

GCE

Chemistry A

H032/01: Breadth in chemistry

AS Level

Mark Scheme for June 2025

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It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS**RM ASSESSOR**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. Crossed-Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple-Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.

7. There is a NR (**No Response**) option. Award NR (No Response):

- if there is nothing written at all in the answer space
- OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
- OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9. *Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.*

Annotations

Place the annotations alongside the mark for the question.

On additional pages, annotate using 

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark

Annotation	Meaning
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore
BP	Blank page

Subject Specific Marking Instructions

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/; OR	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

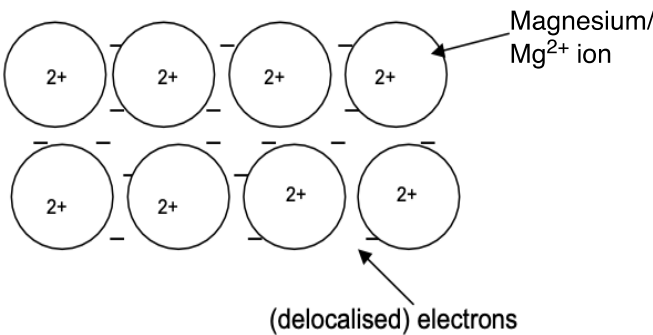
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

SECTION A

Question	Answer	Marks	Guidance
1	D	1	
2	C	1	ALLOW 11
3	C	1	
4	D	1	
5	A	1	
6	C	1	ALLOW +2
7	B	1	
8	B	1	
9	C	1	
10	A	1	
11	D	1	
12	B	1	
13	B	1	
14	C	1	
15	C	1	
16	D	1	
17	C	1	ALLOW 3
18	B	1	
19	D	1	
20	B	1	
	Section A Total	20	

SECTION B

Question			Answer	Mark	Guidance															
21	(a)		<table><thead><tr><th>Species</th><th>Protons</th><th>Neutrons</th><th>Electrons</th><th></th></tr></thead><tbody><tr><td>^{34}S</td><td>16</td><td>18</td><td>16</td><td></td></tr><tr><td>$^{32}\text{S}^{2-}$</td><td>16</td><td>16</td><td>18</td><td></td></tr></tbody></table> 4 correct ✓✓ 3 correct ✓	Species	Protons	Neutrons	Electrons		^{34}S	16	18	16		$^{32}\text{S}^{2-}$	16	16	18		2	NOTE: Look out for the 2– on $^{32}\text{S}^{2-}$ ALLOW $^{32}\text{S}^{-2}$
Species	Protons	Neutrons	Electrons																	
^{34}S	16	18	16																	
$^{32}\text{S}^{2-}$	16	16	18																	
21	(b)		FIRST CHECK ANSWER ON THE ANSWER LINE IF answer = 24.34 (to 2 DP) award 2 marks $\frac{(75.45 \times 24 + 15.21 \times 25 + 9.34 \times 26)}{100}$ OR 24.3389 OR 24.339 ✓ = 24.34 (to 2 DP) ✓	2	For 1 mark: ALLOW ECF → to 2 DP if: • %s used with wrong isotopes ONCE OR • transposed decimal places for ONE %															

Question	Answer	Mark	Guidance
21 (c)	 Diagram showing a regular arrangement of labelled 'Mg²⁺ ions' or '2+ ions' ✓ Scattering of labelled electrons between other species AND statement anywhere of delocalised electrons (can be in text or in diagram) ✓ Delocalised electrons move/flow (in an electric field/across a p.d.) ✓ Idea of movement required	3	Regular arrangement must have at least 2 rows of correctly charged ions and a minimum of 2 ions per row ALLOW as label: positive ions, cations if correct charge is seen within circle ALLOW for labelled Mg²⁺ ions: circles with Mg²⁺ inside DO NOT ALLOW incorrect charge for ions e.g. + , 3+ etc DO NOT ALLOW for label of ions: nuclei OR positive atom OR protons ALLOW e⁻ or 'e' as a label for electron IGNORE "—" for electron label (i.e. needs an additional label) ALLOW 'electrons are mobile (charge carriers)' OR 'sea of electrons moves' IGNORE electrons are free DO NOT ALLOW ions can move

