \\  & \text{H} & & & \text{H}  \end{array}  $ <p><b>Or</b></p> $  \begin{array}{c}  \text{H} & & & \text{H} \\    & & & / \\  \text{H} - \text{C} & - & \text{C} = & \text{C} \\    & & & \backslash \\  \text{H} & & & \text{H} \\    & & & \\  \text{H} - \text{C} & - & \text{H} \\    \\  \text{H}  \end{array}  $	<p><b>ACCEPT</b> cis or trans isomer</p> <p><b>REJECT</b> displayed formulae of cyclic alkanes</p>	1

Question number	Answer	Notes	Marks												
5 (e) (i)	<ul style="list-style-type: none"> <li>• Divide percentages by relative atomic masses</li> <li>• Divide results by smallest value to obtain ratio</li> </ul> <p>Example calculation</p> <p><b>M1</b></p> <table style="margin-left: 40px;"> <tr> <td>C</td> <td>H</td> <td>F</td> </tr> <tr> <td><math>\frac{36.36}{12}</math></td> <td><math>\frac{6.06}{1}</math></td> <td><math>\frac{57.58}{19}</math></td> </tr> </table> <p><b>M2</b></p> <table style="margin-left: 40px;"> <tr> <td><math>\frac{3.03}{3.03}</math></td> <td><math>\frac{6.06}{3.03}</math></td> <td><math>\frac{3.03}{3.03}</math></td> </tr> </table> <p><b>OR</b></p> <table style="margin-left: 40px;"> <tr> <td>1</td> <td>2</td> <td>1</td> </tr> </table>	C	H	F	$\frac{36.36}{12}$	$\frac{6.06}{1}$	$\frac{57.58}{19}$	$\frac{3.03}{3.03}$	$\frac{6.06}{3.03}$	$\frac{3.03}{3.03}$	1	2	1	0 marks if division by atomic numbers or upside down calculation	2
C	H	F													
$\frac{36.36}{12}$	$\frac{6.06}{1}$	$\frac{57.58}{19}$													
$\frac{3.03}{3.03}$	$\frac{6.06}{3.03}$	$\frac{3.03}{3.03}$													
1	2	1													
(ii)	<ul style="list-style-type: none"> <li>• divide relative molecular mass by empirical formula mass</li> <li>• correct molecular formula</li> </ul> <p>Example calculation</p> <p><b>M1</b></p> <table style="margin-left: 40px;"> <tr> <td><math>\frac{66}{12 + 2 + 19}</math></td> <td><b>OR</b></td> <td><math>\frac{66}{33}</math></td> <td><b>OR</b></td> <td>2</td> </tr> </table> <p><b>M2</b></p> <p>C<sub>2</sub>H<sub>4</sub>F<sub>2</sub></p>	$\frac{66}{12 + 2 + 19}$	<b>OR</b>	$\frac{66}{33}$	<b>OR</b>	2	<p><b>ACCEPT</b> symbols in any order</p> <p>correct answer without working scores 2 marks.</p> <p>2CH<sub>2</sub>F scores 1</p>	2							
$\frac{66}{12 + 2 + 19}$	<b>OR</b>	$\frac{66}{33}$	<b>OR</b>	2											
<b>Total 14</b>															

