Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

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.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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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 NaC*l* 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 NaC*l* / same person does each mass of NaC*l* (1)	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>A = ethanol
B = hexene
C = ethanoic acid

All 3 correct = 2
1 or 2 correct = 1</td><td>2</td></tr>
<tr><td>3(a)</td><td>
<table>
<tr><td>Reagent</td><td colspan="3">Observations</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Add bromine solution</td><td>The mixture remains orange / stays the same / has no visible change</td><td>The mixture turns from orange to colourless</td><td>The mixture remains orange</td></tr>
<tr><td>Add solid calcium carbonate</td><td>No visible change</td><td>No visible change</td><td>Effervescence / bubbles / fizzing / calcium carbonate dissolves / disappears</td></tr>
<tr><td>Add dilute sulfuric acid and a few drops of potassium manganate (VII)</td><td>The mixture turns (from purple) to colourless / decolourises</td><td>The mixture turns from purple to colourless</td><td>The mixture remains purple</td></tr>
</table>
</td><td>3</td></tr>
<tr><td>3(c)(i)</td><td>ethanol and ethanoic acid</td><td>1</td></tr>
<tr><td>3(c)(ii)</td><td>(Safety) goggles AND acid corrosive
OR
Avoid flames / use a water bath / hotplate / heating mantle AND ethanol flammable</td><td>1</td></tr>
</table>

Question	Answer	Marks
4		**5**

Test	Observation	Pollutant ions present in sample
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-}

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(a)</td><td>Anhydrous cobalt chloride / cobalt chloride paper (1)
turns blue to pink (1)
or
anhydrous copper sulfate (1)
turns white to blue (1)</td><td>2</td></tr>
<tr><td>5(b)</td><td>Condense the vapour / water</td><td>1</td></tr>
<tr><td>5(c)</td><td>Turn milky / white (ppt)</td><td>1</td></tr>
<tr><td>5(d)</td><td>In parts (i)–(viii) correct answer always scores mark
In parts (i)–(vii) answers to 3 sf – penalise only once
ECF throughout</td><td></td></tr>
<tr><td>5(d)(i)</td><td>
<table>
<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 / dm^3 HCl / cm^3</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>
</table>
Average = 24.4 (1)
</td><td>4</td></tr>
<tr><td>5(d)(ii)</td><td>24.4 / 1000 · 1 = 0.0244 (moles)</td><td>1</td></tr>
<tr><td>5(d)(iii)</td><td>0.0244 (moles)</td><td>1</td></tr>
<tr><td>5(d)(iv)</td><td>0.0976 (moles)</td><td>1</td></tr>
<tr><td>5(d)(v)</td><td>100 / 1000 · 2 = 0.200 (moles)</td><td>1</td></tr>
<tr><td>5(d)(vi)</td><td>0.200 – 0.0976 = 0.1024 (moles)</td><td>1</td></tr>
</table>

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**