



Mark Scheme (Results)

January 2026

Pearson Edexcel International Advanced Subsidiary Level
in Chemistry
Paper 01A: Practical Skills in Chemistry I

WCH13/01A

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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.

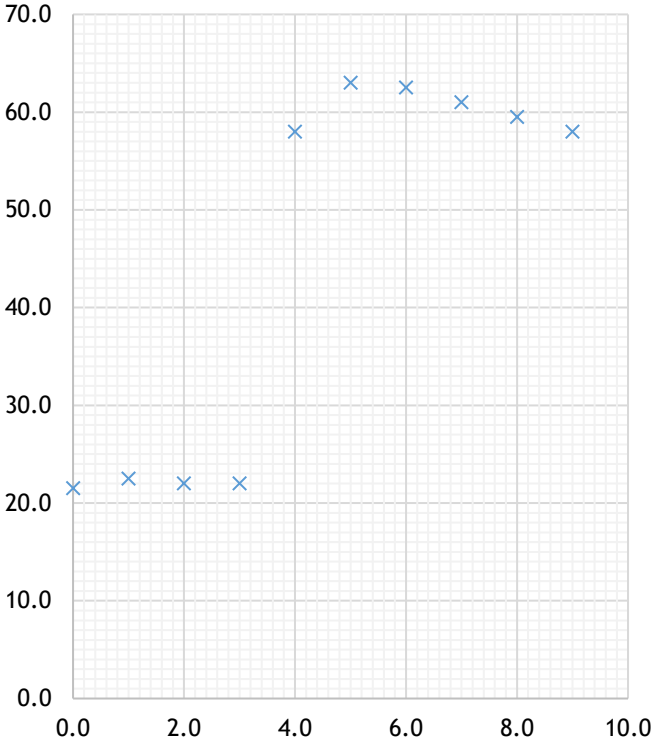
Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

