

GCE

Chemistry A

H032/01: Breadth in chemistry

AS Level

Mark Scheme for June 2023

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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

PREPARATION FOR MARKING

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.
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 50% 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. Work crossed out:

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 a tick to confirm that the work has been seen.
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 isn't 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.**

If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

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.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

No Level of response questions on this paper

The only annotation on a level of response question should be the indication of the level.

A level annotation should be used where all marks for a level have been achieved.

e.g. if a candidate has 6 marks, they would have this annotation on their script:

L3

If a candidate has achieved 5 marks then they have reached Level 3 but will not have met the communication statement.

They should have the following annotations on their scripts:

L3 A
















The same principle should be applied to Level 2 and Level 1.

No marks (0) should have a cross: ✘

Place the annotations alongside the mark for the question.

On additional pages, annotate using SEEN

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore
	Blank page

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

Annotation	Meaning
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

13. Subject-specific Marking Instructions

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	AO element	Guidance
1	B	1	AO1.1	
2	B	1	AO1.2	
3	C	1	AO1.2	
4	C	1	AO1.1	ALLOW 6
5	B	1	AO1.2	
6	C	1	AO2.1	
7	C	1	AO2.6	
8	D	1	AO2.6	
9	C	1	AO2.2	
10	D	1	AO2.4	
11	D	1	AO1.1	
12	D	1	AO1.1	
13	A	1	AO1.1	
14	B	1	AO2.8	
15	D	1	AO1.2	
16	C	1	AO2.5	ALLOW 4
17	A	1	AO2.5	
18	D	1	AO2.7	
19	C	1	AO2.5	
20	B	1	AO2.6	
	Total	20		

SECTION B

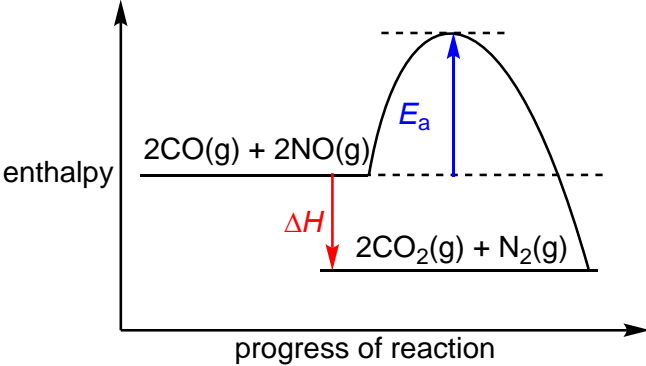
Question			Answer	Marks	AO element	Guidance									
21	(a)	(i)	Shared pair of electrons ✓	1	AO1.1	IGNORE comments about attraction between nuclei and shared pair OR magnetic attraction									
		(ii)	 <p>NF₃: 3 'dot-and-cross' bonds AND 1 lone pair around N AND 3 lone pairs around each of the 3 F atoms ✓</p> <p>BF₃: 3 'dot-and-cross' bonds ONLY around B AND 3 lone pairs around each of the 3 F atoms ✓</p>	2	AO2.5 ×2	<p>Use annotations with ticks, crosses ECF etc. for this part</p> <p>Must be 'dot-and-cross' using 2 different symbol for electron source ONLY</p> <p>IGNORE absence of circles</p> <p>ALLOW 1 mark for correct dot and cross diagrams for NF₃ AND BF₃ BUT with F lone pairs omitted</p> <p>ALLOW absent symbols from circles</p> <p>A lone pair can be shown as 2 single electrons</p> <p>IGNORE charges</p>									
	(b)	(i)	<p>Bond angles and shapes</p> <table border="1" data-bbox="436 1125 1041 1284"> <thead> <tr> <th></th> <th>Bond angle</th> <th>Name of shape</th> </tr> </thead> <tbody> <tr> <td>NF₃</td> <td>107°</td> <td>pyramidal</td> </tr> <tr> <td>BF₃</td> <td>120°</td> <td>trigonal planar</td> </tr> </tbody> </table> <p>ALL 4 points → 2 marks ✓✓ 2 OR 3 points → 1 mark ✓</p>		Bond angle	Name of shape	NF ₃	107°	pyramidal	BF ₃	120°	trigonal planar	2	AO1.2 ×2	<p>For NF₃ ALLOW 106–108° OR 109.5° – 2.5° ALLOW pyramid ALLOW trigonal pyramid(al)</p> <p>For BF₃ ALLOW planar triangle BUT 'planar' is insufficient</p>
	Bond angle	Name of shape													
NF ₃	107°	pyramidal													
BF ₃	120°	trigonal planar													

