OCR
Oxford Cambridge and RSA

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…day June 20XX – Morning/Afternoon

GCSE (9–1) Chemistry B (Twenty First Century Science)
J258/02 Depth in chemistry (Foundation Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 90

This document consists of 20 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. 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.

Level of response questions on this paper are **6(c)** and **8(b)(ii)**.

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.

The breakdown of Assessment Objectives for GCSE (9–1) in Chemistry B:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

Question			Answer	Marks	AO element	Guidance
1	(a)		floods increase / storms increase (over time) / correct use of figures from the graphs to illustrate a correlation for storms ✓ global carbon emissions increase (over time) / correct use of figures from the graphs to illustrate a correlation for carbon emissions ✓ increases follow a similar pattern ✓	3	2.1	Correct use of figures from the graphs to illustrate a correlation for storms.
	(b)	(i)	data not available / no data collected / can't go back ✓ data may be of lower quality / records not kept accurately / not systematic / different methods of collecting data / instrumentation make comparing data difficult ✓	2	2.2	
		(ii)	3000 ÷ 750 x 100 ✓ = 400 % ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
	(c)		<Jean because> global temperatures pose threat to more people / worldwide idea ✓ gives examples of effects of increase in global temperatures: more flooding, ice caps melting, climate change, crops failure / desertification ✓ floods give threat to local area idea / relatively few people ✓ number of floods and storms still (relatively) small / do not happen every day ✓	4	3.1a 3.1a 3.2a 3.2a	If decision is not given, then maximum (2) marks.
	(d)		gives advantage of either method: using CDs/old plastics uses waste / old oil wells are not useful ✓ (makes comparison): Oil wells are bigger scale / can store large amounts of carbon dioxide / not enough CDs idea/a lot of plastic will need to be stored somewhere idea ✓ (makes comparison): Using oil wells has other benefits / more oil is needed for fuels and making chemicals / helps to get (more) oil from oil well / oil is running out so using all reserves is beneficial ✓	3	3.1a 3.2b 3.2b	

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	lithium + fluorine → lithium fluoride ✓ 2Li ✓ + F_2 → 2LiF	2	1.1	
		(ii)	✓ lithium → metal ✓ fluorine → non-metal ✓ lithium fluoride → ionic compound	2	1.1 1.2	All three correct = (2) One or two correct = (1)
	(b)	(i)	shows 2 shared electrons between fluorine atoms ✓ shows correct number of other electrons for each atom (6) ✓	2	1.1 2.2	Accept dots or crosses or a mixture of both.
		(ii)	shows a total of 10 electrons ✓ in configuration 2,8 ✓	2	1.1 2.2	
	(c)		simple covalent substances have lower melting points than giant ionic substances ✓ there are weak forces between simple covalent molecules ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
3	(a)		they all have high melting points ✓	1	2.2	
	(b)	(i)	**A** is a metal/has metallic bonding✓ because it conduct electricity when solid and molten✓	2	2.1 3.2b	
		(ii)	**B** is a covalent compound✓ because it does not conduct when solid or molten✓	2	2.1 3.2b	
		(iii)	**C** is an ionic compound✓ because it does not conduct when solid but does conduct when molten✓	2	2.1 3.2b	

Question			Answer	Marks	AO element	Guidance
4	(a)		C_5H_{12} ✓	1	2.2	
	(b)		methane ✓ butane ✓	2	1.2	
	(c)		C_8H_{18} ✓	1	2.2	
	(d)		✓ all alkanes are hydrocarbons. ✓ the alkanes are a homologous series.	2	1.1	

Question			Answer	Marks	AO element	Guidance
5	(a)		$4Fe(s)$✓$+6H_2O(l) + 3O_2(g)$ ✓ ⟶ $2Fe_2O_3.3H_2O(s)$	2	1.1	
	(b)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 52.25 (%) award 2 marks** 2 iron atoms in a rust atom RAM iron = 55.8 therefore $\frac{2 \times 55.8}{213.6} \times 100$ ✓ = 52.247 = 52.25 (%) to 2dp ✓	2	2.2	
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 51 (g) award 3 marks** mass of iron turned to rust = 2 x 7 x 4 = 56 g✓ mass of rust = $\frac{\text{mass of iron}}{0.5225} = \frac{56}{0.5225}$ = 107.177✓ increase in mass of skate board = 107.177 – 56 = 51.177 = 51 (g) to the nearest gram ✓	3	2.2	**ALLOW ECF** from **(b)(i)**