Question	Answer		Answer	Mark	Guidance
21	(d)	(i)	FIRST CHECK ANSWER ON THE ANSWER LINE IF answer = 2.0×10^{-1} award 3 marks ----- $n(\text{H}_2) = \frac{60}{24000} = 2.50 \times 10^{-3}$ OR 0.0025(0) (mol) ✓ $n(\text{HCl}) = 5.00 \times 10^{-3}$ OR 0.005(00) (mole ratio = 2:1) ✓ $c(\text{HCl}) = \frac{5.00 \times 10^{-3}}{0.0245} = 0.204 = 2.0 \times 10^{-1}$ 2 SF and standard form required ✓	3	ALLOW ECF throughout ALLOW use of ideal gas equation for all 3 marks provided 'sensible' p and T used: e.g. from 101 kPa and 298 K → $n\text{H}_2 = 0.0024459$ → $n\text{HCl} = 0.0048919$ → $c\text{HCl} 0.1996688$ → 2.0×10^{-1} (2SF and standard form) from 100 kPa and 273 K → $n\text{H}_2 = 0.0026435$ → $n\text{HCl} = 0.005287$ → 0.21579656 → 2.2×10^{-1} (2SF and standard form) Examples of 'sensible' $p = 100 \text{ kPa}, 101 \text{ kPa}, 101,325 \text{ Pa}$ $T = 273 - 298 \text{ K}$ <u>Common errors</u> (final answer) Use of 24.5cm^3 for H_2 volume 8.3×10^{-2} → 2 marks Incorrect units for H_2 volume (i.e. 60/24) 2.0×10^2 → 2 marks Not 2SF or standard form 0.204 → 2 marks calculator 0.2040816327

Question	Answer		Answer	Mark	Guidance
21	(d)	(ii)	Concentration (Acid) concentration decreases ✓ Collisions Fewer collisions per second OR less frequent collisions ✓ Reaction stops/graph plateaus (Acid/reactant/limiting reagent) has reacted/been used up ✓	3	For Concentration and Collisions, ALLOW ORA for initial conditions (when $t = 0$), but answer must be comparative (e.g. initially the concentration is <u>highest/higher</u>) ALLOW 'fewer particles in a given volume/space' for concentration decreases IGNORE amount of acid decreases IGNORE magnesium concentration decreases <i>(Mg is solid)</i> DO NOT ALLOW (line increases so) rate increases IGNORE references to energy even if incorrect IGNORE responses not linked to time, e.g. • fewer successful collisions • fewer collisions, less chance of collisions <i>No link to rate.</i> ALLOW idea that reaction stops e.g. no more collisions DO NOT ALLOW Magnesium/reactantS used up <i>(Magnesium is in excess)</i>

Question		Answer	Mark	Guidance
22	(a)	Disproportionation Oxidation and reduction of the same element/bromine OR Bromine has been oxidised and bromine has been reduced ✓ Oxidation numbers and redox Br is oxidised from 0 (in Br₂) to +1 in NaBrO ✓ Br is reduced from 0 (in Br₂) to –1 in NaBr ✓ IGNORE oxidation numbers shown in equation (<i>treat as rough working</i>) BUT If no oxidation numbers in explanation, or if oxidation numbers are not linked to substances, look at equation for annotations which may be worthy of credit	3	'Atom' is insufficient for element ALLOW 1 out of 2 redox marks if NaBrO AND NaBr omitted, i.e. Br is oxidised from 0 to +1 AND Br is reduced from 0 to –1 ALLOW 1 out of 2 redox marks if oxidation number changes are BOTH correct ...BUT reduction/oxidation is incorrectly assigned, i.e. Br is reduced from 0 (in Br₂) to +1 in NaBrO Br is oxidised from 0 (in Br₂) to –1 in NaBr ALLOW 1 out of 2 redox marks for 3 oxidation numbers correct but no mention of words oxidation/reduction: e.g. 0 in Br₂ AND –1 in NaBr AND +1 in NaBrO ----- General: ALLOW number before sign in ox no, i.e. 1+ for +1 1– for –1 IGNORE ionic charges, e.g. Br¹⁺ IGNORE '1' (signs required) IGNORE '+' and '-' (numbers required) IGNORE references to electron loss/gain (even if wrong)