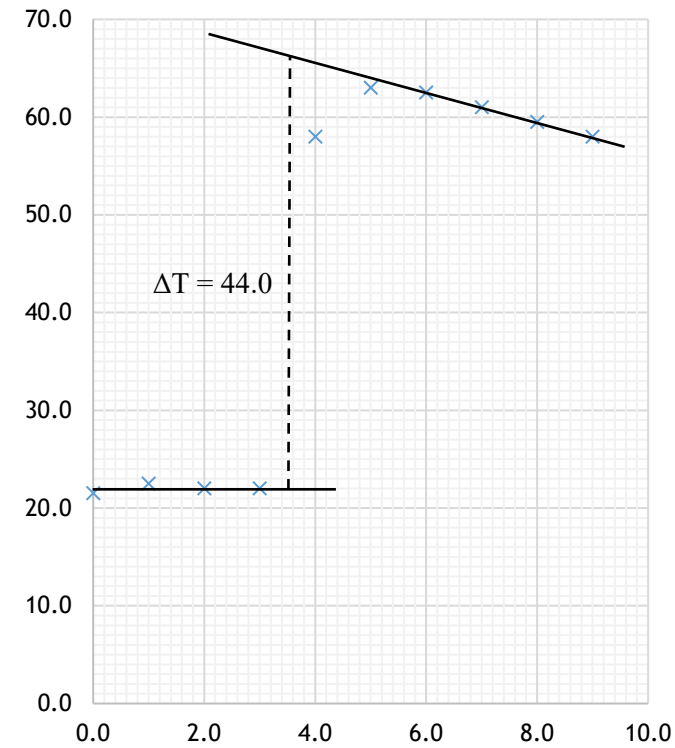
Quality of Written Communication

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)(i)	An answer that makes reference to the following points: 10 points plotted correctly	Example of graph:  Allow +/- ½ a small square Ignore in this item any lines drawn	(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	An answer that makes reference to the following points: - two straight lines of best fit linking the points - extrapolation of both lines to at least 3.5 minutes - reading of value of ΔT from the graph at 3.5 minutes	(1) (1) (1)  $\Delta T = 44.0$ ΔT may be found on the graph or in the space given TE from incorrect plotting in (a)(i) TE for M2 and M3 from incorrect lines drawn in M1; M2 for extrapolation of lines to 3.5 minutes, and M3 from M2 for ΔT calculated from their extrapolated lines at 3.5 minutes	(3)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	- calculation of moles of zinc (1) - calculation of moles of copper(II) sulfate and - mol Zn > mol CuSO₄ (1) Alternative method - calculation of moles of copper sulfate - calculation of mass of zinc required and 4.40 > 3.27	<u>Example of calculation</u> $n = 4.40 \div 65.4 = 0.067278 / 0.06728 \text{ (mol)}$ $n = \frac{50}{1000} \times 1.0 = 0.05(00) / 5(.0) \times 10^{-2} \text{ (mol)}$ Allow 0.06728 > 0.05 for (2) marks $n = \frac{50}{1000} \times 1.0 = 0.05(00) / 5(.0) \times 10^{-2} \text{ (mol)}$ $m = 0.05 \times 65.4 = 3.27 \text{ (g)}$ Ignore SF except 1SF for zinc Ignore SF for copper(II) sulfate	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	calculation of energy transferred	(1) <u>Example of calculation</u> $Q = 50 \times 4.2 \times 44 = 9240 / 9.24 \times 10^3 \text{ (J)}$ TE ΔT from (a)(ii)) Allow 9.24 kJ but units must be given Allow use of 4.18 for 4.2 Allow TE on answer to (a)(ii) Do not award 54.5 for 50 Do not award incorrect units e.g. kJ mol^{-1} Ignore sign Ignore SF except 1 SF Correct answer with no working scores (1)	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	calculation of value for energy transferred per mole (1)	<u>Example of calculation</u> $\Delta H = \frac{\text{answer to (b)(ii)}}{\text{moles of copper(II) sulfate from (b)(i)}}$ $\Delta H = \frac{9240}{0.050} (= 184800 / 185000)$ Ignore units for M1 even if incorrect Allow the mark for the expression irrespective of further calculation or error in calculation calculation of enthalpy change including sign (1) $\Delta H = -\frac{184800}{1000} = -184.8 / 185 \text{ (kJ mol}^{-1}\text{)}$ TE on M1 Allow answer in J mol⁻¹ if unit given Allow TE on (b)(i) and (b)(ii) Ignore SF except 1SF Correct answer with no working scores (2)	(2)

Question Number	Answer	Additional Guidance	Mark
1(c)	An answer that makes reference to two of the following improvements and justifications - place a lid on the polystyrene cup and to reduce heat loss - use a thermometer with more / smaller gradations and to give a more precise temperature change - reweigh the bottle after adding the zinc and to give a more accurate mass of zinc added	(1) Allow smaller intervals Allow a more precise thermometer Allow use a digital thermometer Allow use a thermometer with a higher resolution Allow use a data logger (1) Allow give a more accurate temperature change Allow decrease percentage uncertainty Ignore parallax errors (1) Ignore - use a larger mass / excess of zinc - more concentrated CuSO₄ solution - use of pipette / burette 'better insulation' - repeating the experiment - taking more readings - more accurate weighing - maintaining constant room temperature Allow (1) mark for any two improvements without justification	(2)

(Total for Question 1 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	Ca²⁺	Allow calcium(II) Ignore calcium ion Ignore just Ca	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	nitrogen dioxide / NO₂	Ignore N ₂ O ₄ If both name and formula are given then both must be correct	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	(NO₂ / the gas) is toxic	Allow causes breathing problems Allow poisonous Ignore harmful Comment: Allow bromine is a toxic gas, if Br ₂ given in 2(b)(i)	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	NO₃⁻ / nitrate ((V))	Do not award NO ₂ ⁻ / nitrite If name and formula given then both must be correct	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(iv)	balanced equation	(1) $\text{Ca}(\text{NO}_3)_2(\text{s}) \rightarrow \text{CaO}(\text{s}) + 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$ Allow multiples Allow TE for $\text{Sr}(\text{NO}_3)_2$ if Sr^{2+} given in 2(a) $\text{Sr}(\text{NO}_3)_2(\text{s}) \rightarrow \text{SrO}(\text{s}) + 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$ Allow TE for LiNO_3 if Li^+ given in 2(a) $2\text{LiNO}_3(\text{s}) \rightarrow \text{Li}_2\text{O}(\text{s}) + 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$	(2)
	state symbols	(1) M2 depends on correct species given in M1	

