GCE

Chemistry B

H033/01: Foundations of chemistry

AS Level

Mark Scheme for June 2025

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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.

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. 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 or the RM Assessor messaging system, or by email.

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 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).
   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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 e-mail.

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. **Annotations**

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

11. **Subject Specific Marking Instructions**

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

Annotation	Meaning
/	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.

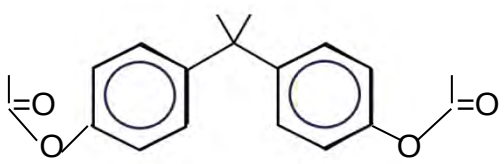
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New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

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

SECTION A

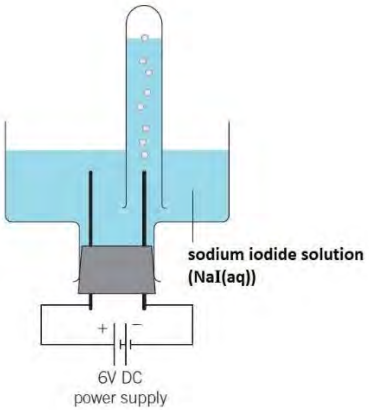
Question	Answer	Marks	Guidance
1	C	1	
2	D	1	
3	B	1	
4	B	1	
5	A	1	
6	B	1	
7	B	1	
8	C	1	
9	D	1	
10	C	1	
11	C	1	
12	D	1	
13	A	1	
14	C	1	
15	D	1	
16	D	1	
17	C	1	
18	C	1	
19	D	1	
20	A	1	
	Total	20	

SECTION B

Question			Answer	Mark	Guidance
21	(a)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 92.7% award 2 marks** *(M*r bisphenol A) = 228 ✓ $\frac{228}{246}$ x 100 = 92.7% ✓	2	**ALLOW** answer to 2 or more sf **ALLOW** for 1 mark: statement: prods x 100/reacts or use of number x 100/246 or (sum of M_r's -18) x 100/ sum of M_r's
21	(b)		 2 ester groups shown (or 1 ester completely correct) ✓ Completely correct (including skeletal) ✓	2	**ALLOW** CH_3 groups on top two carbons **IGNORE** other products
21	(c)		Dissolve in minimum volume of hot solvent/(dilute) ethanoic acid ✓ Filter (hot) **AND** to remove insoluble impurities ✓ Crystallise (**AW**) ✓ Filter **AND** soluble impurities remain in solution/ removed ✓ Wash, dry ✓	5	**IGNORE** choice of solvent **IGNORE** use of buchner funnel **ALLOW** description 'evaporate to crystallisation point' **ALLOW** later steps if earlier ones incorrect
21	(d)		Ester ✓	1	
				10	

Question			Answer	Mark	Guidance
22	(a)		UV/ultraviolet ✓ 1. $C_2H_6 + Cl \rightarrow C_2H_5 + HCl$ 2. $C_2H_5 + Cl_2 \rightarrow C_2H_5Cl + Cl$ ✓ (both equations) $C_2H_5 + Cl \rightarrow C_2H_5Cl$ **OR** $C_2H_5 + C_2H_5 \rightarrow C_4H_{10}$ ✓	3	**IGNORE** dots on radicals No **ECF** from wrong propagation equations for MP3
22	(b)		Decomposes (**AW**) to Cl atoms/radicals ✓ (Cl atoms) Catalyse breakdown of ozone ✓ Ozone removes/screens /blocks/ absorbs UV (ORA) ✓ UV causes <u>skin</u> cancer/sunburn/damage to DNA/causes mutations/damage eyes/damage crops ✓	4	**ALLOW** equation for MP1 For MP2 **ALLOW** equations that show the catalytic action **DO NOT ALLOW** Photochemical smog/respiratory problems
22	(c)		Instantaneous dipole-induced dipole ✓ More electrons in bromoethane /bromine (ORA) ✓	2	**ALLOW** 'id-id', Van der Waal's or London (forces) **IGNORE** references to size, mass or electronegativity
22	(d)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 3.74 dm^3 award 3 marks** (n =) 10/64.5 **OR** 0.155 ✓ V = nRT/P ✓ $0.155 \times 8.314 \times 293 \times 10^3 / 101000 = 3.74\ dm^3$ ✓	3	**ALLOW** 2 or more sf **AWARD** 2 marks for $3.7(4) \times 10^x$ **ALLOW** substituted values for MP2 ECF from MP1 to 3 but not 2 to 3
				12	