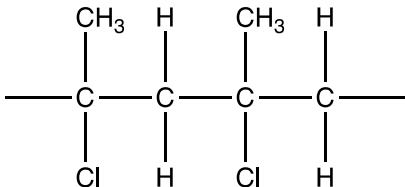
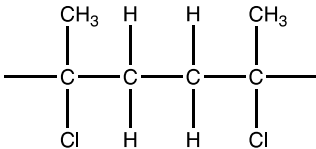
Question			Answer	Mark	Guidance
22	(b)	(i)	Atomic radius Cl has a smaller atomic radius (than Br) OR Cl has fewer shells OR Cl has less shielding ✓ Attraction Nuclear attraction is more in Cl OR (outer) electrons in Cl are more attracted (to nucleus) OR Decreased distance / shielding in Cl outweighs decreased nuclear charge ✓ Ease of gaining electron Easier to gain an electron in Cl ✓	3	Comparison required throughout ORA throughout ALLOW 'down the group' if the group is clearly identified as group 7/halogens For fewer shells, ALLOW lower energy level IGNORE fewer orbitals OR fewer sub-shells IGNORE 'different shell' ALLOW Cl has more nuclear pull IGNORE more effective nuclear charge IGNORE 'nuclear charge' for nuclear attraction ALLOW easier to reduce chlorine IGNORE comments about energy/electronegativity
22	(b)	(ii)	toxic/poisonous OR (forms) chlorinated/halogenated hydrocarbons OR (forms) carcinogenic compounds / toxic compounds ✓	1	IGNORE 'harmful'/'dangerous' IGNORE chlorine is carcinogenic/causes cancer dangerous for health/causes breathing problems IGNORE forms HCl

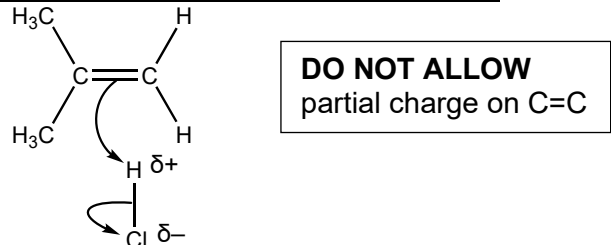
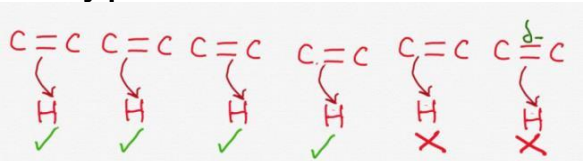
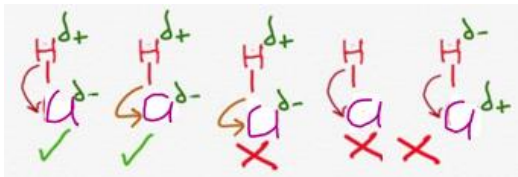
Question		Answer	Mark	Guidance
22	(c)	Identification of halide Add (aqueous) silver nitrate OR AgNO_3 OR Ag^+/silver ions ✓ Observations – mark independently Any 2 precipitate colours from Chloride/Cl^- gives white precipitate Bromide/Br^- gives cream precipitate Iodide/I^- gives yellow precipitate ✓ Precipitate/solid seen at least once Correct equation for at least one halide e.g. $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}$ ALLOW $\text{Ag}^+ + \text{X}^- \rightarrow \text{AgX}$ ✓ IGNORE state symbols (ppt already assessed) Solubility AgCl/precipitate dissolves in dilute $\text{NH}_3(\text{aq})$ AND AgBr/precipitate dissolves in concentrated $\text{NH}_3(\text{aq})$, AND AgI/precipitate does not dissolve (in concentrated $\text{NH}_3(\text{aq})$) ✓	4	ANNOTATE ANSWER WITH TICKS AND CROSSES IGNORE addition of HNO_3 but $\text{HCl}/\text{H}_2\text{SO}_4$ is a CON for AgNO_3 IGNORE addition of $\text{Ba}(\text{NO}_3)_2$ but BaCl_2 is a CON for AgNO_3 ALLOW Cl/chlorine for chloride, etc. (credit is for the colours and precipitate) ALLOW ppt/ptte for precipitate ALLOW equation with Br^- OR I^- e.g. $\text{Ag}^+ + \text{Br}^- \rightarrow \text{AgBr}$ ALLOW ‘ammonia’ or NH_3 for $\text{NH}_3(\text{aq})$ <i>Answer needs to be clear it is the solid/AgX which is dissolving</i>

