

**MARK SCHEME for the May/June 2012 question paper**  
**for the guidance of teachers**

**9701 CHEMISTRY**

**9701/31**

Paper 31 (Advanced Practical Skills 1),  
maximum raw mark 40

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Question	Sections	Indicative material	Mark
(d)	PDO layout	<p><b>I</b> Rate on y-axis and volume on x-axis. Axes clearly labelled (ignore units)</p> <p><b>II</b> Linear scale chosen to use at least half of each axis (need not include 0, 0) If no point at 0, 0 cannot count for &gt; half.</p> <p><b>III</b> Plotting of points. Minimum of 3 readings.</p> <p><b>IV</b> Draws a line of best fit. Minimum 4 readings including 0, 0 (if plotted).</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>[4]</p>
(e)	ACE conclusion	Rate is proportional to peroxodisulfate <b>concentration</b> Rate increases as concentration (volume) increases would score one	<p>2</p> <p>[2]</p>
(f)	ACE interpretation	<p>(i) correctly calculates <math>(0.5 / \text{time from Expt 1}) \times 100</math>. Minimum of 2 s.f.</p> <p>(ii) <math>\frac{\text{ans (b)(iii)}}{\text{Expt 1 time} + 0.5} \times 10^6 \text{ mol dm}^{-3} \text{ s}^{-1}</math> <b>or</b> Rate– (% from (i) <math>\times</math> rate)</p> <p>(iii) Any reasonable suggestion e.g. difficult to judge colour change / measurement of volumes / variation in T</p>	<p>1</p> <p>1</p> <p>1</p>
	ACE improvement	use of colorimeter / burettes for all volumes / (thermostatic) waterbath. Not air conditioning.	<p>1</p> <p>[4]</p>
(g)	ACE conclusion	<p>(ii) Thiosulfate concentration / number moles / volume is doubled (1) Time is longer/ reaction is slower with more thiosulfate (1)</p>	<p>2</p> <p>[2]</p>
			[Total: 26]

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Question	Sections	Indicative material			Mark
FA 5 = CuCl <sub>2</sub> ; FA 6 = NaOH; FA 7 = Pb(NO <sub>3</sub> ) <sub>2</sub> ; FA 8 = K <sub>2</sub> CrO <sub>4</sub> ; FA 9 = MgSO <sub>4</sub>					
2 (a)	MMO collection	Blue ppt insol in excess (1) Not 'dark blue'	White ppt (1) Ignore 'excess'.  White ppt soluble in excess (1)	Yellow / brown / greenish-brown ppt (1) Not 'orange, red, red / brown' Ignore excess.  No reaction / yellow solution <b>and</b> yellow ppt soluble in excess CONs ppt (1)	[5]
(b)	ACE conclusion	Cu <sup>2+</sup> in FA 5 AND CrO <sub>4</sub> <sup>2-</sup> in FA 8  Pb <sup>2+</sup> in FA 7 AND OH <sup>-</sup> in FA 6  Cl <sup>-</sup> in FA 5			1  1  1 [3]
(c)	MMO decision  MMO decision  PDO recording  MMO collection  MMO collection  ACE conclusion	I Add Pb (NO <sub>3</sub> ) <sub>2</sub> or BaCl <sub>2</sub> or Ba(NO <sub>3</sub> ) <sub>2</sub>  II Add HNO <sub>3</sub> or HCl  III Presents observations in a single table – no extra reagents. Must be > 2 'boxes'  IV White ppt  V No SO <sub>2</sub> evolved or ppt insoluble  VI sulfate			1  1  1  1  1  [6]
	[Total: 14]				