Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/05**

Paper 5 Planning, Analysis and Evaluation **For Examination from 2016**

SPECIMEN MARK SCHEME

1 hour 15 minutes

MAXIMUM MARK: 30

This document consists of **5** printed pages and **1** blank page.

CAMBRIDGE International Examinations

Question	Expected Answer	Additional Guidance	Mark
1 (a) (i)	The temperature		1
	The surface area of the marble chips	Allow size of the marble chips	1
(ii)	Measure the temperature of the hydrochloric acid **AND** Use the same mass and number of marble chips		1
(iii)	The mass of the carbon dioxide	Allow loss in mass of the flask containing the reactants	1
(b)	The diagram shows a container for the marble chips and hydrochloric acid connected to a gas syringe.	Allow collection of carbon dioxide over water	1
	All connections are shown such that the apparatus would work without leakage of carbon dioxide.	Bungs/corks must be shown where required	1
	The apparatus is fully labelled.		1
(c)	The volume of hydrochloric acid The concentration of the hydrochloric acid The mass of marble chips The time taken to collect 100 cm^3 of carbon dioxide	Ignore mention of temperature or size of marble chips Allow final time or time to end of experiment	
	4 correct 2 marks **3 correct 1 mark**		1 1
(d)	Stated volume of 2.00 mol dm^{-3} hydrochloric acid is taken **using a pipette/burette** and placed in a volumetric flask	Do **not** allow the use of a measuring cylinder	1
	Water added to the volumetric flask to make up to the mark **AND** solution then shaken/flask is inverted several times		1
	The volume of the volumetric flask is four times the volume of hydrochloric acid taken **OR** the volume of water added is three times the volume of hydrochloric acid taken	Volumetric flask must be a conventional size (i.e. allow 25, 50, 100, 150, 200, 250, 500, 1000 or 2000 cm^3)	1
(e)	The concentration of the acid must be such that it is the acid and not the marble chips which is controlling the rate of reaction	Allow any wording of the answer which shows an understanding of this point	1

Question	Expected Answer	Additional Guidance	Mark
(f)	The concentration of the hydrochloric acid		1
	The inverse of the time taken	Do **not** allow 'rate' unless this is stated as 1/t	1
Qn 1		**Total**	**15**

<table>
<tr><th>Question</th><th>Expected Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>2 (a)</td><td>
<table>
<tr><th>E</th><th>F</th></tr>
<tr><td>Mass of X_2CO_3 /g
A – B</td><td>Mass of CO_2 /g
C + E – D</td></tr>
<tr><td>2.81</td><td>0.95</td></tr>
<tr><td>4.65</td><td>1.45</td></tr>
<tr><td>0.90</td><td>0.38</td></tr>
<tr><td>5.50</td><td>2.08</td></tr>
<tr><td>5.80</td><td>1.84</td></tr>
<tr><td>3.70</td><td>1.20</td></tr>
<tr><td>2.20</td><td>0.56</td></tr>
<tr><td>7.40</td><td>2.15</td></tr>
<tr><td>5.24</td><td>1.70</td></tr>
<tr><td>6.40</td><td>2.05</td></tr>
<tr><td>3.40</td><td>0.90</td></tr>
<tr><td>7.32</td><td>2.34</td></tr>
</table>
Correct formulae and units for table heading

All values to two decimal places

All values correct</td><td></td><td>1

1

1</td></tr>
<tr><td>(b)</td><td>All points plotted correctly

Appropriate straight line of best fit drawn
(The deviation of points on each side of the best fit line must be nearly the same)</td><td>

It is not a requirement that the best fit line extends beyond the range of the data obtained but if the line of best fit is extended it should pass through the origin.</td><td>1

1</td></tr>
</table>

Question	Expected Answer	Additional Guidance	Mark
(c)	The anomalous point chosen must be more than two small squares distant from the line of best fit. If the point identified indicates too much CO_2 produced then this could be because the cotton wool plug was not weighed at the end **OR** If the point identified indicates too little CO_2 produced then this could be that the solution was not saturated with CO_2 at the start/CO_2 not left long enough to diffuse		1
(d)	Identifies less reliability with lower masses of X_2CO_3 because percentage errors will be higher	Allow any wording of the answer which shows an understanding of this point	1
(e) (i)	Marks on the graph and gives correct co-ordinates for two points which lie on the line of best fit Calculates the gradient correctly using the two points	 No mark should be awarded if units are given for the gradient	1 1
(ii)	Explains that the gradient is the mass of CO_2 divided by the mass of X_2CO_3 Calculates correctly M_r of X_2CO_3 as 44/gradient		1 1
(f) (i)	No change as the mass is unaffected by a change in temperature		1
(ii)	Line would have a steeper gradient An equivalent mass of Y_2CO_3 produces more CO_2 **OR** an equivalent volume of CO_2 is produced by a smaller mass of Y_2CO_3		1 1
(g)	Use a titration of X_2CO_3 against HC*l*	Allow other named strong acid	1
Qn2		**Total**	**15**

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