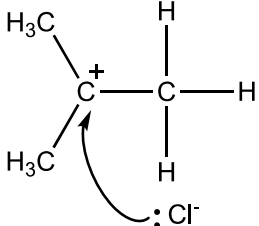
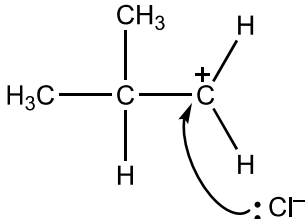
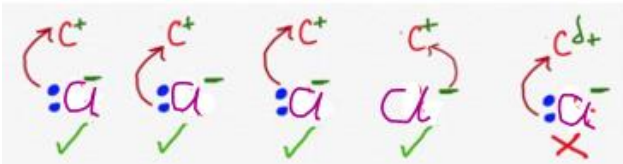
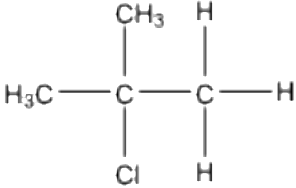
Question		Answer	Mark	Guidance
23	(a)	Two (✓ ✓) from: • rate of forward reaction = rate of reverse reaction • Concentrations (of reactants and products) do not change/are constant • In a closed system/environment	2	IGNORE reactions take place together/reversible reaction ALLOW backward for reverse DO NOT ALLOW concentration of reactants = concentration of products ALLOW 'nothing can leave/enter'

Question	Answer	Answer	Mark	Guidance
23	(b)	FIRST, CHECK THE ANSWER LINE, IF bond enthalpy = (+)463 (kJ mol⁻¹) award 3 marks Energy for bonds broken (4 × S=O in SO₂) + 1 × O=O) (4 × 522) + (1 × 494) OR 2088 + 494 OR 2582 (kJ) ✓ S=O bond enthalpy in 6 x SO₃ correctly calculated 6 × S=O bond enthalpy in SO₃ = 2582 + 196 = 2778 (kJ mol⁻¹) ✓ S=O bond enthalpy in SO₃ correctly calculated S=O bond enthalpy in SO₃ = $\frac{2778}{6}$ = (+)463 kJ mol⁻¹ ✓ Mark is for answer	3	FULL ANNOTATIONS MUST BE USED IGNORE sign (rearranging assessed below) ECF for MP2: Ans to part 1 + 196 ECF for MP3: Ans to part 2/6; IGNORE significant figures and rounding errors. <u>COMMON ERRORS</u> Use of 2 S=O (reactants) and 3 S=O (product) +578 → 1 mark Wrong sign for 196 +398 → 2 marks (ans: 397.6...) Use of 2 S=O (reactants) and dividing by 2 +867 → 1 mark Addition of S=O (product) bonds, not subtraction -463 → 2 marks