Question number	Answer	Notes	Marks						
6 (a)	zinc + hydrochloric acid → zinc chloride + hydrogen	<b>ACCEPT</b> fully correct chemical equation	1						
(b)	<table border="1" data-bbox="419 387 1011 640"> <tr> <td data-bbox="419 387 855 483">temperature in °C after adding zinc</td> <td data-bbox="860 387 1011 483">22.4</td> </tr> <tr> <td data-bbox="419 490 855 586">temperature in °C before adding zinc</td> <td data-bbox="860 490 1011 586">17.7</td> </tr> <tr> <td data-bbox="419 593 855 640">temperature change in °C</td> <td data-bbox="860 593 1011 640">4.7</td> </tr> </table>	temperature in °C after adding zinc	22.4	temperature in °C before adding zinc	17.7	temperature change in °C	4.7	If readings are correct but in wrong order award 1 mark for M1 and M2	3
temperature in °C after adding zinc	22.4								
temperature in °C before adding zinc	17.7								
temperature change in °C	4.7								
	M1 22.4								
	M2 17.7								
	M3 (+)4.7	<b>ALLOW</b> ECF for M3 if M1 and/or M2 incorrect If answers not given to nearest 0.1°C penalise once only							
(c) (i)	<p>An explanation that links any two of the following points</p> <p>M1 polystyrene is an insulator</p> <p>M2 (so) reduces heat loss</p> <p>M3 temperature rise/change/reading will be closer to true value OWTTE</p>	<p><b>ALLOW</b> is not a (good) conductor of heat</p> <p><b>ALLOW</b> is a poor conductor of heat</p> <p><b>ALLOW</b> prevents heat loss</p> <p><b>ALLOW</b> keeps heat in</p> <p><b>ALLOW</b> temperature rise/change/reading will be more accurate/valid</p>	2						
(ii)	<p>Any three from</p> <p>M1 amount/mass of metal</p> <p>M2 concentration of acid</p> <p>M3 volume of acid</p> <p>M4 (speed/time of) stirring</p> <p>M5 external / room temperature</p>	<p><b>ALLOW</b> size / surface area of metal</p> <p><b>ALLOW</b> amount of acid</p> <p><b>ALLOW</b> initial /starting temperature</p>	3						

Question number	Answer	Notes	Marks
6 (d)	(i) no reaction (occurred between copper and hydrochloric acid)	IGNORE copper is unreactive ALLOW copper is less reactive than hydrogen	1
	(ii) Any value between 1.5 and 5.0 °C inclusive		1
	(iii) most reactive magnesium zinc iron tin copper	ACCEPT symbols	1
			<b>Total</b> 12

Question number	Answer	Marks
7 (a)	(i) B bromine	1
	(ii) A is incorrect as astatine is a solid C is incorrect as chlorine is a gas D is incorrect as iodine is a solid	1
	(iii) C chlorine (as it is pale green)  A is incorrect as astatine is black B is incorrect as bromine is brown C is incorrect as iodine is dark grey  A astatine  B is incorrect as bromine is more reactive than astatine C is incorrect as chlorine is more reactive than astatine D is incorrect as iodine is more reactive than astatine	1

(b) (i)	M1 (colourless solution turns) brown M2 (solution stays) brown / no change	ALLOW no reaction	2
(ii)	bromine would not react with (sodium) bromide / bromine cannot displace itself OWTTE	ALLOW bromine cannot react with itself ALLOW both contain bromine/same element/same halogen ALLOW because no reaction would occur REJECT bromine cannot displace bromide	1
(iii)	$\text{Br}_2 + 2\text{NaI} \rightarrow 2\text{NaBr} + \text{I}_2$	ACCEPT correct ionic equation $\text{Br}_2 + 2\text{I}^- \rightarrow 2\text{Br}^- + \text{I}_2$ ALLOW multiples and fractions	1

Question number	Answer	Notes	Marks
7 (c)	<p>A description that makes reference to the following 6 points</p> <p>Test for cation</p> <p><b>M1</b> add sodium hydroxide (solution)</p> <p><b>M2</b> if blue precipitate forms solution contains copper(II) ion(s) / contains <math>\text{Cu}^{2+}</math> / is a copper compound</p> <p><b>M3</b> if green precipitate forms solution contains iron(II) ion(s) / contains <math>\text{Fe}^{2+}</math> / is an iron compound</p>	<p><b>ALLOW</b> ammonia solution</p> <p><b>IGNORE</b> qualifiers <b>REJECT</b> other colours</p> <p><b>IGNORE</b> qualifiers <b>REJECT</b> other colours</p> <p>If no reagent or incorrect reagent but correct M2 and M3 score 1</p> <p><b>ALLOW</b> M1 flame test or description of flame test</p> <p>M2 if blue-green (flame) solution contains copper(II) ion(s) / contains <math>\text{Cu}^{2+}</math> / is a copper compound</p> <p>No M3 for this test</p> <p><b>ALLOW</b> M1 addition of suitable metal above Cu in reactivity series</p> <p>M2 brown/pink/pink-brown solid forms</p> <p>No M3 for this test</p>	6

