

OCR

Oxford Cambridge and RSA

Practice Paper P1

A level Chemistry B

H433/03 Practical Skills in Chemistry

MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 60

Final

This document consists of 15 pages

MARKING INSTRUCTIONS**PREPARATION FOR MARKING****SCORIS**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris 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 posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 scoris 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 scoris messaging system.

5. Work crossed out:
- where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
 - if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.
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 scoris **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 scoris 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, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content 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 science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, **best** describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme.

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 science content determines the level.**
- **The communication statement determines the mark within a level.**

Level of response questions on this paper are **1c(ii)** and **3c**.

11. Annotations

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

12. Subject-specific Marking Instructions

INTRODUCTION

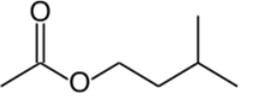
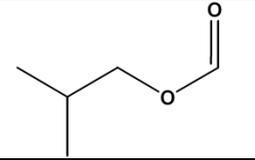
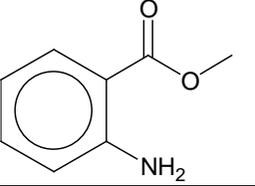
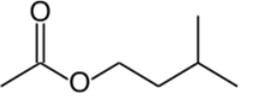
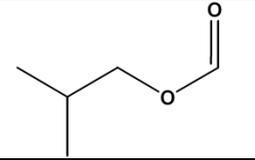
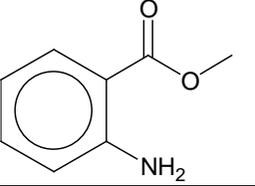
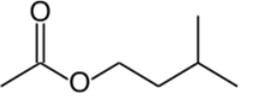
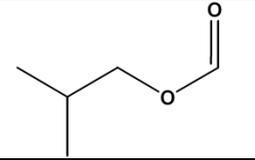
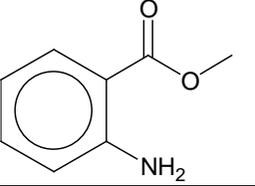
Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- 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.

Question			Answer	Marks	Guidance															
1	(a)	(i)	speeds up reaction/catalyst ✓	1	IGNORE references to sulfuric acid removing water produced															
		(ii)	neutralises excess acid (so easier to smell ester) AND fizzing/effervescence/bubbling ✓	1																
	(b)		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Alcohol</th> <th style="width: 25%;">Carboxylic acid</th> <th style="width: 50%;">Structure of Ester</th> </tr> </thead> <tbody> <tr> <td>pentan-1-ol</td> <td>ethanoic acid</td> <td></td> </tr> <tr> <td>3-methylbutan-1-ol</td> <td>ethanoic acid</td> <td></td> </tr> <tr> <td>2-methylpropan-1-ol</td> <td>methanoic acid</td> <td></td> </tr> <tr> <td>methanol</td> <td>anthranilic acid</td> <td></td> </tr> </tbody> </table> <div style="display: flex; justify-content: space-around; width: 100%;"> ✓ ✓ ✓ </div>	Alcohol	Carboxylic acid	Structure of Ester	pentan-1-ol	ethanoic acid		3-methylbutan-1-ol	ethanoic acid		2-methylpropan-1-ol	methanoic acid		methanol	anthranilic acid		3	one mark for each ALLOW any unambiguous representations of structures
Alcohol	Carboxylic acid	Structure of Ester																		
pentan-1-ol	ethanoic acid																			
3-methylbutan-1-ol	ethanoic acid																			
2-methylpropan-1-ol	methanoic acid																			
methanol	anthranilic acid																			
	(c)	(i)	removes water/drying agent ✓	1																