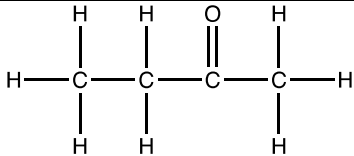
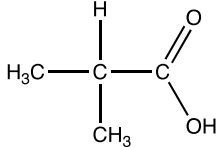
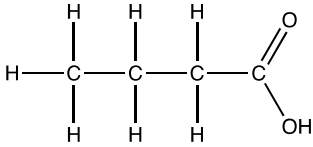
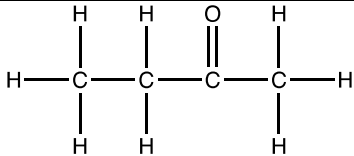
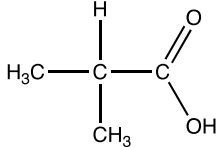
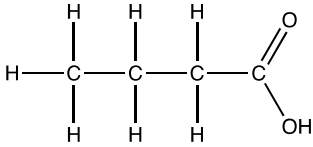
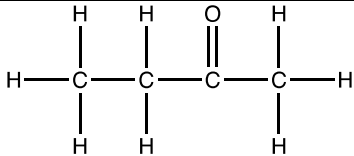
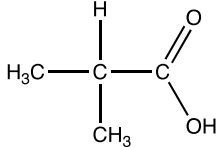
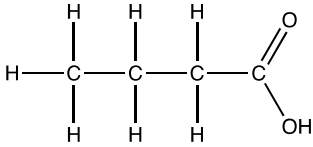
Question	Answer	Answer	Mark	Guidance
23	(c)	K_c expression $(K_c =) \frac{[\text{SO}_3(\text{g})]^2}{[\text{SO}_2(\text{g})]^2 [\text{O}_2(\text{g})]} \quad \checkmark$ Calculation $(K_c =) \frac{42.0^2}{25.0^2 \times 108} \quad \text{OR} \quad 0.02613\ldots \quad \checkmark$ $= 2.61 \times 10^{-2} \quad \text{to 3 SF and standard form} \quad \checkmark$	3	Square brackets required for K_c expression IGNORE state symbols, even if wrong DO NOT ALLOW $K_c = \frac{[\text{SO}_3(\text{g})]^2}{[\text{SO}_2(\text{g})]^2 + [\text{O}_2(\text{g})]}$ for first two marks BUT ALLOW ECF to 3SF and standard form i.e. 2.41×10^0 ALLOW 42^2 and 25^2 in substituted equation ALLOW ECF for Calculation from inverted K_c expression ONLY i.e. 3.83×10^1 for two marks (to 3 SF and standard form) DO NOT ALLOW 0.0261×10^0 ALLOW ECF from any incorrect K_c value for 3 SF and standard form IGNORE attempts at units

Question			Answer	Mark	Guidance
24	(a)	(i)	 Two correct repeat units for 2-chloropropene (<i>n</i> and brackets not required) ✓	1	ALLOW structural OR displayed OR skeletal formula OR mixture of the above (as long as unambiguous) ALLOW:  but CH₃ and Cl must be on same C atom CH₃ and Cl can be shown either side of the structure NOTE: 'side bonds' ARE required on either side of repeat unit from C atoms IGNORE connectivity of methyl group IGNORE brackets IGNORE <i>n</i> or subscript numbers
24	(a)	(ii)	Formation of HCl/hydrochloric acid/ OR chlorine	1	ALLOW Cl or Cl₂ for chlorine ALLOW produces CO (from incomplete combustion) IGNORE toxic waste products <i>Response must reflect chlorine or carbon monoxide in some way</i>
24	(b)		$\text{C}_5\text{H}_{10} + 7\frac{1}{2} \text{O}_2 \rightarrow 5\text{CO}_2 + 5\text{H}_2\text{O}$ ✓	1	ALLOW $2\text{C}_5\text{H}_{10} + 15\text{O}_2 \rightarrow 10\text{CO}_2 + 10\text{H}_2\text{O}$ IGNORE state symbols (even if incorrect)

Question	Answer	Mark	Guidance
24 (c) (i)	Curly arrows can be straight, snake-like, etc. but NOT double headed or half headed arrows 1. Curly arrow from C=C to HCl and H-Cl 2 marks  Curly arrow from C=C bond to H of H-Cl ✓ Correct dipole shown on H-Cl AND curly arrow that breaks H-Cl bond ✓	5	1st curly arrow must - go to the H atom of H-Cl AND - start from, OR be traced back to any point across width of C=C  2nd curly arrow must - start from, OR be traced back to any part of $\delta^+ \text{H}-\text{Cl} \delta^-$ bond AND - go to $\text{Cl}^{\delta-}$  Use of Cl-Cl or H-Br loses first marking point but gains ECF for second marking point

