GradeMax



Mark Scheme (Results)

Summer 2026

Pearson Edexcel International Advanced Subsidiary Level In Chemistry
WCH13_01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
· an idea of the types of response expected
· how individual marks are to be awarded
· the total mark for each question
· examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:
· write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
· select and use a form and style of writing appropriate to purpose and to complex subject matter
· organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities. Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer		Additional Guidance	Mark
1(a)	An explanation that makes reference to the following points			**(5)**
	● use a platinum / nichrome wire / loop /rod	**(1)**	Accept NiCr Allow silica rod Allow use of wooden splints Do not award inoculating loop / sterilising wire	
	● dip into (concentrated) hydrochloric acid	**(1)**	Allow using HCl to clean the wire / make a paste / solution Do not award any other acid	
	● place solid on wire and in a non-luminous / roaring / hot / blue / colourless/ (Bunsen) **flame**	**(1)**	Allow solid/salt/compound/ substance/powder/paste/solution for sample. Allow any suitable method of transferring sample to the wire, eg dipping wire in sample Allow on/over/under/near/show/above for "in" flame Ignore spray solution in flame Do not award burn in flame Do not award just metal for solid	
	● colour of flame with lithium sulfate: red/carmine	**(1)**	Do not award brick-red/crimson/scarlet	
	● colour of flame with potassium sulfate: lilac	**(1)**	Ignore violet/mauve/lavender Do not award pink/purple	

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	An answer that makes reference to the following points: sodium bromide ● observation: brown/red-brown vapour /fumes/gas **(1)** ● identification: bromine / Br_2 **(1)** sodium iodide ● observation: purple vapour/fumes/gas or yellow solid or bad/ rotten eggs smell **(1)** ● identification: iodine (vapour) / I_2 or hydrogen sulfide / H_2S **(1)**	Ignore steamy / misty fumes Ignore solution Do not allow smoke Allow hydrogen bromide / HBr Allow sulfur dioxide / SO_2 Ignore steamy / misty fumes Allow (dark) grey/black solid Do not award yellow precipitate Allow hydrogen iodide/HI If name and formulae given both must be correct	**(4)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	An answer that makes reference to the following point: ● bromine / Br_2 is toxic or hydrogen bromide / HBr is toxic or sulfur dioxide / SO_2 is toxic or hydrogen sulfide / H_2S is toxic or hydrogen iodide / HI is toxic	Allow poisonous for toxic Allow toxic gases are formed Allow hydrogen halides are toxic Do not award just halides are toxic	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	An answer that makes reference to the following points: ● sodium hydroxide/NaOH (solution) **and** warm/heat **(1)** ● test ammonia/ gas with (damp) red litmus **and** turns blue **(1)**	Accept potassium hydroxide/KOH Accept ammonia gas turns (damp) universal indicator (paper) turns blue Accept (concentrated) HCl on a glass rod produces white smoke Do not award reference to ammonium M2 dependent on M1 or near miss	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	An answer that makes reference to the following points: ● hydrochloric acid/nitric acid **and** barium chloride/barium nitrate (solution) **(1)** ● white precipitate **(1)**	Use of sulfuric acid scores zero Accept correct formulae Ignore references to concentration Ignore order of reagents Ignore just acidified Ignore just Ba^{2+} Allow ppt / ppte / solid M2 dependent on either barium chloride or barium nitrate used as a reagent	**(2)**

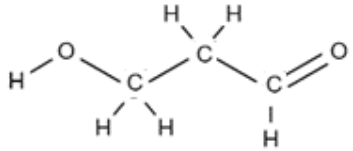
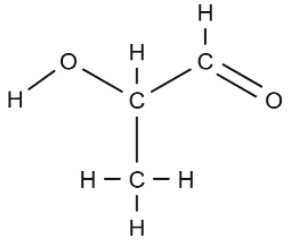
Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	● ionic equation with state symbols	<u>Example of equation</u> $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$	**(1)**

