OCR
Oxford Cambridge and RSA

…day June 20XX – Morning/Afternoon

AS Level Chemistry A

H032/01 Breadth in chemistry

SAMPLE MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 70

This document consists of 16 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:

   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks

   b. 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. **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

11. **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.

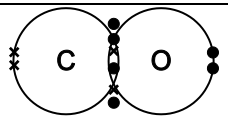
SECTION A

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

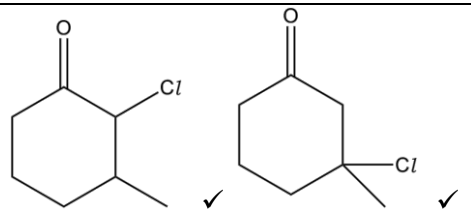
SECTION B

Question			Answer	Marks	Guidance
20	(a)		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$ ✓	1	**ALLOW** …$4s^2 3d^{10}$…
	(b)		$AlBr_3$ ✓	1	
	(c)		forces between (simple) molecules … ✓ … (which are) induced dipole–dipole forces **OR** London forces … ✓ … are weak, so (relatively easily) overcome by increased thermal motion/kinetic energy ✓	3	**IGNORE** any reference to covalent bonds **ALLOW** van der Waals' forces
	(d)		$HgBr_2$ conducts when molten but not when solid ✓ … because **ions** are mobile in molten $HgBr_2$ ✓ … but are fixed in a lattice in solid $HgBr_2$ ✓ Mercury conducts in both the solid and molten states … ✓ … because delocalised electrons move (in both solid and liquid state) ✓	5	Explanations **must** be included for 2nd and 3rd marks. **IGNORE** references to aqueous $HgBr_2$ **IGNORE** 'delocalised ions' **OR** 'free ions' for 'mobile ions' **DO NOT ALLOW** any mention of electrons moving **DO NOT ALLOW** any mention of + ions moving

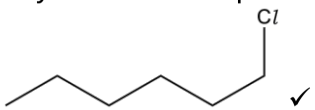
Question			Answer	Marks	Guidance
	(e)	(i)	$\frac{(85.00 \times 72.17) + (87.00 \times 27.83)}{2}$ ✓ = 85.56 (to 2 d.p.) ✓	2	
		(ii)	Rubidium **OR** Rb	1	
			Total	13	

Question			Answer	Marks	Guidance
21	(a)		Element oxidised: zinc/Zn 0 to +2 ✓ Element reduced: carbon/C +4 to +2 ✓	2	**ALLOW** 1 mark for all oxidation numbers correct, but oxidised and reduced the wrong way around **max** 1 mark if missing '+' or 'if given as charges e.g. '2+'
	(b)		 three shared electron pairs plus a lone pair on C and O ✓ one of the shared pairs shown as dative – i.e. both with the same type of dot/cross as the other electrons around the O ✓	2	mark can be awarded if either lone pair is missing, but there must be three shared pairs
	(c)	(i)	*Determining limiting factor* *n*(Zn) 0.27/65.4 = 0.0041 mol **AND** *n*($CaCO_3$) = 0.38/100.1 = 0.0038 mol so Zn is in excess ✓ <u>*Determining volume of CO*</u> ratio 1:1, so *n*(CO) = 0.0038 (mol) vol. CO = 0.0038 x 24.0 = 0.091 dm^3 = **91** (cm^3) ✓	2	evidence of 0.27/65.4 is required (or using the mass ratio to predict 0.116g of CO from 0.27g Zn) or use of the mass ratio to predict 0.106g CO from 0.38g $CaCO_3$, and dividing by 28.0 to get 0.0038 mol CO **ALLOW** 2 sig figs up to calculator answer **ALLOW** second and third marks for correct final answer with no working **ALLOW** 2 marks for 99 cm^3 from excess Zn mass

Question			Answer	Marks	Guidance
		(ii)	heat until syringe stops moving/no further gas produced ✓ wait until the gas has cooled (to room temperature) before measuring the volume *owtte* ✓	2	**ALLOW** heat for longer than two minutes **ALLOW** heat a greater mass
	(d)	(i)	axes: labels correct, **AND** units **AND** scales chosen so that the plotted points occupy at least half the graph grid in both the *x* and *y* directions ✓ **ALL** points plotted correctly ✓ Best curve drawn through points **AND** ignoring point at 20 s ✓	3	
		(ii)	*Tangent* tangent drawn to curve at t = 50 s ✓ *Calculation of rate from the gradient of tangent drawn* e.g. rate = $\frac{64}{94}$ = 0.68 ($cm^3\ s^{-1}$) ✓	2	Annotate tangent on graph **Note**: This mark can only be awarded from a tangent **ALLOW ECF** for tangent drawn at different time from 50 s **ALLOW** ±10% of gradient of tangent drawn **ALLOW** 2 sig figs up to calculator value **ALLOW** trailing zeroes, e.g. 0.7 for 0.070 **IGNORE** '–' sign for rate **Note:** if candidate calculates rate via ln 2 method, consult with TL
			Total	**13**	