Question	Answer	Marks	Guidance
(ii) *	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3: 5-6 marks Identifies key absorptions unique to ester, justifying by C13 NMR AND IR spectra. States both wavenumber and relevant absorption for IR Recognises any difference in C13 NMR AND IR spectra for BOTH alcohol and acid spectra</p> <p><i>The ideas are logical and well-structured providing significant clarity in the communication of the science</i></p> <p>Level 2: 3-4 marks Identifies key absorptions unique to ester, justifying by C13 NMR AND IR spectrum OR absence of features from acid and alcohol.</p> <p><i>There is partial structuring of the ideas with the communication of the science generally clear.</i></p> <p>Level 1: 1-2 marks Identifies key absorptions unique to ester, justifying by C13 NMR OR IR spectrum. Recognises any difference in EITHER spectra for EITHER acid or alcohol</p> <p><i>The ideas expressed are logical but limit the communication of the science.</i></p> <p>Level 0: (no marks) <i>No response or no response worthy of credit.</i></p>	6	<p>Expected chemical points:</p> <p>Ester <i>C-13 spectrum</i> (at least 2 from:)</p> <ul style="list-style-type: none"> • 4C environments suggest ester present; • ca 160 shift suggests C=O • 70 shift suggests C-O <p><i>IR spectrum</i> (at least 2 from:)</p> <ul style="list-style-type: none"> • no OH absorption • C=O at around 1750 • C-O at around 1250 <p>Alcohol <i>C-13 spectrum</i></p> <ul style="list-style-type: none"> • 3C environments • one at δ 50-70 (C-O) <p><i>IR spectrum</i></p> <ul style="list-style-type: none"> • OH absorption in region 3200-3600 • no C=O stretch at 1750 <p>Carboxylic Acid <i>C-13 spectrum</i></p> <ul style="list-style-type: none"> • only 1C environment • at δ 160-200 (C=O) <p><i>IR spectrum</i></p> <ul style="list-style-type: none"> • OH absorption in region 2500-3300 <p>All three molecules</p> <ul style="list-style-type: none"> • C-H at 2900 stretch in IR spectra NB
	Total	12	

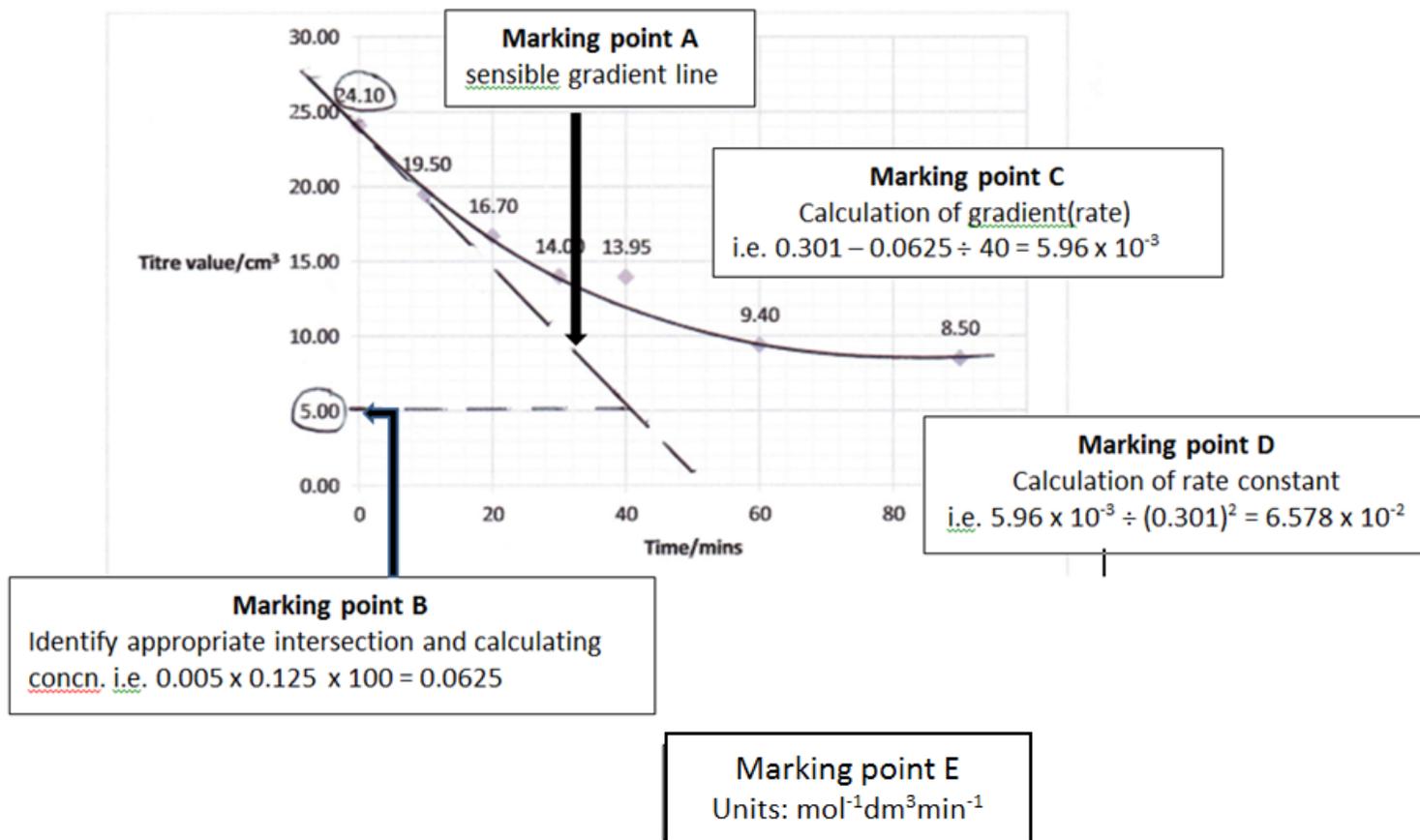
Question			Answer	Marks	Guidance
2	(a)	(i)	precipitation	1	
		(ii)	+4 -1 +2 0 	2	reactants ✓ products ✓ ALLOW 1 mark if + signs omitted but is otherwise correct.
	(b)	(i)	Starch ✓ blue/black to white ✓	2	allow black allow colourless for white
		(ii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE IF concentration = 1.3×10^{-4} (mol dm ⁻³) award 4 marks $10.50 \times (2.5 \times 10^{-6}) = 2.625 \times 10^{-5}$ mole thio ✓ from $(2.625 \times 10^{-5} / 4) = 6.57 \times 10^{-6}$ mol of O ₂ ✓ Conc. is $6.57 \times 10^{-6} \times 1000/50 = 1.314 \times 10^{-4}$ moldm ⁻³ ✓ concentration = 1.3×10^{-4} (mol dm ⁻³) to 2 sig figs (0.00013) ✓	4	
		(iii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE IF concentration = 9.0 (ppm) award 2 marks mass of O ₂ = $2.8 \times 10^{-4} \times 32 = 8.96 \times 10^{-3}$ g in 1000g water ✓ concentration = = 9.0 (ppm)	2	ALLOW 2 or more sf
			Total	11	