Question		Answer	Marks	AO element	Guidance
	(ii)	<ul style="list-style-type: none">NF₃ has 3 bonded pairs AND 1 lone pair (of electrons) AND lone pairs repel more (than bonded pairs) ✓BF₃ has three bonded pairs (of electrons) ✓	2	AO1.2 ×2	ALLOW lp for lone pair (of electrons) bp for bonding pair (of electrons) regions for electron pairs ALLOW 'bonds' for 'bonded pair' IGNORE 'electrons repel' DO NOT ALLOW 'atoms repel'

Question		Answer	Marks	AO element	Guidance												
22	(a)	(Strong acid) completely/fully dissociates/ionises ✓	1	AO1.1	DO NOT ALLOW easily dissociates ALLOW ALL H ⁺ ions are released												
	(b) (i)	$\text{CuO} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$ ✓	1	AO2.6	ALLOW multiples IGNORE state symbols IGNORE charges, even if wrong												
	(ii)	$(\text{NH}_4)_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NH}_4\text{NO}_3 + \text{CO}_2 + \text{H}_2\text{O}$ Any 4 formulae correct ✓ All 5 formulae correct and balanced ✓	2	AO2.6 ×2	ALLOW multiples IGNORE state symbols IGNORE charges, even if wrong ALLOW H ₂ CO ₃ for CO ₂ + H ₂ O Counts as 2 formulae for marking criteria												
	(c) (i)	Volumetric flask ✓	1	AO1.2	ALLOW graduated flask												
	(ii)	<table border="1" style="width: 100%; text-align: center;"> <tbody> <tr> <td>Final reading/cm³</td> <td>20.25</td> <td>40.85</td> <td>25.85</td> </tr> <tr> <td>Initial reading/cm³</td> <td>0.00</td> <td>20.25</td> <td>5.50</td> </tr> <tr> <td>Titre/cm³</td> <td>20.25</td> <td>20.60</td> <td>20.35</td> </tr> </tbody> </table> All 3 titres correct to 2 DP ✓	Final reading/cm ³	20.25	40.85	25.85	Initial reading/cm ³	0.00	20.25	5.50	Titre/cm ³	20.25	20.60	20.35	1	AO1.2	DO NOT ALLOW 1 DP, e.g. 20.6 instead of 20.60
Final reading/cm ³	20.25	40.85	25.85														
Initial reading/cm ³	0.00	20.25	5.50														
Titre/cm ³	20.25	20.60	20.35														
	(iii)	mean titre = $\frac{20.25 + 20.35}{2} = 20.30$ (cm ³) ✓ i.e. using concordant (consistent) titres	1	AO2.8	ALLOW 20.3 Missing '0' already penalised in c(ii) DO NOT ALLOW mean of all three titres, i.e. $\frac{20.25 + 20.60 + 20.35}{3} = 20.40$												

