

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9701 CHEMISTRY

9701/51

Paper 5 (Planning, Analysis and Evaluation),
maximum raw mark 30

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Page 2	Mark Scheme	Syllabus	Paper
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Question	Expected Answer	Mark
1 (a)	$PV = nRT$	[1]
	$M_r = \text{mass/amount in mol}$ OR $M_r = m/n$ OR g/n OR any of these formulae correctly re-arranged	[1]
(b) (i)	volume (measured/recorded at 60 °C) is higher OR volume is lower at 50 °C/at lower temperature (calculated) M_r is lower	[3]
(ii)	The volume would be reduced OR as P increases M_r increases AND answer closer to the true value/yes	[1]
(c)	Place water/oil/sand within the outer VM tube AND heat the outer tube	[1]
	Shows appropriate connections to collect the air over water/in syringe (any size) using the side tube	[1]
(d)	Hexane: <ul style="list-style-type: none"> • is (in)flammable/burns readily • causes irritation to the skin • causes breathing difficulties • forms explosive mixture (with air) OR is combustible Any one from the list above	[1]
(e) (i)	The air expands (And) goes into the collection apparatus	[1] [1]
	(ii) (Wait until) no more bubbles (of air are produced) in the water/syringe no longer moves	[1]
(f)	The mass of tube + hexane and mass of empty tube	[1]
	Temperature and pressure	[1]
	Syringe reading before hexane is added + the syringe reading after hexane is added	[1]
Qn1		[Total: 15]

Page 3	Mark Scheme	Syllabus	Paper
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Question	Expected Answer	Mark																				
2 (a)	<table border="1"> <thead> <tr> <th>Temperature rise / °C</th> <th>barium hydroxide added / mol</th> </tr> </thead> <tbody> <tr> <td>1.2</td> <td>0.00292</td> </tr> <tr> <td>2.4</td> <td>0.00585</td> </tr> <tr> <td>3.7</td> <td>0.00877</td> </tr> <tr> <td>4.7</td> <td>0.0117</td> </tr> <tr> <td>7.3</td> <td>0.0175</td> </tr> <tr> <td>9.7</td> <td>0.0234</td> </tr> <tr> <td>10.4</td> <td>0.0292</td> </tr> <tr> <td>10.4</td> <td>0.0351</td> </tr> <tr> <td>10.4</td> <td>0.0468</td> </tr> </tbody> </table>	Temperature rise / °C	barium hydroxide added / mol	1.2	0.00292	2.4	0.00585	3.7	0.00877	4.7	0.0117	7.3	0.0175	9.7	0.0234	10.4	0.0292	10.4	0.0351	10.4	0.0468	
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	Values in temperature column correct and to 1 decimal place Values in barium hydroxide column are correct and to 3 sig figs	[1] [1]																				
(b) (i)	All points plotted correctly	[1]																				
(ii)	Two best-fit straight lines drawn and then levelling to a horizontal line	[1]																				
	The value on the x-axis is read correctly	[1]																				
(c)	The concentration of the acid is calculated as: $(2 \times \text{mol of Ba(OH)}_2) \times 1000 / 60$	[2]																				
(d)	Exothermic reaction	[1]																				
	After hydrochloric acid is neutralised / fully reacted OR barium hydroxide is in excess the temperature (rise) is constant	[1]																				
(e) (i)	Loss of heat (to the surroundings)	[1]																				
	Greater temperature gradient OR the reaction is slower OR (rate of) heat loss is greater	[1]																				
(ii)	Give polystyrene cup a lid or cover / use a finer powder	[1]																				

Page 4	Mark Scheme	Syllabus	Paper
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Question	Expected Answer	Mark
(f)	Line rises less steeply and intersects second line at a lower temperature rise	[1]
	Maximum is reached at the same mol of barium hydroxide as the experiment with hydrochloric acid	[1]
	Some of the heat that would have been released is used to ionise the ethanoic acid	[1]
Qn2		[Total: 15]