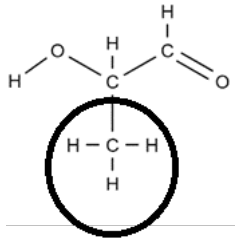
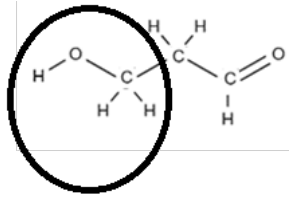
(Total for Question 1 = 15 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	An answer that makes reference to the following point: ● alcohol	Allow hydroxy / hydroxyl Ignore primary / secondary / tertiary Ignore OH Do not award hydroxide	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	An answer that makes reference to the following points: ● blue (solution) **(1)** ● (brick) red **and** precipitate **(1)**	Do not award blue solid or ppt Allow yellow/orange Allow ppt / ppte / solid	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An answer that makes reference to the following point: ● CHO/aldehyde	Allow  Do not award COH Do not award any structure with COOH/carboxylic acid Ignore carbonyl	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	An answer that makes reference to the following points: •  **(1)** •  **(1)**	Allow skeletal / structural formulae or a combination Ignore connectivity of OH unless horizontal but only penalise once Ignore molecular formulae Ignore names even if incorrect – e.g. 1-hydroxypropanal Penalise use of COH for aldehyde once only	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	An answer that makes reference to the following points: ● $m/z = 15$ (due to 2-hydroxypropanal) ● due to CH_3^+ **(1)**  **(1)** or ● $m/z = 31$ **(1)** (due 3-hydroxypropanal) ● due to CH_2OH^+ **(1)** 	TE allowed only from incorrect structures from 2ci which contain alcohol/ketone/carboxylic acid **Penalise lack of linkage of the fragment to the structure, once only** Do not award if the bond is shown from the fragment, eg —CH_3 Accept the rest of the molecule shown with $m/z = 59$ scores 2 Allow CH_3O^+ Accept the rest of the molecule shown with $m/z = 43$ scores 2 Accept the rest of the molecule, i.e. 43 with a + charge Penalise each additional incorrect fragment structure and m/z value which does not identify the isomer Penalise any fragments produced by two bonds breaking	**(2)**

(Total for Question 2 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	A description that makes reference to the following points: ● place sample in beaker and add deionised/distilled water ● stir (to dissolve) ● using the funnel to transfer into the (volumetric) flask ● transfer with washings ● use the (dropping) pipette to add deionised/distilled water to the mark/line ● add stopper ● invert (to mix) An answer that makes reference to the following point 7 points correct scores 4 5-6 points correct scores 3 3-4 points correct scores 2 2 points correct scores 1	Do not award 250 cm^3 Do not award filter or decant into the flask Ignore just seal Ignore swirl, shake, mix Mention of 'deionised/distilled' is required once only in bp 1 or bp 5 If the answer starts with transferring sodium carbonate into the volumetric flask only bp 4 to 7 can score	**(4)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(b)(i)</td><td>● all three values correct
and
mean</td><td><u>Example of completed table</u>

<table><tr><td>Titration number</td><td>1</td><td>2</td><td>3</td></tr><tr><td>Final burette reading / cm^3</td><td>22.45</td><td>44.40</td><td>22.05</td></tr><tr><td>Initial burette reading / cm^3</td><td>0.00</td><td>22.45</td><td>0.00</td></tr><tr><td>Titre / cm^3</td><td>22.45</td><td>21.95</td><td>22.05</td></tr></table>
(21.95 + 22.05) ÷ 2 = 22.00 (cm^3)</td><td>(1)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	• calculation of moles of hydrochloric acid	Example of calculation Ignore SF except 1 SF throughout this calculation n = (22.00 × 0.100) ÷ 1000 = 2.2×10^{-3} / 0.0022 (mol) Allow TE on mean from (b)(i)	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b(iii)	• calculation of moles of sodium carbonate in 25.00 cm^3 of solution	Example of calculation n = $2.2 \times 10^{-3} \div 2 = 1.1 \times 10^{-3}$ (mol) / 0.0011 (mol) TE from (b)(ii) n = 0.0011075/1.1075 10^{-3} (mol)	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iv)	• calculation of moles of sodium carbonate in 250 cm^3 of solution	Example of calculation n = $1.1 \times 10^{-3} \times 10 = 1.1 \times 10^{-2}$ (mol) / 0.011 (mol) TE from (b)(iii) n = 0.011075/1.1075 x 10^{-2}	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(v)	• calculation of molar mass of hydrated sodium carbonate **(1)** • calculation of mass of water in hydrated sodium carbonate **(1)** • calculation of n **(1)** or • calculation of mass of anhydrous sodium carbonate • subtraction for mass of water **and** moles of water • ratio of moles **and** whole number	<u>Example of calculation</u> 3.15 (g) ÷ 1.1×10^{-2} (mol) = 286.36 ($g\ mol^{-1}$) 286.36 – 106 = 180.36 (g) 180.36 ÷ 18 = (10.02) = 10 Must be a whole number TE throughout except for M3 value must be less than 12 Correct answer with no working scores (1) Correct answer with some working scores (3) m = 106 x 0.011 = 1.166 (g) 3.15 – 1.166 = 1.984 (g) n = 1.984 ÷ 18 = 0.1102 (mol) 0.1102:0.011 = (10.02) =10	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)	An answer that makes reference to the following points: ● weigh an empty crucible and then add some (hydrated) sodium carbonate and reweigh **(1)** or weigh the crucible and hydrated sodium carbonate at the start and reweigh after heating ● heat (allow to cool and reweigh) **(1)** ● and repeat until the mass does not change **(1)**	2 weighings must be mentioned Allow weigh crucible by difference Allow test tube/boiling tube/evaporating basin Do not award beaker Do not award sodium carbonate solution Ignore use of a lid Do not award for any other heating other than a bunsen burner or using a yellow flame Accept heat to constant mass Ignore until all the water has been lost Allow maximum (1) for answers describing the formation of crystals eg heat to boiling Do not award M3 if any incorrect detail is added eg colour change	**(3)**