Question	Answer	Marks	AO element	Guidance
(iv)	$n(\text{H}_2\text{SO}_4) = 0.165 \times \frac{20.30}{1000} = 3.35 \times 10^{-3} \text{ (mol) } \checkmark$ $n(\text{MOH}) \text{ in } 25.0 \text{ cm}^3 = 2 \times 3.35 \times 10^{-3} = 6.70 \times 10^{-3} \text{ (mol) } \checkmark$ $n(\text{MOH}) \text{ in } 250.0 \text{ cm}^3 = 10 \times 6.70 \times 10^{-3} = 6.70 \times 10^{-2} \text{ (mol) } \checkmark$ $A_r \text{ of } \mathbf{M} = \frac{2.62}{6.70 \times 10^{-2}} = 39.1 \text{ AND } \mathbf{M} = \text{potassium/K } \checkmark$	4	AO3.1 ×3 AO3.2 ×1	ALLOW ECF throughout and from incorrect concordant titres from 22c(iii) Calculator value = 3.3495×10^{-3} Calculator value = 6.699×10^{-3} Calculator value = 6.699×10^{-2} By ECF , ALLOW Group 1 metal nearest to calculated value of A_r
	<p>COMMON ERRORS</p> <p>Use of 20.4 from mean of all 3 titres ALL 4 MARKS</p> $n(\text{H}_2\text{SO}_4) = 0.165 \times \frac{20.4}{1000} = 3.366 \times 10^{-3} \text{ (mol) } \checkmark \text{ from (c)(iii)}$ $n(\text{MOH}) \text{ in } 25.0 \text{ cm}^3 = 2 \times 3.366 \times 10^{-3} = 6.732 \times 10^{-3} \text{ (mol) } \checkmark$ $n(\text{MOH}) \text{ in } 250.0 \text{ cm}^3 = 10 \times 6.732 \times 10^{-3} = 6.732 \times 10^{-2} \text{ (mol) } \checkmark$ $A_r \text{ of } \mathbf{M} = \frac{2.62}{6.732 \times 10^{-2}} = 38.9 \dots \text{ OR } 39 \text{ AND } \mathbf{M} = \text{K } \checkmark$ <p>IF ×10 is absent, $A_r = 389$ AND M = Cs OR Fr</p>	<p>Use of 25.0 (wrong volume) for $n(\text{H}_2\text{SO}_4)$</p> $n(\text{H}_2\text{SO}_4) = 0.165 \times \frac{25}{1000} = 4.125 \times 10^{-3} \text{ (mol) } \times$ $n(\text{MOH}) \text{ in } 25.0 \text{ cm}^3 = 2 \times 4.125 \times 10^{-3} = 8.25 \times 10^{-3} \text{ (mol) } \checkmark$ $n(\text{MOH}) \text{ in } 250.0 \text{ cm}^3 = 10 \times 8.25 \times 10^{-3} = 8.25 \times 10^{-2} \text{ (mol) } \checkmark$ $A_r \text{ of } \mathbf{M} = \frac{2.62}{8.25 \times 10^{-2}} = 31.75 \dots \text{ AND } \mathbf{M} = \text{K } \checkmark$ <p>IF ×10 is absent, $A_r = 317.5$ AND M = Cs OR Fr</p>		

Question			Answer	Marks	AO element	Guidance
23	(a)	(i)	$C_7H_{16} + 11O_2 \rightarrow 7CO_2 + 8H_2O$ Correct species ✓ Balanced ✓	2	AO2.6 ×2	ALLOW multiples IGNORE state symbols For heptane formula, ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous ALLOW 1 mark for balanced combustion equation for a different alkane (ECF) e.g. $C_6H_{14} + 9\frac{1}{2}O_2 \rightarrow 6CO_2 + 7H_2O$

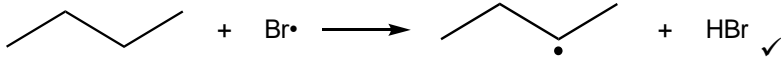
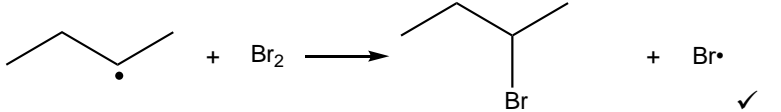


Question	Answer	Marks	AO element	Guidance
(ii)	 <p>Reactants, products and ΔH 2CO + 2NO on LHS AND 2CO₂ + N₂ on RHS AND ΔH labelled with products below reactants AND Arrow downwards ✓</p> <p>E_a (independent of ΔH) curve with arrow from reactants to top of curve AND E_a labelled ✓</p> <p>IF endothermic diagram shown, ALLOW ECF for E_a using MS criteria</p>	2	AO2.1 AO1.2	<p>ANNOTATE ANSWER WITH TICKS AND CROSSES ETC</p> <p>IGNORE state symbols</p> <p>ΔH DO NOT ALLOW $-\Delta H$ DO NOT ALLOW double headed arrow on ΔH</p> <p>ALLOW ΔH arrow even with small gap at the top and bottom, i.e. line does not quite reach reactant or product line.</p> <p>ALLOW -746 for ΔH</p> <p>E_a ALLOW AE OR A_E</p> <p>ALLOW 2 arrowheads at each end of E_a line OR no arrowhead BUT DO NOT ALLOW arrowhead down</p> <p>E_a line must reach maximum (or near to maximum) on curve</p>

Question		Answer	Marks	AO element	Guidance
	(iii)	<p>Catalyst lowers activation energy OR Catalyst increases rate without itself changing ✓</p> <p>Reaction proceeds via a different route/pathway OR More molecules/particles exceed activation energy ✓</p>	2	AO1.2 ×2	<p>ALLOW 2nd labelled curve on profile diagram in 23(a)(ii) with lower activation energy/E_c with catalyst</p> <p>ALLOW E_c needs less energy to start reaction</p> <p>ALLOW E_c curve is lower than E_a curve</p> <p>IGNORE 'shorter route' for alternative route</p> <p>IGNORE more successful collisions</p>
(b)	(i)	<p>298 K/25°C AND 100 kPa ✓</p>	1	AO1.1	<p>ALLOW 'a stated temperature' <i>To accept that other standard temperatures can be used and 298 should strictly be added as ΔH_{298}^\ominus</i></p> <p>IF a temperature is seen, it must be 298/25°C</p> <p>ALLOW 1×10^5 Pa, 101 kPa, 1.01×10^5 Pa, 1 atm, 1 bar</p>