Question Number	Answer	Additional Guidance	Mark
2(c)	An answer that makes reference to the following points: - formula of nitrate compound - the cation / Li^+ / Mg^{2+} / Be^{2+} / ionic radius is smaller - so better distorts the electron cloud in/attracts electrons from the nitrate ion/anion or so weakens the nitrogen-oxygen/N–O bond more (which breaks at a lower temperature)	(1) LiNO_3 / $\text{Mg}(\text{NO}_3)_2$ / $\text{Be}(\text{NO}_3)_2$ Allow $\text{Ca}(\text{NO}_3)_2$ if Sr^{2+} given in 2(a) A compound with a larger cation cannot score any marks for 2(c) (1) TE on 2(a) If $\text{Mg}(\text{NO}_3)_2$ / $\text{Ca}(\text{NO}_3)_2$ given as formula, allow ionic radius increases down the group. Ignore Li / lithium / Mg / magnesium / Be / beryllium – must be an ion Allow just (so is) more polarising (1) Do not award weakens the ionic bond If Li^+ is given in 2(a) then only $\text{Be}(\text{NO}_3)_2$ will score for M1, and a greater charge for Be^{2+} could score M2, rather than a comparison of size.	(3)

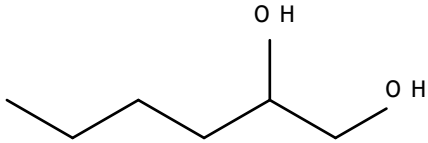
(Total for Question 2 = 9 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	hexan-1-ol	Allow 1-hexanol Ignore just hexanol	(1)

Question Number	Answer	Additional Guidance	Mark
3(b)	An answer that makes reference to the following points: PCl_5 / phosphorus(V) chloride / phosphorus pentachloride (1) - misty / steamy fumes (1) Or - acidified (potassium) dichromate / H^+ and $\text{K}_2\text{Cr}_2\text{O}_7$ (1) - colour change from orange to green (1)	Allow SOCl_2 / thionyl chloride Do not award PCl_3 / phosphorus(III) chloride Allow fumes that turn damp litmus paper red Allow fumes/gas form white smoke with (conc.) NH_3 Do not award just white smoke Allow sodium dichromate Do not award acidified manganate Comment: Allow sodium / Na (1) and fizzing (1) Allow addition of a carboxylic acid and sulfuric acid (1) and a sweet/fruity smell (of an ester) (1)	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)	An answer that makes reference to the following points: - AgNO₃ / silver nitrate (solution) (1) - Yellow precipitate / ppt. / solid / crystals (1)	Ignore addition of NaOH and / or HNO₃ before AgNO₃ Ignore solvent Ignore addition of ammonia Do not award if any other acid added Ignore any other description of yellow, e.g. pale / primrose Ignore effect of adding ammonia even if incorrect Do not award other colours e.g. cream M2 is dependent on silver nitrate being added in M1	(2)

Question Number	Answer	Additional Guidance	Mark
3(d)(i)	An answer that makes reference to the following points: from purple to colourless	Ignore pink Ignore clear Do not award other colours e.g. violet, lilac	(1)

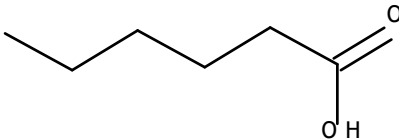
Question Number	Answer	Additional Guidance	Mark
3(d)(ii)	Skeletal formula of hexan-1,2-diol	 Do not award structural or displayed formula Ignore vertical connectivity	(1)

Question Number	Answer	Additional Guidance	Mark
3(e)	An answer that makes reference to the following points: - potassium hydroxide / KOH (1) - ethanolic / alcoholic (1)	Accept sodium hydroxide / NaOH Allow aqueous ethanol Ignore comments about heat / temperature	(2)

Question Number	Answer	Additional Guidance	Mark
3(f)(i)	“water in” at the bottom of the condenser and “water out” at the top (1) - anti bumping granules (1)	Allow small pieces of glass / ceramic Ignore bumping granules Comment: Allow anything small, solid and inert. “Stones” is insufficient, as limestone would react.	(2)

Question Number	Answer	Additional Guidance	Mark
3(f)(ii)	An answer that makes reference to the following points: (heating under) reflux	Do not award HUR	(1)

