
CHEMISTRY

5070/41

Paper 4 Alternative to Practical

May/June 2019

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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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This document consists of **9** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	B (volumetric) pipette	1
1(b)(i)	Burette	1
1(b)(ii)	Yellow / orange Red / pink	2
1(c)	M1 Measure aqueous ammonia in burette / pipette M2 Measure sulfuric acid in burette / pipette M3 volume of ammonia is 2× the volume of acid M4 Heat / evaporate / leave in sun M5 to saturation point / crystallise M6 Dry crystals between filter paper	6
1(d)(i)	35 (cm ³)	1
1(d)(ii)	No change / stays blue and Turns blue	1

Question	Answer	Marks
2(a)(i)	Y axis labelled time OR s AND scale > ½ axis And X axis labelled mass OR g AND scale > ½ axis (1) 5 or 6 points plotted correctly (1) Smooth which curve does not go through point at 1.5 g (1)	3
2(a)(ii)	Correct value from graph (450 sec)	1
2(b)(i)	5	1
2(b)(ii)	Out of pattern / does not follow the trend / is same as the previous value / anomalous	1
2(c)	The more NaCl the faster the rate	1
2(d)	Longer / greater / increase (1) (Paint) slows rusting / reduces rate of rusting / prevents oxygen and or water getting at iron / forms a barrier (1)	2
2(e)(i)	Different values because different people see colour differently (1) OR Reaction times in use of stopwatch are different OR Mass/surface area of iron is different	1
2(e)(ii)	Trend the same because systematic error / error same for each mass of NaCl / same person does each mass of NaCl (1)	1

Question	Answer	Marks																				
3(a)	A = ethanol B = hexene C = ethanoic acid All 3 correct = 2 1 or 2 correct = 1	2																				
3(a)	<table border="1"> <thead> <tr> <th data-bbox="322 448 663 513">Reagent</th> <th colspan="3" data-bbox="663 448 1680 513">Observations</th> </tr> <tr> <td data-bbox="322 513 663 579"></td> <th data-bbox="663 513 1003 579">A</th> <th data-bbox="1003 513 1344 579">B</th> <th data-bbox="1344 513 1680 579">C</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 579 663 746">Add bromine solution</td> <td data-bbox="663 579 1003 746">The mixture remains orange / stays the same / has no visible change</td> <td data-bbox="1003 579 1344 746">The mixture turns from orange to colourless</td> <td data-bbox="1344 579 1680 746">The mixture remains orange</td> </tr> <tr> <td data-bbox="322 746 663 914">Add solid calcium carbonate</td> <td data-bbox="663 746 1003 914">No visible change</td> <td data-bbox="1003 746 1344 914">No visible change</td> <td data-bbox="1344 746 1680 914">Effervescence / bubbles / fizzing / calcium carbonate dissolves / disappears</td> </tr> <tr> <td data-bbox="322 914 663 1082">Add dilute sulfuric acid and a few drops of potassium manganate (VII)</td> <td data-bbox="663 914 1003 1082">The mixture turns (from purple) to colourless / decolourises</td> <td data-bbox="1003 914 1344 1082">The mixture turns from purple to colourless</td> <td data-bbox="1344 914 1680 1082">The mixture remains purple</td> </tr> </tbody> </table>	Reagent	Observations				A	B	C	Add bromine solution	The mixture remains orange / stays the same / has no visible change	The mixture turns from orange to colourless	The mixture remains orange	Add solid calcium carbonate	No visible change	No visible change	Effervescence / bubbles / fizzing / calcium carbonate dissolves / disappears	Add dilute sulfuric acid and a few drops of potassium manganate (VII)	The mixture turns (from purple) to colourless / decolourises	The mixture turns from purple to colourless	The mixture remains purple	3
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3(c)(i)	ethanol and ethanoic acid	1																				
3(c)(ii)	(Safety) goggles AND acid corrosive OR Avoid flames / use a water bath / hotplate / heating mantle AND ethanol flammable	1																				

Question	Answer			Marks
4	Test	Observation	Pollutant ions present in sample	5
	M1 Add aqueous sodium hydroxide / NaOH(aq) / aqueous NaOH	white ppt., soluble in excess giving a colourless solution	Al^{3+}	
	Acidify with dilute nitric acid, then add aqueous silver nitrate	M2 white ppt	Cl^{-}	
	Add aqueous ammonia	Light blue ppt., soluble in excess, giving a dark blue solution	M3 Cu^{2+}	
	M4 Aqueous barium chloride / aqueous $BaCl_2$ / aqueous barium nitrate / aqueous $Ba(NO_3)_2$ (1) AND Acid / Dilute nitric acid / aqueous HNO_3 or Dilute hydrochloric acid / aqueous HCl (1)	M5 white ppt	SO_4^{2-}	

Question	Answer	Marks																				
5(a)	Anhydrous cobalt chloride / cobalt chloride paper (1) turns blue to pink (1) or anhydrous copper sulfate (1) turns white to blue (1)	2																				
5(b)	Condense the vapour / water	1																				
5(c)	Turn milky / white (ppt)	1																				
5(d)	In parts (i)–(viii) correct answer always scores mark In parts (i)–(vii) answers to 3 sf – penalise only once ECF throughout																					
5(d)(i)	<table border="1" data-bbox="322 679 1059 1043"> <tbody> <tr> <td>titration number</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>final reading</td> <td>24.9</td> <td>29.5</td> <td>38.8</td> </tr> <tr> <td>initial reading</td> <td>0.0</td> <td>5.2</td> <td>14.3</td> </tr> <tr> <td>volume of 1.00 mol / dm³ HCl / cm³</td> <td>24.9</td> <td>24.3</td> <td>24.5</td> </tr> <tr> <td>best titration results (✓)</td> <td></td> <td>✓</td> <td>✓</td> </tr> </tbody> </table> <p data-bbox="322 1082 568 1114">Average = 24.4 (1)</p>	titration number	1	2	3	final reading	24.9	29.5	38.8	initial reading	0.0	5.2	14.3	volume of 1.00 mol / dm ³ HCl / cm ³	24.9	24.3	24.5	best titration results (✓)		✓	✓	4
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best titration results (✓)		✓	✓																			
5(d)(ii)	$24.4 / 1000 \times 1 = 0.0244$ (moles)	1																				
5(d)(iii)	0.0244 (moles)	1																				
5(d)(iv)	0.0976 (moles)	1																				
5(d)(v)	$100 / 1000 \times 2 = 0.200$ (moles)	1																				
5(d)(vi)	$0.200 - 0.0976 = 0.1024$ (moles)	1																				

Question	Answer	Marks
5(d)(vii)	$0.1024 / 2 = 0.0512$ moles	1
5(d)(viii)	$0.73 / 86 = 0.00849$ moles	1
5(d)(ix)	$0.0512 / 0.00849 = 6.03$ n = 6	1

Question	Answer	Marks
6(a)	0.38 AND 0.76	1
6(b)(i)	Brown / pink and Solid	1
6(b)(ii)	Copper (formed)	1
6(c)	M1 Line of best fit drawn and extended to at least 28 mins (1) M2 Correct value from graph (1.05 (g)) (1)	2
6(d)	Solid falls off the cathode / solid falls into solution / not all solid sticks to cathode	1
6(e)(i)	(Mass of anode) decreases	1
6(e)(ii)	3.43 (g) scores 2 If 2 marks not scored Any value subtracted from 4 score 1 OR Any indication of using 0.57 score 1	2