Question	Answer	Marks	AO element	Guidance
(ii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = -394 (kJ mol⁻¹) award 3 marks</p> <p>Use of $\Delta_f H$ values and balancing numbers $\pm (-824)$ seen anywhere AND $\pm (3 \times -111)$ OR $\pm (333)$ OR ± 1157 seen anywhere ✓</p> <p>Correct subtraction for $3\Delta_f H(\text{CO})$ using ΔH $(-25) + (-1157)$ $-1157 = 824 + (3 \times -111)$ $= -1182$ (kJ mol⁻¹) ✓</p> <p>Calculation of $\Delta_f H(\text{CO}_2)$ formation $\Delta_f H(\text{CO}_2) = \frac{-1182}{3} = -394$ (kJ mol⁻¹) ✓</p>	3	AO2.6 ×3	<p>FULL ANNOTATIONS MUST BE USED</p> <p>ALLOW ECF throughout</p> <p>COMMON ERRORS</p> <p>-1182 omission of ÷3 for $\Delta_f H(\text{CO}_2)$ 2 marks (+)394 Incorrect subtraction 2 marks (+)1182 Incorrect subtraction & no ÷3 1 mark</p> <p>-320 no ×3 for -111 2 marks -960 no ×3 for -111 AND no ÷3 1 mark</p> <p>-377.3 / -377 incorrect subtraction 2 mark -1132 incorrect subtraction AND no ÷3 1 mark</p> <p>-303.3 / -303 no ×3 for -111 AND incorrect subtraction 1 mark</p> <p>-385.66... / -385.7 no ΔH (25) and ÷3 2 marks (+)385.66... / (+)385.7 no ΔH (25) and ÷3 and wrong sign 1 mark</p>

24	(a)	<p>All reaction species have same state/phase OR Reactants AND products has same state ✓</p>	1	AO1.1	<p>ALLOW SO₂ AND O₂ AND SO₃ for all species OR reactants and products are gases OR the molecules are all gases</p> <p>IGNORE reactants and catalyst have same state</p>
	(b)	<p>Throughout, ALLOW suitable alternatives for right-hand side, e.g. towards SO₃/products OR forward direction</p> <p>-----</p> <p>Pressure 2 marks Increased pressure shifts equilibrium to right OR favours the right OR increases yield (of SO₃) ✓</p> <p>Right-hand side has fewer (gaseous) moles OR 3 (gaseous) moles → 2 (gaseous) moles ✓</p> <p>Temperature 2 marks Increased temperature shifts equilibrium to left OR favours the left OR decreases yield (of SO₃) ✓</p> <p>(Forward) reaction is exothermic/ΔH is negative OR (Forward) reaction gives out heat ✓</p> <p>Catalyst 1 mark No shift in equilibrium OR no effect on yield (of SO₃) ✓</p>	5	<p>AO1.1</p> <p>AO1.1</p> <p>AO1.2</p> <p>AO1.1</p> <p>AO1.2</p> <p>AO1.2</p>	<p>FULL ANNOTATIONS MUST BE USED -----</p> <p>ORA for reverse reaction e.g. decreased pressure shifts equilibrium to left</p> <p>For moles, ALLOW molecules/particles</p> <p>ORA for reverse reaction e.g. decreased temperature shifts equilibrium to right</p> <p>ALLOW reverse reaction is endothermic ΔH is positive/takes in heat</p> <p>ALLOW rates of forward and reverse reaction increase by same amount</p> <p>IGNORE 'no increase in yield' <i>Yield could still decrease</i></p>