Question Number	Answer	Additional Guidance	Mark
3(f)(iii)	An explanation that makes reference to the following points: - vapour(s) / gas(es) condense(d) (1) (and) return to the flask (1) - to ensure complete oxidation / so reaction goes to completion (1)	Allow reactant / products condense(d) Allow prevents reactants / products escaping Allow prevents volatile compounds escaping Allow further reaction Allow for further oxidation of aldehyde/hexanal Allow unreacted alcohol can be oxidised Ignore just further oxidation of compound E	(3)

Question Number	Answer	Additional Guidance	Mark
3(f)(iv)	structural formula of hexanoic acid	$\text{CH}_3(\text{CH}_2)_4\text{COOH}$ Allow skeletal formula, displayed formula or combinations  Ignore molecular formulae	(1)

(Total for Question 3 = 16 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	(free) radical substitution	Do not award electrophilic / nucleophilic	(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	ultraviolet light / ultraviolet radiation	Allow UV light / sunlight Ignore temperature / heat Do not award if given with any other reagents/conditions	(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(iii)	An answer that makes reference to the following point: there can be further substitution (reactions) / more than one substitution product	Allow there are other organic compounds formed Allow other hydrocarbons formed Allow other named products formed such as dibromobutanes and octane Ignore hydrogen bromide is formed Ignore waste products Ignore low yield Ignore just further reactions Ignore reference to atom economy/yield Ignore side reactions	(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	two layers and top layer labelled aqueous and bottom layer labelled 1-bromobutane	Allow water Allow organic	(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	An answer that makes reference to the following point: To neutralise / react with / remove (any remaining) HCl / hydrochloric acid	Allow H ⁺ in place of HCl Allow to neutralise excess acid Ignore to absorb HCl Do not award react with H ₂ SO ₄ /sulfuric acid	(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	An answer that makes reference to the following points: (change) from cloudy to clear	Allow “becomes clear” Ignore colourless Ignore reference to removal of water	(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	calculation of % yield	$\% \text{ yield} = \frac{19.24}{30.0} \times 100 = 64(.13) \%$ Ignore SF except 1SF Correct answer without workings scores (1)	(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	An answer that makes reference to two of the following points: - side / competing reactions occur - reaction is incomplete - product is lost in purification / transfer	(1) Allow converted back to the alcohol (1) Allow it is an equilibrium reaction Do not award incomplete combustion (1) Ignore evaporation Ignore: - reactants are not pure - heat loss - measuring errors	(2)

Question Number	Answer	Additional Guidance	Mark
4(d)	An answer that makes reference to the following point: method 1 and total mass / M_r of biproducts/waste products is lower	Allow answer by calculation (atom economy = $\frac{\text{molar mass of desired product}}{\text{sum of molar masses of all products}} \times 100$) for both methods so $62.9\% > 49.8\%$ or molar mass HBr < molar mass NaHSO₄ + H₂O or $80.9 < 138(.1)$	(1)

Question Number	Answer	Additional Guidance	Mark
4(e)(i)	1-bromobutane and water are immiscible or To allow the 1-bromobutane to mix/react with the silver nitrate (solution)	Allow 1-bromobutane does not dissolve in water Allow so the 1-bromobutane can mix with the water Allow silver nitrate does not dissolve in 1-bromobutane Allow ethanol is a co-solvent Ignore just 1-bromobutane can dissolve in ethanol	(1)

Question Number	Answer	Additional Guidance	Mark
4(e)(ii)	To ensure that the amount of precipitate is the same (in each experiment)	Allow same degree of cloudiness at a fixed point Ignore just to make it a fair test Comment: Allow volume of precipitate is the same	(1)

Question Number	Answer	Additional Guidance				Mark						
4(e)(iii)	An answer that makes reference to the following points:					(2)						
	- Any one compound in the correct box (1) - All three compounds in the correct boxes (1)	<table><tr><td>halogenoalkane</td><td>1-bromobutane</td><td>1-iodobutane</td><td>2-bromo-2-methylbutane</td></tr><tr><td>time taken for precipitate to form / s</td><td>72</td><td>56</td><td>4</td></tr></table>	halogenoalkane	1-bromobutane	1-iodobutane		2-bromo-2-methylbutane	time taken for precipitate to form / s	72	56	4	
halogenoalkane	1-bromobutane	1-iodobutane	2-bromo-2-methylbutane									
time taken for precipitate to form / s	72	56	4									

(Total for Question 4 = 14 marks)

(TOTAL FOR PAPER = 50 MARKS)