

Markscheme

May 2026

Chemistry

Standard level

Paper 2

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Subject Details: Chemistry Standard Level Paper 2 Markscheme

Candidates are required to answer **ALL** questions. Maximum total = **[50 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)	$\ll 15.0 \text{ g} * \frac{1 \text{ mol}}{256.56 \text{ g}} * \frac{8 \text{ mol}}{1 \text{ mol}} = \gg 0.468 \ll \text{mol} \gg \checkmark$ $\ll 0.468 \text{ mol} * \frac{22.7 \text{ dm}^3}{1 \text{ mol}} = \gg 10.6 \ll \text{dm}^3 \gg \checkmark$	Award [2] for correct final answer.	2						
1.	(a)	(ii)	$\frac{10.6 \text{ dm}^3}{273 \text{ K}} \times 298 \text{ K} \ll = \gg 11.6 \ll \text{dm}^3 \gg \checkmark$	Accept “16.4 <<dm ³ >>” if using 15.0 dm ³ . Accept use of 273.15K and 298.15K.	1						
1.	(b)	(i)	<table><tr><td>Compound</td><td>Oxidation State of Sulfur</td></tr><tr><td>SO₂</td><td>+4</td></tr><tr><td>SO₃</td><td>+6</td></tr></table>	Compound	Oxidation State of Sulfur	SO ₂	+4	SO ₃	+6	Accept IV AND VI. Do not accept 4+/4 OR 6+/6.	1
Compound	Oxidation State of Sulfur										
SO ₂	+4										
SO ₃	+6										
1.	(b)	(ii)	$\frac{[\text{SO}_3]^2}{[\text{SO}_2]^2[\text{O}_2]} \checkmark$	Square Brackets [] required.	1						
1.	(b)	(iii)	decreases AND forward reaction exothermic ✓		1						
1.	(b)	(iv)	<table><tr><td>Decreasing volume</td><td>shifts to right/towards products AND fewer moles of gas/products ✓</td></tr><tr><td>Value of K</td><td>stays the same ✓</td></tr></table>	Decreasing volume	shifts to right/towards products AND fewer moles of gas/products ✓	Value of K	stays the same ✓	Allow [1 max] if both directions correct without correct explanations. Accept “shifts right/towards products AND to reduce the pressure” for M1	2		
Decreasing volume	shifts to right/towards products AND fewer moles of gas/products ✓										
Value of K	stays the same ✓										

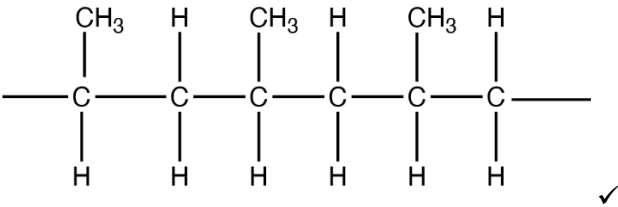
Question			Answers	Notes	Total
1.	(c)		covalent bonding between S and O/within $\text{H}_2\text{SO}_4/\text{HSO}_4^-/\text{SO}_4^{2-}$ OR covalent bonding between H and O/within H_2O ✓ ionic bonding between $\text{H}^+/\text{H}_3\text{O}^+$ and $\text{HSO}_4^-/\text{SO}_4^{2-}$ ions ✓	Accept any named intermolecular force between named species for M2. Do not award mark without correct ion charge notations for M2	2
1.	(d)	(i)	strong acids dissociate/ionize completely AND weak acids dissociate/ionize partially <<in solution/water>> ✓		1
1.	(d)	(ii)	Lewis formula: $\left[\begin{array}{c} \text{:O:} \\ \\ \text{:}\ddot{\text{O}}-\text{S}-\ddot{\text{O}}\text{:} \end{array} \right]^{2-} \quad \left[\begin{array}{c} \text{:}\ddot{\text{O}}\text{:} \\ \\ \text{:}\ddot{\text{O}}-\text{S}-\ddot{\text{O}}\text{:} \end{array} \right]^{2-}$ ✓ Molecular Geometry: trigonal pyramidal ✓	Accept any combination of lines and dots Penalize missing brackets and/or negative charge for M1. Negative charges may be indicated on 2 singularly bonded oxygens without brackets. M2 mark must follow from Lewis structure shown	2
1.	(e)		$\text{Pb(s)} + 2\text{H}_2\text{SO}_4(\text{aq}) + \text{PbO}_2(\text{s}) \rightarrow 2\text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O(l)}$ OR $\text{Pb(s)} + 4\text{H}^+(\text{aq}) + 2\text{SO}_4^{2-}(\text{aq}) + \text{PbO}_2(\text{s}) \rightarrow 2\text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O(l)}$ ✓	Accept " $\text{Pb(s)} + 2\text{H}^+(\text{aq}) + 2\text{HSO}_4^-(\text{aq}) + \text{PbO}_2(\text{s}) \rightarrow 2\text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O(l)}$ "	1