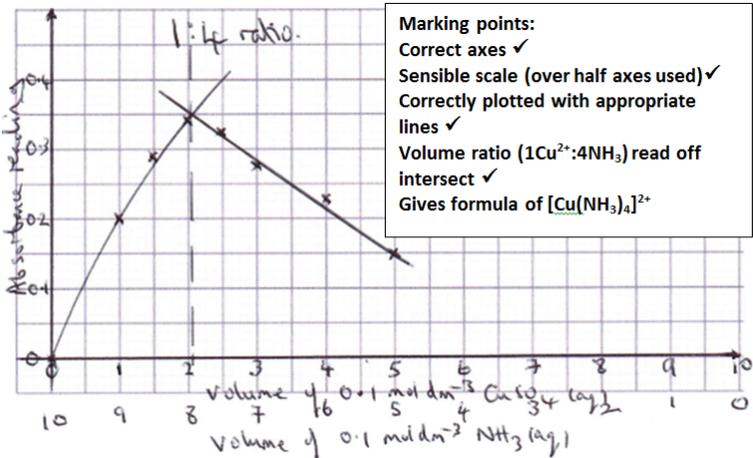
Question			Answer	Marks	Guidance
3	(a)	(i)	substitution ✓ nucleophilic ✓	2	
		(ii)	heterolytic ✓	1	
	(b)	(i)	slow down reaction (so time for titration)✓	1	ALLOW 'stop reaction' IGNORE quench
		(ii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE IF initial concentration = 0.301(25) (mol dm ⁻³) award 2 marks 24.10 x 0.125 x 10 ⁻³ = 3.0125 x 10 ⁻³ mole of acid ✓ conc. of OH ⁻ = 3.0125 x 10 ⁻³ x 100 = 0.301(25) (mol dm ⁻³) ✓	2	ALLOW 2 or more sf
		(iii)	Two of; Rate = k[RBr][OH] Rate = k[RBr] ² Rate = k[OH] ² ✓	1	
		(iv)	(A) curve drawn with <u>gradient line</u> cutting y axis at t =0✓ (B) concentration calculated at appropriate intercept with y axis see scan✓ (C) calculating gradient(rate) = difference in concentration ÷ 40 ✓	3	see graph scan at the end of the question. ALLOW ECF from part ii
		(v)	(D) correct substitution in k = rate ÷ (0.301)² and evaluation ✓ (E) correct units mol ⁻¹ dm ³ min ⁻¹ ✓	2	

