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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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Question	Expected Answer	Mark
1 (a)	$PV = nRT$ M_r = mass / amount in mol **OR** M_r = m / n **OR** g / n **OR** any of these formulae correctly re-arranged	**[1]** **[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 Shows appropriate connections to collect the air over water / in syringe (any size) using the side tube	**[1]** **[1]**
(d)	Hexane: • 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 Temperature and pressure Syringe reading before hexane is added + the syringe reading after hexane is added	**[1]** **[1]** **[1]**
Qn1		**[Total: 15]**

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Question	Expected Answer	Mark
2 (a)	<table><tr><th>Temperature rise / °C</th><th>barium hydroxide added / mol</th></tr><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></table> 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 The value on the x-axis is read correctly	**[1]** **[1]**
(c)	The concentration of the acid is calculated as: (2 × mol of $Ba(OH)_2$) × 1000 / 60	**[2]**
(d)	Exothermic reaction After hydrochloric acid is neutralised / fully reacted **OR** barium hydroxide is in excess the temperature (rise) is constant	**[1]** **[1]**
(e) (i)	Loss of heat (to the surroundings) Greater temperature gradient **OR** the reaction is slower **OR** (rate of) heat loss is greater	**[1]** **[1]**
(ii)	Give polystyrene cup a lid or cover / use a finer powder	**[1]**

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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]**

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