Question			Answer	Mark	Guidance
23	(a)		Cyclohexane ✓	1	
23	(b)		$C_6H_{12} + 9O_2 \rightarrow 6CO_2 + 6H_2O$ ✓	1	**IGNORE** state symbols
23	(c)	(i)	exothermic ✓	1	
		(ii)	more energy given out making bonds than absorbed breaking them (AW) ✓	1	**DO NOT ALLOW** 'more bonds made than broken' **DO NOT ALLOW** Energy required to make bonds
23	(d)	(i)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = –3098** kJ mol^{-1} **award 3 marks** (Amount hexane) = 2.6/84 **OR** 0.031 (mol) ✓ (energy transferred) = 505 x 4.18 x 45.5 **OR** 96046 (J) ✓ ΔH = 96046/0.031 x 1000 = –3098 (kJ mol^{-1}) ✓	3	**ALLOW** answers to 2 or more sf rounding to –3100. **ALLOW** ECF Need minus sign for MP3.
23	(d)	(ii)	(Bullet 1:) Correct **AND** more (apparently) burnt means smaller ΔH (AW) ✓ (Bullet 2:) Wrong **AND (**wick/lamp/fuel) hotter at end ✓ so more will evaporate **AW** ✓	3	
23	(e)		<u>One/a</u> ^{13}C atom/isotope (in the C_6H_{12} molecule)	1	
				11	

Question			Answer	Mark	Guidance
24	(a)	(i)	Electrodes in a circuit with (DC) power supply with **EITHER** correct cell convention **OR** labelled ± ✓ Sodium iodide solution/ NaI(aq) labelled ✓ electrodes in solution ✓ gas collection (separately over cathode) ✓  	4	**DO NOT ALLOW** AC **IGNORE** incorrect cell convention if electrodes correctly labelled ± **ALLOW** 'solution' or 'electrolyte' MP2 **ALLOW** wire to electrode passing through the collection vessel MP4 **IGNORE** separate gas collection over anode
24	(a)	(ii)	Hydrogen/ H_2 formed ✓ $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$ ✓	2	**NB** $2H^+ + 2e^- \rightarrow H_2$ scores first mark only **IGNORE** state symbols
24	(a)	(iii)	Iodine ✓	1	**IGNORE** state of iodine
24	(b)	(i)	$Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ ✓	1	**IGNORE** state symbols

24	**(b)**	**(ii)**	Chlorine takes electrons from (AW) <u>iodide/I^-</u> ✓	**1**	**IGNORE** references to oxidation/reduction
24	**(c)**		*Any two from* ✓✓ (Impure as) forms H_2S (Impure as) forms I_2 Use phosphoric acid (to make a pure sample)	**2**	**IGNORE** S/SO_2
24	**(d)**	**(i)**	Iodate(V)	**1**	**ALLOW** gap between word and number
24	**(d)**	**(ii)**	Iodide/ I^- ✓ from -1 to 0 ✓	**2**	**ALLOW** $5I^-$ Mark separately
24	**(d)**	**(iii)**	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 83 (cm^3) award 3 marks** (amount NaI =) 15/150(or 149.9) **OR** 0.1 (mol) ✓ (Vol =) 0.1 x 1000/5 x 0.24 ✓ = 83 (cm^3) 2sf ✓	**3**	Any answer with more than 2sf that rounds to 83.3 or 83.4 .... scores 2 marks **ALLOW** ECF Any calculated number to 2 sf scores MP3
				17	

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