Question			Answers	Notes	Total						
1.	(f)	(i)	Anode half-equation: $\text{H}_2(\text{g}) + 2\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 2\text{e}^-$ ✓ Cathode half-equation: $\text{O}_2(\text{g}) + 4\text{e}^- + 2\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{OH}^-(\text{aq})$ ✓	Allow [1 max] for “$\text{H}_2(\text{g}) \rightarrow 2\text{H}^+(\text{aq}) + 2\text{e}^-$ AND $\text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}(\text{aq})$” Penalize the use of equilibrium arrows once only.	2						
1.	(f)	(ii)	electrons occupy <<discrete/separate>> energy levels ✓ higher energy levels converge ✓	Accept other correct statements such as “energy levels spaced unequally” for M2	2						
2.	(a)	(i)	<table border="1"><tr><td>Protons</td><td>19</td></tr><tr><td>Electrons</td><td>18</td></tr><tr><td>Neutrons</td><td>20</td></tr></table> ✓ ✓	Protons	19	Electrons	18	Neutrons	20	Award [2] for three correct answers, [1] for two correct answers.	2
Protons	19										
Electrons	18										
Neutrons	20										
2.	(a)	(ii)	$1\text{s}^22\text{s}^22\text{p}^63\text{s}^23\text{p}^6$ ✓	Ignore “4s^0”	1						
2.	(a)	(iii)	$39.10 = x(0.9326) + 40.96(0.06730)$ ✓ $\ll \frac{36.34}{0.9326} = \gg x$ 38.97 ✓	Do not award M1 without working. Do not award M2 without 4 significant figures. Allow other valid methods for determining answer.	2						
2.	(b)	(i)	potassium/K has fewer protons/lower nuclear charge/lower atomic number ✓ <<both have>> same shielding <<by inner electrons>>/<< occupied >> energy levels ✓	Accept “Ca has a smaller atomic radius/electron removed is closer to the nucleus” for M2	2						
2.	(b)	(ii)	valence e^- in potassium/K more shielded <<by inner electrons>>/<< occupied >> energy levels ✓	Allow K has larger atomic radius than Na if not used as an explanation in 2b(i)	1						

Question			Answers	Notes	Total									
2.	(c)	(i)	$2\text{K(s)} + 2\text{H}_2\text{O(l)} \rightarrow 2\text{KOH(aq)} + \text{H}_2\text{(g)}$ correct products and state symbols ✓ correct balancing ✓	<i>Accept any correct multiples</i> <i>Accept balanced ionic equation.</i> <i>Only award M2 if products are correct</i>	2									
2.	(c)	(ii)	<table border="1"><tr><td></td><td>Type of bonding</td><td>How valence electrons produce bonds</td></tr><tr><td>K</td><td>metallic bond</td><td>delocalized electrons attracted to cations/positive ions <<in lattice structure>> ✓ AND</td></tr><tr><td>H₂O</td><td><<polar>> covalent bonds</td><td>shared electrons <<unequally between atoms/nuclei>> ✓ AND</td></tr></table>		Type of bonding	How valence electrons produce bonds	K	metallic bond	delocalized electrons attracted to cations/positive ions <<in lattice structure>> ✓ AND	H ₂ O	<<polar>> covalent bonds	shared electrons <<unequally between atoms/nuclei>> ✓ AND	<i>Award [1 max] for any correct column.</i> <i>Do not accept protons/nucleus in place of cation/positive ions.</i>	2
	Type of bonding	How valence electrons produce bonds												
K	metallic bond	delocalized electrons attracted to cations/positive ions <<in lattice structure>> ✓ AND												
H ₂ O	<<polar>> covalent bonds	shared electrons <<unequally between atoms/nuclei>> ✓ AND												

Question			Answers	Notes	Total
3.	(a)	(i)	<i>Bonds broken:</i> $\ll 2 \times \text{C-C} \gg + \ll 8 \times \text{C-H} \gg + \ll 5 \times \text{O=O} \gg$ $2 \times 346 \ll \text{kJ} \gg + 8 \times 414 \ll \text{kJ} \gg + 5 \times 498 \ll \text{kJ} \gg / 6494 \ll \text{kJ} \gg \checkmark$ <i>Bonds formed:</i> $\ll 6 \times \text{C=O} \gg + \ll 8 \times \text{O-H} \gg$ $6 \times 804 \ll \text{kJ} \gg + 8 \times 463 \ll \text{kJ} \gg / 8528 \ll \text{kJ} \gg \checkmark$ $\ll \Delta H = \Sigma \text{bonds broken} - \Sigma \text{bonds formed} = (6494 \text{ kJ} - 8528 \text{ kJ}) = \gg -2034 \ll \text{kJ} \gg \checkmark$	Award [3] for correct final answer. Award [2 max] for final answer of $\ll + \gg 2034 \ll \text{kJ} \gg$.	3
3.	(a)	(ii)	$\ll \frac{25.0 \text{ g}}{44.11 \text{ g mol}^{-1}} = \gg 0.567 \ll \text{mol C}_3\text{H}_8 \gg$ AND $\ll \frac{95.0 \text{ g}}{32.00 \text{ g mol}^{-1}} = \gg 2.97 \ll \text{mol O}_2 \gg \checkmark$ $\ll 0.567 \text{ mol} \times 5 = \gg 2.84 \ll \text{mol} \gg$ OR $\ll \frac{2.97 \text{ mol}}{5} = \gg 0.594 \ll \text{mol} \gg$ AND propane/C₃H₈ limiting reagent $\checkmark$ $\ll 0.567 \text{ mol} \times 3 \times \frac{44.01 \text{ g}}{1 \text{ mol}} = \gg 74.9 \ll \text{g} \gg \checkmark$	Award [3] for correct final answer. Do not penalize the use of whole number molecular masses. Accept other valid methods for determining M1 AND/OR M2. Accept final answers in the range 74.8-75.3 $\ll \text{g} \gg$.	3

