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Cambridge Ordinary Level

CHEMISTRY

5070/42

Paper 4 Alternative to Practical

May/June 2017

MARK SCHEME

Maximum Mark: 60

Published

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.

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Abbreviations used in the mark scheme

- / separates alternatives within a marking point.
- **OR** gives the alternative marking point.
- **Allow** indicates an answer that is less than ideal but which should be marked correct.
- **Ignore** means mark as if the response was not there.
- **Reject** means the response is not given credit
- M1, M2 etc. distinguish each marking point within an answer
- Ecf means credit a correct statement / working that follows from a previous wrong response.
- Use of brackets in the Answer column indicates that the word(s) is / are ideal but not required to obtain the mark.

Question	Answer	Marks
1(a)(i)	Pops in a flame / lighted splint pops / burning splint pops	1
1(a)(ii)	A – conical flask (1) B – gas syringe (1)	2
1(a)(iii)	46 (cm ³)	1
1(b)(i)	Y (1) The gas must bubble through / into the drying agent (1)	2
1(b)(ii)	The gas can enter the tube and leave it without passing through the drying agent (or reverse argument)	1
2(a)	To prevent explosion / to prevent build-up of pressure / to prevent pressure increase	1
2(b)(i)	141 (°C)	1
2(b)(ii)	Propanoic acid	1
2(b)(iii)	The temperature will begin to rise (again)	1
2(c)	Safety goggles / safety glasses	1

Question	Answer	Marks
3(a)	<p>Method 1</p> <p>M1 Weigh crystals / weigh before heating (1)</p> <p>M2 Heat to ensure that all water has been removed / heat to dryness / heat to constant mass / heat until solid turns white (1)</p> <p>M3 Weigh anhydrous salt / weigh after heating (1)</p> <p>M4 (Calculate mass of water by) subtraction of masses / calculate decrease or loss in mass (This mark can score from the expression in M5) (1)</p> <p>M5 Mass of water or decrease in mass \div mass of crystals \times 100 = % water (1)</p> <p>OR</p> <p>Method 2</p> <p>M1 Weigh crystals / weigh before heating (1)</p> <p>M2 Heat to ensure that all water has been removed / heat to dryness / heat to constant mass / heat until (solid) turns white (1)</p> <p>M3 Condense water (can be shown in diagram) / (obtain water by) distillation (can be shown in diagram) (1)</p> <p>M4 Weigh water (1)</p> <p>M5 Mass of water \div mass of crystals \times 100 = % water (1)</p>	5
3(b)	<p>Any three from:</p> <ul style="list-style-type: none"> • M1 Not all the water is removed or evaporated / some water is left (in the crystals) (1) • M2 Some water remained gaseous or evaporated or escaped. All of these need to be qualified by adding either and were not collected or during collection (1) • M3 Not heated (long) enough / stopped heating too soon/ should have been heated longer / should be heated until it turns white (1) • M4 Heat to constant mass (of solid) / heat to constant volume or constant mass of water (1) 	3

Question	Answer	Marks												
4(a)	1.22 (g)	1												
4(b)	Effervescence / fizzing / bubbling	1												
4(c)(i)	Volumetric flask / standard flask / graduated flask	1												
4(c)(ii)	M1 Safety bulb / pipette filler (1) M2 Prevent liquid entering mouth / (acids) cause burns to skin / (acids) corrosive to skin (1)	2												
4(d)	Red or pink to orange or yellow	1												
4(e)	<table border="1" style="display: inline-table; vertical-align: top;"> <tbody> <tr> <td>24.1</td> <td>41.1</td> <td>28.5</td> </tr> <tr> <td>0.0</td> <td>17.6</td> <td>4.8</td> </tr> <tr> <td>24.1</td> <td>23.5</td> <td>23.7</td> </tr> <tr> <td></td> <td>✓</td> <td>✓</td> </tr> </tbody> </table> 3 marks: award 1 mark for each correct row or column to the benefit of the candidate (3) Titre = 23.6 (1)	24.1	41.1	28.5	0.0	17.6	4.8	24.1	23.5	23.7		✓	✓	4
24.1	41.1	28.5												
0.0	17.6	4.8												
24.1	23.5	23.7												
	✓	✓												
4(f)	0.00236 (moles) OR ecf on candidate's mean titre	1												
4(g)	0.00236 (moles) OR ecf (f)	1												
4(h)	0.0236 (moles) OR ecf (g) × 10	1												
4(i)	0.0264 (moles) OR ecf 0.0500 – (h)	1												
4(j)	0.0132 (moles) OR ecf (i) ÷ 2	1												
4(k)(i)	1.1088 / 1.109 / 1.11 (g) OR ecf (j) × 84	1												
4(k)(ii)	(1.11 / 1.22 × 100 =) 91.0 (%) OR ecf (k)(i)/(a) × 100	1												

Question	Answer	Marks
5(a)	M1 Aqueous barium chloride / aqueous BaCl_2 / aqueous barium nitrate / aqueous $\text{Ba}(\text{NO}_3)_2$ (1) M2 Dilute nitric acid / aqueous HNO_3 OR Dilute hydrochloric acid / aqueous HCl (1) M3 white precipitate (1)	3
5(b)(i)	Fe^{3+} / iron(III) (1) Cu^{2+} / copper(II) (1) Fe^{2+} / iron(II) (1) Cr^{3+} / chromium(III) (1)	4
5(b)(ii)	M1 (Grey-)green precipitate; insoluble in excess / no change (1) M2 Green precipitate; insoluble in excess / no change (1) M3 Light blue precipitate; (soluble in excess) deep blue solution (1) M4 Red-brown precipitate; insoluble in excess / no change (1)	4

Question	Answer	Marks
6(a)	M1 All points plotted correctly (1) M2 Smooth curve (1) M3 Extension of line to cross y-axis (1)	3
6(b)(i)	13.9	1
6(b)(ii)	13(.0)	1
6(c)(i)	7.0	1
6(c)(ii)	27.5 (cm ³)	1
6(d)	M1 (Moles H ₂ SO ₄ =) 0.0125 (1) M2 0.455 mol / dm ³ (1) based on 6(c)(ii) = 27.5 cm ³	2
6(e)	M1 Heat (aqueous sodium sulfate) (1) M2 To crystallisation point /saturation(point) (1) M3 Description of drying the crystals (1)	3