Question			Answer	Marks	Guidance
22	(a)		4-methylheptan-3-ol ✓	1	**ALLOW** 4-methyl-3-heptanol
	(b)	(i)	 ✓ ✓	2	**ALLOW** any unambiguous structure or formula **ALLOW ECF** on the second structure for hydrogen atom errors if candidate tries to convert to a displayed/structural formula, but the carbon skeleton must be correct
		(ii)	correct structure of either possible carbocation intermediate shown ✓ the tertiary halogenoalkane (which will be labelled as either product 1 or product 2) is identified as the one formed in greater amounts … because the carbocation more stable on C3 than C2 *owtte* ✓	2	If both carbocations are drawn, only one needs to be correct to score the mark **ALLOW ECF** from **(i)** for correct justification of product formed in greater amount based on incorrect structures
		(iii)	*Amount of **D** that reacts* *M*(**D**: $C_7H_{16}O$) = 110 (g mol^{-1}) **AND** $n(C_7H_{16}O) = \frac{4.125}{110} = 0.0375$ (mol) ✓ *Masses of two products formed* *M*(product: $C_7H_{17}OCl$) = 152.5 (g mol^{-1}) **AND** Mass of 95% product = $0.0375 \times \frac{95}{100} \times 152.5 = 5.43$ g **AND**	2	

Question			Answer	Marks	Guidance
			Mass of 5% product = $0.0375 \times \frac{5}{100} \times 152.5 = 0.29$ g ✓		**ALLOW** Mass of both products = $0.0375 \times 152.5 = 5.72$ g Mass of 95% product = $\frac{95}{100} \times 5.72 = 5.43$ g Mass of 5% product = $\frac{5}{100} \times 5.72 = 0.29$ g **ALLOW** 'product 1' and 'product 2' if linked to **correct** mass given labelling in **(i)** and reasoning in **(ii)** (**ALLOW ECF** from **(ii)**).
	(c)		(broad) peak at 3300–3600 (cm^{-1}) for O–H (therefore A or C) ✓ molar ratio: C : H : O $\frac{78.94}{12.0} : \frac{10.53}{1.0} : \frac{10.53}{16.0}$ **OR** 6.58 : 10.53 : 0.658 ✓ 10 : 16 : 1 **OR** $C_{10}H_{16}O$, therefore C ✓	**3**	**ALLOW** 3200–3600 cm^{-1} **IGNORE** references to the peak at ~2900 for C–H **ALLOW** annotation of the spectrum to identify the bond responsible for the peak instead of quoting the wavenumber Conclusion may also follow from empirical formula followed by IR data.
			Total	**10**	

Question			Answer	Marks	Guidance
23	(a)	(i)	$NaClO + 2HCl \rightarrow NaCl + Cl_2 + H_2O$ correct formulae of reactants, $NaCl$ and chlorine ✓ water and balancing ✓	2	**ALLOW** $NaClO_3 + 6HCl \rightarrow NaCl + 3Cl_2 + 3H_2O$ for 1 mark
		(ii)	Test: add (a few drops of aqueous) silver nitrate ✓ Result: white ppt ✓	2	**IGNORE** addition of dilute nitric acid before the $AgNO_3$ **IGNORE** redissolving in excess NH_3 or darkening of the ppt
		(iii)	separating funnel ✓	1	**ALLOW** dropping pipette
	(b)	(i)	any mono or multiple substituted chlorohexane – e.g.  ✓	1	
		(ii)	(because) substitution can replace any H atom / multiple substitution *owtte* ✓	1	**IGNORE** vague statements about free radical reactions being random **ALLOW** termination can join alkyl radicals to form larger hydrocarbons *owtte*
			Total	7	

Question			Answer	Marks	Guidance
24	(a)	(i)	phosphoric acid / H_3PO_4 ✓	1	if both name and formula are given, the formula must be correct, but **ALLOW** minor errors in an attempt at the name
		(ii)	(allows the reaction to proceed via a route with) lower activation energy … ✓ … so that a greater proportion of molecules exceed the activation energy ✓	2	**ALLOW** a sketch of an energy profile diagram as long as the catalysed and uncatalysed E_a are both labelled **ALLOW** 'more molecules exceed the activation energy' **ALLOW** a sketch of a Boltzmann distribution as long as both axes and both E_a values are labelled
	(b)		atom economy suggests hydration is more sustainable ✓ (but …) ***Any two from:*** the CO_2 given off is taken in by plants as they grow ✓ (ethene from) crude oil is non-renewable/glucose is renewable ✓ fermentation does not require high temperatures/ pressures, so lower energy demand ✓ so on balance fermentation is more sustainable *owtte* ✓	4	**IGNORE** references to global warming or 'carbon neutral' There must be a conclusion for this mark
			Total	7	

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