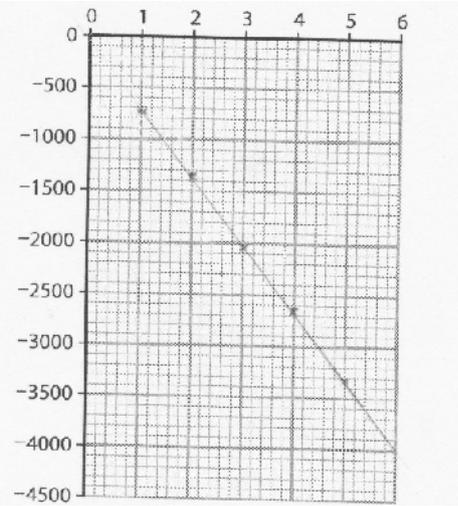


Question number	Answer	Notes	Marks
8 (a) (i)	sublimation / subliming		1
	(ii) M1 (add to/bubble into) limewater M2 (limewater) turns cloudy/milky	ACCEPT forms white precipitate M2 DEP M1	2
	(b) An explanation that links the following two points  M1 weak forces (of attraction) between molecules / weak intermolecular forces (of attraction)  M2 little energy needed to overcome the (intermolecular) forces	ALLOW weak intermolecular bonds ALLOW weak intermolecular attractions  IGNORE less energy  ALLOW little energy needed to separate the molecules  M2 DEP M1 correct or missing	2



Question number	Answer	Notes	Marks
9 (a)	to minimise/prevent (mass loss by) evaporation of the (liquid) fuel OWTTE	<b>ALLOW</b> to find mass of fuel used/burned	1
(b) (i)	soot/carbon	<b>REJECT</b> copper oxide	1
(ii)	An explanation that links the following two points.  M1 incomplete combustion (occurs)  M2 (because) the air/oxygen supply is limited OWTTE	<b>ALLOW</b> mark for soot/carbon if not seen in (i), unless copper oxide is mentioned in (i)  If copper oxide in (i) <b>ALLOW</b> 1 mark for (because) copper reacts with oxygen (in air)	2
(c) (i)	<ul style="list-style-type: none"> <li>substitution into <math>Q = mc\Delta T</math></li> <li>calculation of heat energy in Joules</li> <li>conversion to kJ</li> </ul> <p>Example calculation</p> <p>M1 <math>Q = 100 \times 4.2 \times 30</math></p> <p>M2 = 12600 (J)</p> <p>M3 = 12.6 kJ</p>	<p>12600 (J) with no working scores M1 and M2 M2 ECF M1</p> <p><b>ALLOW</b> approximately = 13 kJ</p> <p>12.6 kJ with no working scores 3</p>	3

(ii)	<ul style="list-style-type: none"> <li>• calculate the amount, in moles, of methanol</li> <li>• divide Q by the amount in moles</li> <li>• give the answer with the correct sign</li> </ul> <p>Example calculation</p> <p>M1 <math>0.96 \div 32</math> OR <math>0.03</math></p> <p>M2 <math>12.6 \div 0.03</math> OR <math>420</math> (kJ/mol)</p> <p>M3 <math>- 420</math> (kJ/mol)</p>	<p>ACCEPT <math>13 \div 0.03</math> OR <math>430/433</math> for M2</p> <p>AND <math>- 430 / - 433</math> for M3</p>	3
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Question number	Answer	Notes	Marks
9 (d) (i)	<p><b>M1</b> all points plotted correctly</p> <p><b>M2</b> line of best fit drawn with a ruler</p> 	<p>does not need to start at (0,0)</p>	2
(ii)	<p><b>M1</b> straight line extrapolated up to 6 carbon atoms</p> <p><b>M2</b> value of <math>\Delta H</math> read from their graph</p>	<p><b>ALLOW</b> extra point shown at 6 carbon atoms</p> <p>negative sign needed</p>	2
(iii)	<p>The greater the number of carbon atoms (per molecule) the greater (the magnitude/ value of) <math>\Delta H</math></p>	<p><b>ALLOW</b> <math>\Delta H</math> is (directly) proportional to the number of carbon atoms per molecule</p> <p><b>ALLOW</b> The greater the number of carbon atoms (per molecule) the more exothermic the <math>\Delta H</math> value</p>	1
			<b>Total 15</b>

