

Markscheme

May 2026

Chemistry

Higher level

Paper 1b

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Subject Details: Chemistry Higher Level Paper 1B Markscheme

Candidates are required to answer **ALL** questions. Maximum total = **[35 marks]**.

1. Each row in the “Question” column relates to the smallest subpart of the question.
2. The maximum mark for each question subpart is indicated in the “Total” column.
3. Each marking point in the “Answers” column is shown by means of a tick (✓) at the end of the marking point.
4. A question subpart may have more marking points than the total allows. This will be indicated by “**max**” written after the mark in the “Total” column. The related rubric, if necessary, will be outlined in the “Notes” column.
5. An alternative word is indicated in the “Answers” column by a slash (/). Either word can be accepted.
6. An alternative answer is indicated in the “Answers” column by “**OR**”. Either answer can be accepted.
7. An alternative markscheme is indicated in the “Answers” column under heading **ALTERNATIVE 1** etc. Either alternative can be accepted.
8. Words inside chevrons « » in the “Answers” column are not necessary to gain the mark.
9. Words that are underlined are essential for the mark.
10. The order of marking points does not have to be as in the “Answers” column, unless stated otherwise in the “Notes” column.
11. If the candidate’s answer has the same “meaning” or can be clearly interpreted as being of equivalent significance, detail and validity as that in the “Answers” column then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect) in the “Notes” column.
12. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
13. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script.
14. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the “Notes” column.
15. If a question specifically asks for the name of a substance, do not award a mark for a correct formula unless directed otherwise in the “Notes” column. Similarly, if the formula is specifically asked for, do not award a mark for a correct name unless directed otherwise in the “Notes” column.
16. If a question asks for an equation for a reaction, a balanced symbol equation is usually expected, do not award a mark for a word equation or an unbalanced equation unless directed otherwise in the “Notes” column.

Ignore missing or incorrect state symbols in an equation unless directed otherwise in the “Notes” column.

Question			Answers	Notes	Total
1.	(a)	(i)	«water level is» below sea level ✓	Do not accept only “water depth increases”.	1
1.	(a)	(ii)	rate «of change» increases «in magnitude» OR rate «of change» becomes more negative ✓ curve gets steeper OR gradient increases «in magnitude» OR gradient becomes more negative ✓	Accept rate becomes faster for M1. Accept any correct mathematical treatment using the values from the graph for M2.	2
1.	(a)	(iii)	«change in level = $(-398) - (-392) =$ » «-»6 «m» ✓ «volume = $6 \text{ m} \times 1020 \times 10^6 \text{ m}^2 =$ » 6×10^9 «m ³ » ✓	Accept answers in the range -5.8 to -6.3 «m» for M1. Do not penalize missing negative sign in M1. Accept answers in the range 5.9×10^9 to 6.4×10^9 «m ³ » for M2.	2
1.	(a)	(iv)	Any two of: decreasing rainfall ✓ increasing temperature/global warming ✓ higher wind «speeds» ✓ changes/diversions in the flow of water/river(s) «around the Dead Sea» ✓ lower «atmospheric» humidity ✓	Apply List Principle. Do not accept “industrial reasons” unless linked to environmental impacts. Accept “climate change” OR “greenhouse effect” for global warming.	2 max

Question			Answers	Notes	Total												
1.	(b)	(i)	Any two of: «measurements made at» different locations/areas ✓ «measurements made during» different years/times «of the year/day»/seasons ✓ «measurements made with» different instruments/«sampling» methods ✓ «measurements made at» different depths ✓	Apply List Principle. Do not accept instruments not calibrated or other suggestions based on experimental error. Do not accept only “global warming”.	2 max												
1.	(b)	(ii)	« $\frac{(46-40.65)}{\left(\frac{46+40.65}{2}\right)} \times 100 =$ » 12«%» ✓		1												
1.	(b)	(iii)	<table><tr><td>Ion</td><td>Concentration / mol dm⁻³</td><td>[Cl⁻] required to form chloride salt / mol dm⁻³</td></tr><tr><td>Na⁺ (aq)</td><td>1.703</td><td>1.703</td></tr><tr><td>Mg²⁺ (aq)</td><td>1.672</td><td>«2x1.672 mol dm⁻³» 3.344 ✓</td></tr><tr><td>Cl⁻ (aq)</td><td>«212.40 g dm⁻³/35.45 g mol⁻¹» 5.992 ✓</td><td></td></tr></table>	Ion	Concentration / mol dm ⁻³	[Cl ⁻] required to form chloride salt / mol dm ⁻³	Na ⁺ (aq)	1.703	1.703	Mg ²⁺ (aq)	1.672	«2x1.672 mol dm ⁻³ » 3.344 ✓	Cl ⁻ (aq)	«212.40 g dm ⁻³ /35.45 g mol ⁻¹ » 5.992 ✓			2
Ion	Concentration / mol dm ⁻³	[Cl ⁻] required to form chloride salt / mol dm ⁻³															
Na ⁺ (aq)	1.703	1.703															
Mg ²⁺ (aq)	1.672	«2x1.672 mol dm ⁻³ » 3.344 ✓															
Cl ⁻ (aq)	«212.40 g dm ⁻³ /35.45 g mol ⁻¹ » 5.992 ✓																
1.	(b)	(iv)	Alternative 1: «MgCl ₂ and NaCl require total [Cl ⁻] = 3.344 + 1.703 =» 5.047 «mol dm ⁻³ » AND valid/[Cl ⁻] is enough ✓ Alternative 2: salts are dissociated into ions «in the sea» AND it is not valid to discuss salts found ✓		1												