(c)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3: 5-6 marks Learners demonstrate knowledge and understanding of the method with an explanation of the steps followed AND Learners describe some of the observations AND Learners suggest a sound conclusion.</p> <p><i>The ideas are logical and well-structured providing significant clarity in the communication of the science.</i></p> <p>Level 2: 3-4 marks Learners demonstrate knowledge and understanding of the method with some explanation of the steps followed AND EITHER Learners describe some of the observations OR Learners suggest a sound conclusion.</p> <p><i>There is partial structuring of the ideas with the communication of the science generally clear.</i></p> <p>Level 1: 1-2 marks Learners demonstrate knowledge and understanding of the method with no explanation of the steps followed AND EITHER Learners describe some of the observations OR Learners suggest a sound conclusion.</p> <p><i>The ideas expressed are poorly structured and do not contribute to the communication of the science.</i></p>	<p>6</p> <p>Expected chemical/practical points include:</p> <p>Method</p> <ul style="list-style-type: none"> • dissolve halogenoalkanes in ethanol in test tubes • stand in beaker of hot water • add solution of silver nitrate • start timing <p>Explanation of steps</p> <ul style="list-style-type: none"> ➤ ethanol – co-solvent/halogeno's don't dissolve in water ➤ hot water needed reaction too slow in cold ➤ equal amounts/volumes of reactant for 'fair test' <p>Observations</p> <ul style="list-style-type: none"> • precipitate forms/tubes go cloudy • note time on first appearance <p>Explanation of observations</p> <ul style="list-style-type: none"> ➤ precipitates caused by halide ions reacting with silver ions/formation of insoluble silver halides ➤ colours and equations <p>Conclusion</p> <ul style="list-style-type: none"> ➤ shorter time means faster rate • rate of hydrolysis in order iodo(fastest), bromo and chloro. ➤ bond strengths increase in above order
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			Level 0: (no marks) <i>No response or no response worthy of credit.</i>		
			Total	18	

3b(iv)
Graph scan



Question			Answer	Marks	Guidance
4	(a)	(i)	keep total volume constant ✓	1	ALLOW to keep concentration of copper (sulfate) the same
		(ii)	$\text{Cu}^{2+}(\text{aq}) + 2\text{OH}^{-}(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s})$ ✓ ✓	2	one mark for equation second mark for state symbols (provided '(aq) + (aq) → (s)')
		(iii)	coordinate/dative bond (to central metal ion)	1	
	(b)	(i)	burette/graduated/ <u>volumetric pipette</u>	1	
		(ii)	try different filters with 'complex' solution ✓ choose one showing maximum absorption ✓	2	
		(iii)	use $c_1v_1 = c_2v_2$ to calculate volume to dilute ✓ transfer 50cm^3 stock using burette/volumetric pipette ✓ to 250cm^3 volumetric flask and make up to mark ✓	3	
	(c)		 <p>Marking points: Correct axes ✓ Sensible scale (over half axes used) ✓ Correctly plotted with appropriate lines ✓ Volume ratio (1Cu²⁺:4NH₃) read off intersect ✓ Gives formula of [Cu(NH₃)₄]²⁺</p>	5	see scanned graph

Question		Answer	Marks	Guidance
	(d)	Dissolved $(\text{NH}_4)_2\text{SO}_4$ means concentration of NH_4^+ high ✓ Equilibrium (position) shifts to left to (maintain K_c), (removing some of added NH_4^+) ✓ Concentration of OH^- reduced ✓ Not enough/too low a concentration to cause precipitate. ✓	4	ALLOW $[\text{NH}_4^+]$ increases ALLOW solubility product not exceeded IGNORE no OH^- ions.
			Total	19