Question			Answers	Notes	Total
3.	(b)	(i)	<i>Initiation:</i> $\text{Br-Br} \rightarrow \text{Br}\cdot + \text{Br}\cdot$ ✓ <i>Propagation:</i> $\text{Br}\cdot + \text{CH}_3\text{CH}_2\text{CH}_3 \rightarrow \text{HBr} + \cdot\text{CH}(\text{CH}_3)_2$ ✓ $\cdot\text{CH}(\text{CH}_3)_2 + \text{Br}_2 \rightarrow \text{CH}_3\text{CHBrCH}_3 + \text{Br}\cdot$ ✓	<i>Radical electron required in structure. Penalize missing radical electron once only.</i> <i>Penalize use of $\cdot\text{C}_3\text{H}_7$ instead of $\cdot\text{CH}(\text{CH}_3)_2$ or incorrect hydrocarbon used, once only in 3b(i) and 3b(ii)</i>	3
3.	(b)	(ii)	<i>Any one of:</i> $\text{Br}\cdot + \text{Br}\cdot \rightarrow \text{Br-Br}$ ✓ $\text{Br}\cdot + \cdot\text{CH}(\text{CH}_3)_2 \rightarrow \text{CH}_3\text{CHBrCH}_3$ ✓ $\cdot\text{CH}(\text{CH}_3)_2 + \cdot\text{CH}(\text{CH}_3)_2 \rightarrow \text{CH}_3\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)\text{CH}_3$ ✓	<i>Radical electron required in structure. Penalize missing radical electron once only.</i> <i>Accept $\text{CH}(\text{CH}_3)_2\text{CH}(\text{CH}_3)_2$ OR $(\text{CH}_3)_2\text{CHCH}(\text{CH}_3)_2$ for final structure in M3.</i>	1
3.	(c)	(i)	increases frequency of <<successful>> collisions/collisions per unit time ✓ increases energy of collisions and so increases proportion of successful collisions OR increases fraction/number of molecules that have $E \geq E_a$ ✓	<i>Reference to frequency or time required for M1.</i> <i>Do not accept chance or probability instead of frequency if no mention of time.</i> <i>Do not accept answers related to equilibrium shifting.</i>	2

Question			Answers	Notes	Total
3.	(c)	(ii)	propan-2-ol more soluble AND <<has OH/hydroxyl group which>> forms H-bond with water ✓ propene <<less/not soluble and>> non-polar/only has LDF/London forces /dispersion forces /induced/transient dipoles ✓	<i>Do not accept hydroxide for hydroxyl.</i> <i>Award [1] for “propan-2-ol is polar AND propene is nonpolar” alone.</i> <i>Award [1] for “propan-2-ol is soluble AND propene is not/less soluble” alone.</i>	2
3.	(c)	(iii)		<i>Continuation bonds must be shown.</i> <i>Methyl groups may be drawn on opposite sides or head to tail.</i> <i>Ignore square brackets or “n”.</i> <i>Accept skeletal formula.</i>	1
3.	(d)		propanone ✓		1

Question			Answers	Notes	Total
4.	(a)		<i>Alternative 1:</i> $\ll [\text{H}^+] = \frac{1.00 \times 10^{-14}}{0.0685} = \gg 1.460 \times 10^{-13} \ll \text{mol dm}^{-3} \gg \checkmark$ $\ll \text{pH} = -\log (1.460 \times 10^{-13}) = \gg 12.836 \checkmark$ <i>Alternative 2:</i> $\ll \text{pOH} = -\log (0.0685) = \gg 1.164 \checkmark$ $\ll \text{pH} = 14.000 - 1.164 = \gg 12.836 \checkmark$	<i>Award [2] for correct final answer.</i> <i>Accept answers correctly rounded to 1dp, 1.2 and 12.8.</i>	2
4.	(b)		<i>volume of base 33.3-33.7 $\ll \text{cm}^3 \gg \checkmark$</i> $\ll \frac{33.5 \text{ cm}^3 \times 0.0685 \text{ mol dm}^{-3}}{50.0 \text{ cm}^3} = \gg 0.0459 \ll \text{mol dm}^{-3} \gg \checkmark$	<i>Award [2] for a final answer in the range 0.0456 - 0.0462 $\ll \text{mol dm}^{-3} \gg$.</i>	2