Question			Answers	Notes	Total
1.	(b)	(v)	<i>Any three of:</i> prepare «minimum» 5 dilutions «of known concentrations» using standard solution ✓ range of concentrations must include expected sample concentration ✓ «calibrate» at selected wavelength/wavelength of maximum absorbance ✓ measure absorbance/transmittance for each «concentration» ✓ minimum 2 concordant values per concentration ✓ plot graph of absorbance vs concentration ✓ deduce the best-fit/trend/regression line «thorough origin» OR strong R^2/coefficient of determination value «> 0.99» ✓	Accept “repeats for each concentration” for M5.	3 max
1.	(c)	(i)	<i>Independent variable:</i> depth «water sample is obtained from» ✓ <i>Dependent variable:</i> current/reading on ammeter/conductivity ✓		2
1.	(c)	(ii)	<i>Any two of:</i> distance between electrodes ✓ «surface» area of electrodes ✓ voltage ✓ depth of electrodes in solution/water ✓	Apply List Principle. Accept volume of water/solution, resistance/diameter/length of wires, cleanliness of electrode surface.	2 max
1.	(c)	(iii)	«fractional uncertainty = $0.01 / 2.52 =$ » « $\pm$ » 0.004 ✓		1

Question			Answers	Notes	Total
1.	(c)	(iv)	<i>Conclusion:</i> as depth increases conductivity/current decreases ✓ <i>Explanation:</i> ion/salt concentration decreases with depth OR «salt» solubility decreases as temperature decreases at lower depths ✓		2
1.	(c)	(v)	<i>Cathode:</i> $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$ OR $2\text{H}_2\text{O}(\text{l}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g}) + 2\text{OH}^-(\text{aq})$ ✓ <i>Anode:</i> $2\text{Br}^-(\text{aq}) \rightarrow 2\text{e}^- + \text{Br}_2(\text{aq})$ ✓	Award [1] if answers are reversed.	2

Question			Answers	Notes	Total
2.	(a)		Any two of: excess oxidizing agent/sodium dichromate/$\text{Na}_2\text{Cr}_2\text{O}_7$ ✓ reflux/«ethanal is» condensed back to the flask «for further oxidation» ✓ «heat to» boil ✓	Apply List Principle.	2 max
2.	(b)		Any two of: no flame/Bunsen burner/electric heater «as ethanol is flammable» ✓ use heating mantle/water bath «to heat ethanol» ✓ ventilate «room»/fume hood ✓ wear gloves «to avoid contact with oxidizing agent/acid/heat» ✓ store reagents away from heat/humidity ✓ heat gently ✓	Apply List Principle. Accept respirator/«face» mask.	2 max

Question			Answers	Notes	Total
2.	(c)		Alternative 1: «sulfuric» acid/H₂SO₄/sodium dichromate/Na₂Cr₂O₇/dichromate(VI) ion/Cr₂O₇²⁻ «is present» OR NaOH «used to prepare solution» absorbed moisture/is hygroscopic ✓ more sodium hydroxide/NaOH will be used «in the titration» OR «titration» gives a higher yield «of ethanoic acid» ✓ Alternative 2: water/H₂O «is present» OR «some» vapors escaped «during heating» OR «mixture» needed longer heating time ✓ less sodium hydroxide/NaOH will be used «in the titration» OR «titration» gives a lower yield «of ethanoic acid» ✓ Alternative 3: error in detecting endpoint «chromium(III) ions/Cr³⁺ are colored» ✓ less sodium hydroxide/NaOH will be used «in the titration» OR «titration» gives a lower yield «of ethanoic acid» ✓	<i>Do not accept "NaOH solution not standardized" for M1.</i> <i>Accept "higher NaOH volume used" OR "gives higher yield of ethanoic acid" for M2 in Alternative 3.</i>	2

Question			Answers	Notes	Total
2.	(d)	(i)	Any two of: ethanal/ CH_3CHO water/ H_2O sodium dichromate/ $\text{Na}_2\text{Cr}_2\text{O}_7$ /dichromate(VI) ion/ $\text{Cr}_2\text{O}_7^{2-}$ /sodium ion// Na^+ sulfuric acid/ H_2SO_4 /hydrogen ion/ H^+ /sulfate ion/ SO_4^{2-} chromium(III) ion/ Cr^{3+} ethyl ethanoate/ $\text{CH}_3\text{COOCH}_2\text{CH}_3$ ✓	Apply List Principle.	1 max
2.	(d)	(ii)	incorrect «it increased calculated yield» AND impurities increased the mass «of liquid» collected ✓		1
2.	(e)		mean «volume» = 22.80 cm^3 AND $n(\text{NaOH}) = 0.250 \text{ «mol dm}^{-3}\text{»} \times 0.02280 \text{ «dm}^3\text{»} = 0.00570 \text{ «mol»} \checkmark$ «1:1» total $n(\text{CH}_3\text{COOH}) = 0.00570 \times 18.7 / 5.00 = 0.0213 \text{ «mol»} \checkmark$	Do not penalize for incorrect significant figures.	2