	(c)	<p>(i) FIRST CHECK THE ANSWER ON ANSWER LINE IF answer = 7.9×10^4 award 2 marks</p> <p>-----</p> <p>K_c expression</p> $(K_c =) \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2 [\text{O}_2]} \quad \text{OR} \quad \frac{(5.0 \times 10^{-2})^2}{(3.0 \times 10^{-3})^2 \times (3.5 \times 10^{-3})}$ <p style="text-align: center;">OR 79365. ✓</p> <p>Answer to 2 SF and in standard form</p> $K_c = 7.9 \times 10^4 \quad \checkmark$	2	AO2.6 ×2	<p>IF there is an alternative answer, check for any ECF credit possible using working below.</p> <p>-----</p> <p>Square brackets required for K_c expression</p> <p>ALLOW ECF to 2 SF and standard form ONLY from inverted K_c expression → 1.3×10^{-5}</p> <p>DO NOT ALLOW $\frac{[\text{SO}_3]^2}{[\text{SO}_2]^2 + [\text{O}_2]} = 0.71$ (no marks)</p> <p>IGNORE attempts at units</p>
		<p>(ii) Equilibrium shifts to the right/towards products/SO_3 ✓</p>	1	AO3.1	ALLOW equilibrium favours the right

Question		Answer	Marks	AO element	Guidance
25	(a)	<p><i>Each marking point is independent</i></p> <p>Chain length: interaction between molecules Chain length (in pentane) is longer AND more (surface) contact OR greater surface area/SA ✓</p> <p>London forces: strength and energy Stronger / more London forces OR more energy to break London forces ✓</p>	2	AO1.1 ×2	<p>Comparisons needed throughout ORA throughout</p> <p>Assume the following for longer chain</p> <ul style="list-style-type: none"> ▪ larger/bigger molecule ▪ more C (and H) ▪ more atoms ▪ more electrons <p>BUT 'branching' is a CON</p> <p>IGNORE comments about packing</p> <p>ALLOW induced dipole(–dipole) interactions for London forces</p> <p>IGNORE van der Waals'/vdw forces</p>
	(b)	<p>Skeletal formulae required</p> <p></p> <p></p>	2	AO3.1 ×2	<p>ALLOW 1 mark (ECF) for 2 'correct' equations with dot omitted or incorrectly positioned</p> <p>ALLOW 1 mark for forming 1-bromobutane with dots correct for 1-bromobutane e.g.</p> <p></p> <p></p> <p>No credit for responses using molecular formulae for organic structures</p>

Question	Answer	Marks	AO element	Guidance
(c)	<p style="text-align: center;"> $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}_3\text{C}-\text{C}-\text{C}-\text{CH}_3 \\ \quad \\ \text{H} \quad \text{Br} \\ \text{bromoalkane} \end{array}$ </p> <p style="text-align: center;"> $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}_3\text{C}-\text{C}-\text{C}-\text{CH}_3 \\ \quad \\ \text{H} \quad \text{OH} \\ \text{alcohol} \end{array}$ </p>	4	<p>AO1.2</p> <p>AO2.5</p> <p>AO1.2</p> <p>AO2.5</p>	<p>ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous</p> <p>ALLOW Pt OR Pd for Ni</p> <p>ALLOW H₂O(g) for steam (g) OR temperature >100°C required</p> <p>For acid, ALLOW H⁺/H₂SO₄/H₃PO₄ ALLOW small slip in acid formula e.g. phosphoric acid as H₂PO₃, etc</p> <p>ALLOW vertical bond to any part of OH, i.e. $\begin{array}{ccc} \text{OH} & \text{OH} & \text{OH} \\ & & \end{array}$</p> <p>BUT DO NOT ALLOW -HO OR OH-</p>

Question	Answer	Marks	AO element	Guidance
26	<p>Correct structural isomers of C₃H₈O <i>1 mark</i> CH₃CH₂CH₂OH AND CH₃CHOHCH₃ ✓</p> <p>Reaction conditions <i>1 mark</i> Distillation for aldehyde AND reflux for carboxylic acid OR ketone ✓</p> <p>Functional group of organic product <i>2 marks</i> CH₃CH₂CH₂OH → aldehyde OR → carboxylic acid ✓ CH₃CHOHCH₃ → ketone ✓</p> <p>One correct equation <i>1 mark</i> CH₃CH₂CH₂OH + [O] → CH₃CH₂CHO + H₂O OR CH₃CHOHCH₃ + [O] → CH₃COCH₃ + H₂O OR CH₃CH₂CH₂OH + 2[O] → CH₃CH₂COOH + H₂O ✓</p>			<p>ANNOTATE WITH TICKS AND CROSSES</p> <p>Throughout, ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous</p> <p>IF functional group is NOT given, ALLOW propanal / RCHO ALLOW propanoic acid / RCOOH</p> <p>ALLOW propanone / RCOR</p> <p>IGNORE small slips in formulae (assessed in equation)</p>

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