Question	Answer	Mark	Guidance
	2. Curly arrow from Cl⁻ to carbocation 1 mark  DO NOT ALLOW δ+ on C of carbocation Curly arrow from Cl⁻ to C⁺ of carbocation (carbocation must follow structure from step 1 i.e. 2 methyl groups) ✓		ALLOW formation of minor carbocation, i.e.  (formation of major product assessed below) ALLOW ECF from use of Cl₂ OR HBr 3rd curly arrow must - go to the C⁺ of carbocation AND - start from, OR be traced back to any point across width of lone pair on :Cl⁻ OR start from – charge of Cl⁻ ion  (Lone pair NOT needed if curly arrow shown from – charge of Cl⁻ ion) ALLOW ECF for correct tertiary product following use of HBr ONLY (i.e. Cl in structure shown replaced with Br)
	3. Product 1 mark  ✓		

Question			Answer	Mark	Guidance
			4. Name of mechanism 1 mark Electrophilic addition ✓		
24	(c)	(ii)	More stable (tertiary) carbocation is formed as intermediate OR The minor product forms a less stable (primary) carbocation ✓	1	NOTE must refer to stability of carbocation IGNORE references to Markownikoff's rule IGNORE secondary

Question		Answer	Mark	Guidance										
25	(a)	<table><thead><tr><th>Alcohol</th><th>Organic product</th></tr></thead><tbody><tr><td>D</td><td></td></tr><tr><td>E</td><td></td></tr><tr><td>F</td><td>No reaction</td></tr><tr><td>G</td><td></td></tr></tbody></table> ALL 4 responses correct → 3 marks ✓✓✓ 3 responses correct → 2 marks ✓✓ 2 responses correct → 1 marks ✓	Alcohol	Organic product	D		E		F	No reaction	G		3	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous DO NOT ALLOW structure if H(s) are missing from ONE structural formula BUT ALLOW any further omissions as ECF Take care with numbers of carbons, the branches and the position of branching especially for E IGNORE connectivity for methyl groups BUT penalise incorrect connectivity for OH once e.g. -HO ALLOW structure of alcohol F for 'no reaction'
Alcohol	Organic product													
D														
E														
F	No reaction													
G														
25	(b)	D ✓	1											

Question		Answer	Mark	Guidance
25	(c)	For CALCULATION, check the volume of CO₂ on answer line MUST be derived from $pV = nRT$, Award 5 marks for calculation for: answer = 2.89×10^4 (cm³) OR 28900 (cm³) <i>Calculation of number of moles, n of CO₂ produced</i> $n(\text{Alcohol F}) = \frac{g}{M} = \frac{25.9}{74.0} = 0.35(0) \text{ (g mol}^{-1}\text{)} \checkmark$ $n(\text{CO}_2) = 4 \times 0.35(0) = 1.4(0) \text{ mol } \checkmark$ <i>Rearranging ideal gas equation to make V subject</i> $V = \frac{nRT}{p} \checkmark$ <i>Conversion of 100°C to 373K, and substituting all values into rearranged ideal gas equation</i> $V = \frac{1.40 \times 8.314 \times 373}{1.50 \times 10^5} \text{ OR } 0.02894380... \text{ (m}^3\text{)} \checkmark$ <i>V conversion of m³ → cm³ AND 3 SF (most appropriate)</i> $V = 0.02894 \times 10^6 = 2.89 \times 10^4 \text{ cm}^3 \text{ OR } 28900 \text{ cm}^3 \checkmark$	5	ANNOTATE ANSWER WITH TICKS AND CROSSES Check entire response for credit worthy working If there is an alternative answer, check to see if there is any ECF credit possible using working Marking point 3 can be awarded by direct substitution of values. ALLOW 150 (kPa) for 1.50×10^5 (conversion is assessed in marking point 4) ALLOW use of 8.31 for R → 0.02892988 DO NOT ALLOW use of 150 (kPa) ALLOW 3 SF up to calculator value, correctly rounded (use of 8.31 for R gives same answer) Note use of 373.15 → 29000 Fine for all 5 marks

Question			Answer	Mark	Guidance
					<u>Common errors:</u> No use of ratio x4 7240 → 4 marks Not appropriate SF 28943.8 → 4 marks No temp conversion 7760 → 4 marks Use of 25.9 as n in $pV=nRT$ 535000 → 3 marks

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