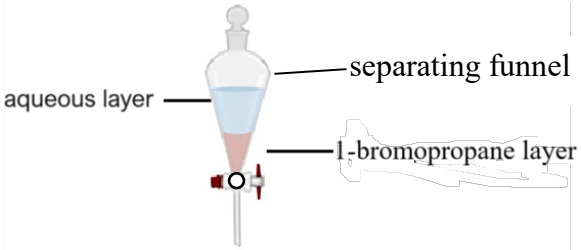
(Total for Question 3 = 14 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	An answer that makes reference to the following points: ● Apparatus A: (simple) distillation / distilling **and** Apparatus B: (heating under) reflux / refluxing	Do not award fractional distillation	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	An answer that makes reference to the following points: ● potassium or sodium dichromate/dichromate(VI) **and** sulfuric acid **(1)** ● orange to green **(1)**	Allow acidified dichromate (ions) Allow acidified $Cr_2O_7^{2-}$ / H^+, $Cr_2O_7^{2-}$ Ignore concentration of sulfuric acid If name, formula and oxidation numbers are given all must be correct Allow orange to blue Ignore just goes green	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	An explanation that makes reference to the following points: ● further oxidation will occur **(1)** ● forming butanoic acid **(1)**	 Allow complete/full oxidation Allow forms a carboxylic acid	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)	A description that makes reference to the following points: ● vapour/gas enters the condenser where it turns back into a liquid **(1)** ● liquid returns into the flask (where it continues to react) **(1)**	 Accept evaporates then condenses Allow named substances for the vapour in M1 and for the liquid in M2 Any implication of drips back into the flask/returns to flask. Ignore any reference to HBr evaporating and condensing.	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(d)	An answer that makes reference to the following points: ● separating funnel label **(1)** ● diagram with tap and stem at the bottom, and narrow top capable of being stoppered **(1)** ● layers correctly labelled and in the correct order **(1)**	Example of diagram  Do not award if a filter funnel is drawn Ignore stoppers Allow organic layer for 1-bromopropane Do not award single boundary or if the top boundary is within the neck or more than two boundaries	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(e)	• calculation of mass **and** moles of propan-1-ol **(1)** Either • calculation of maximum mass of 1-bromopropane **(1)** • calculation of percentage yield **(1)** or • calculation of moles of bromobutane **(1)** • calculation of percentage yield **(1)**	<u>Example of calculation</u> m = 10.0 × 0.80 = 8.00 (g) n = 8.00 ÷ 60 = 0.13333 (mol) m = 0.13333 × 122.9 = 16.39 (g) or m = (122.9 ÷ 60) × 8.0 = 16.39 (g) 7.98 ÷ 16.39 × 100 = 48.688 = 48.7% n = 7.98 ÷ 122.9 = 0.06493 (mol) 0.06493 ÷ 0.13333 x 100 = 48.7% Allow TE except no M3 on TE if over 100% Ignore SF except 1 Correct answer with or without working scores 3 Penalise incorrect truncation in M2 of 0.0649 to 0.064 or 16.39 to 16.3	**(3)**

(Total for Question 4 = 13 marks)

TOTAL FOR PAPER = 50 MARKS