Question number	Answer	Notes	Marks
10 (a) (i)	$4\text{NH}_3 + 5\text{O}_2 \rightleftharpoons 4\text{NO} + 6\text{H}_2\text{O}$	ACCEPT multiples and fractions	1
(ii)	reversible (reaction)	ACCEPT reaction that goes both ways / both forwards and backwards reactions occur  IGNORE references to equilibrium	1
(iii)	to increase the rate of the reaction / to speed up the reaction OWTTE	IGNORE references to lowering the activation energy	1
(b)	$2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$	ACCEPT multiples and fractions	1
(c) (i)	<ul style="list-style-type: none"> <li>calculate <math>M_r</math> of <math>\text{NO}_2</math> and <math>\text{HNO}_3</math></li> <li>calculate the amount, in moles, of <math>\text{NO}_2</math></li> <li>calculate the amount, in moles, of <math>\text{HNO}_3</math></li> <li>calculate the mass in tonnes of <math>\text{HNO}_3</math></li> </ul> <p>Example calculation</p> <p>M1 <math>M_r</math> of <math>\text{NO}_2 = 46</math> <math>M_r</math> of <math>\text{HNO}_3 = 63</math></p> <p>M2 <math>n(\text{NO}_2) = 11.5 \times 10^6 \div 46</math> OR 250 000 (mol)</p> <p>M3 <math>n(\text{HNO}_3) = \frac{2 \times 25\,0000}{3}</math> OR 167 000 / 170 000</p> <p>M4 <math>(167\,000 \times 63 \text{ g}) = 10.5</math> (tonnes)</p>	<p>ALLOW working in megamoles i.e. <math>11.5 \div 46</math> OR 0.25</p> <p>ALLOW ECF from incorrect <math>M_r</math> of <math>\text{NO}_2</math></p> <p>calculator answer 166666.66 ALLOW working in megamoles i.e. <math>\frac{2 \times 0.25}{3}</math> OR 0.167 / 0.17</p> <p>ALLOW ECF from M2</p> <p>10.5 (tonnes) with no working scores 4</p> <p>ACCEPT 10.7 (if 170 000 used)</p> <p>ALLOW ECF from M3 ALLOW ECF from incorrect <math>M_r</math> of <math>\text{HNO}_3</math></p>	4
(ii)	can be (re)used in stage 2 / to make more nitrogen dioxide (in stage 2) / can be used to make more nitric acid	IGNORE can be recycled/reused unless qualified	1

Question number	Answer	Notes	Marks
10 (d)	<ul style="list-style-type: none"> <li>• calculate the amount, in moles, of copper(II) nitrate</li> <li>• calculate the theoretical yield, in moles, of copper(II) nitrate</li> <li>• calculate the percentage yield</li> </ul> <p>Example calculation</p> <p><b>M1</b> <math>n\text{Cu}(\text{NO}_3)_2</math> formed = <math>15.3 \div 187.5</math> <b>OR</b> 0.0816</p> <p><b>M2</b> theoretical <math>n\text{Cu}(\text{NO}_3)_2 = 0.200 \div 2</math> <b>OR</b> 0.100</p> <p><b>M3</b> (% yield) = <math>\frac{(0.0816 \times 100)}{(0.100)} = 81.6</math> (%)</p> <p>Alternative method</p> <ul style="list-style-type: none"> <li>• calculate the theoretical yield, in moles, of copper(II) nitrate</li> <li>• calculate the theoretical mass of copper nitrate that should be formed</li> <li>• calculate the percentage yield</li> </ul> <p>Example calculation</p> <p><b>M1</b> theoretical <math>n\text{Cu}(\text{NO}_3)_2 = 0.200 \div 2</math> <b>OR</b> 0.100</p> <p><b>M2</b> theoretical mass of copper nitrate = <math>0.1 \times 187.5 = 18.75</math></p> <p><b>M3</b> (% yield) = <math>\frac{15.3}{18.75} \times 100 = 81.6</math> (%)</p>	<p><b>ALLOW</b> 0.082</p> <p><b>ACCEPT</b> 82 (%)</p> <p>Mark M3 CSQ on M1 and M2</p> <p>40.8 scores 2</p> <p><b>ALLOW</b> 18.8</p> <p><b>ACCEPT</b> 82 (%)</p> <p>Mark M3 CSQ on M1 and M2</p> <p>40.8 scores 2</p> <p>81.6(%) with no working scores 3 marks</p>	<p>3</p> <p><b>Total 12</b></p>

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