Question			Answer	Marks	AO element	Guidance
	(c)		coat/galvanise/grease ball bearings ✓ to form barrier to keep the water and oxygen from the steel ✓ or use another material ✓ with the same desirable properties but that does not rust ✓ or suggestion of an alternative material such as ceramic ✓ and why ✓	2	1.1	Any two linked answers
6	(a)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 0.5 (g) award 2 marks** mass of solvent = 1 x 250 =250 ✓ mass of NaCl = 250 x 0.2 ÷ 100 = 0.5 (g) ✓	2	2.2	
		(ii)	draw start line with pencil ✓ put a dot of dye on start line ✓ add sodium chloride/solvent to beaker / put paper into solvent ✓ make sure solvent is below level of dot ✓	4	1.2	all points may be scored from a clearly labelled diagram

Question	Answer	Marks	AO element	Guidance
(b)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** *Shows correct understanding of output of the chromatogram and calculates correctly the Rf of some of the spots, including linking the Rf values to the table of food dyes.* **And** *makes correct conclusions about the jelly* **And** *Suggests improvements to increase confidence in the result.* *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated* **Level 2 (3–4 marks)** *Shows correct understanding of output of the chromatogram and calculates correctly the Rf of some of the spots, including linking the Rf values to the table of food dyes.* **And** *makes some conclusions about the jelly or suggests improvements.*	**6**	**2 x 1.2 2 x 2.2 3.2b 3.3b**	**Indicative scientific points may include** **AO3.2b: making conclusions about the dye dyes by comparing results with table of Rf values** For example • one spot possibly a safe dye • one spot banned dye • cannot be exported to USA **AO2.2: directly linking spots Rf values** For example • calculates the Rf of dyes: 0.37 / 0.92 • compares spots with table **AO1.2: understanding of the output from a chromatogram** For example • jelly contains 2 dyes • shows how to calculate RF value **AO3.3b: making improvement to increase confidence** For example • use a different solvent • suggest a different method • look at a more extensive Rf table to identify other dye and check for safety

Question			Answer	Marks	AO element	Guidance
			There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence. **Level 1 (1–2 marks)** *Shows correct understanding of output of the chromatogram and attempts to calculate the Rf of a spot but incorrectly (shows knowledge of the formula)* *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.			

Question			Answer	Marks	AO element	Guidance
7	(a)		carbon monoxide ✓ toxic / reduces oxygen content of blood ✓	2	2.1 1.1	
	(b)		(links judgment to main reasons why non-sustainable) methane is non-renewable/finite/will run out/comes from fossil fuels ✓ carbon dioxide is a waste product which causes climate change ✓ makes another point 'against' the process: high temperature uses energy / large energy input / atom economy is low / large amount of waste products idea ✓	3	 3.2a 3.2a 3.1a	.
	(c)	(i)	reversible reaction / explanation of reversible reaction ✓ idea that reaction never reaches 100% yield / all reactants do not react / reaction does not go to completion ✓	2	2.1	
		(ii)	does not waste raw materials / use less methane / methane is non-renewable ✓ less waste given out / less waste to dispose of ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 15.38 (%) award 3 marks** Total mass of H_2 molecules = 4 x 2 = 8 ✓ Total mass of molecules used = (2 x 18) + (1 x 16) = 52 ✓ atom economy = 8 ÷ 52 x 100 = 15.38 (%) ✓	**3** **2.2**	 **2.1** **2.1** 	 **ALLOW** total mass of molecules used = (4 x 2) + 44 = 52 **ALLOW** 2 or more sig figs, correctly rounded.
		(ii)	idea that < means 'less than' ✓ (yes because) 15.38 is <u>less than</u> 20 ✓	**2** **2.2**	**2.1**	**ALLOW ECF** on incorrect value from (d)(i)

Question			Answer	Marks	AO element	Guidance
8	**(a)**		volume of acid✓ temperature of acid ✓ mass of magnesium✓ surface area of magnesium ✓ Correct link between increase in rate of reaction and factor (e.g. if surface area is greater, rate increase) ✓	**5**	**1.2**	
	(b)	**(i)**	(1.50) 5+6+6 /3=5.7(to two sig figs) ✓ (2.00) 6+7+6 /3 =6.3 (to two sig figs) ✓ both values round to 6 (to one sig fig) ✓	**3**	**2.2**	**ALLOW** 5.67 etc if correctly rounded (last number must be 7)

Question			Answer	Marks	AO element	Guidance
	(b)	(ii)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** *Correctly evaluates the quality of the data as being poor with valid reasons.* **And** *Makes several correct suggestions for the development of the method with correct explanation of how the data will be improved.* *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated* **Level 2 (3–4 marks)** *Correctly evaluates the quality of the data as being poor with valid reasons.* **And** *Makes several correct suggestions for the development of the method or makes one suggestion with a correct explanation of how the data will be improved.* *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	**2 x 3.1b** **2 x 3.3a** **2 x 3.3b**	**Indicative scientific points may include** **AO3.1b evaluation of the quality of Joe's results.** For example • no spread of data • results too close together • volumes measured very small **AO3.3a suggestions for the development of Joe's method** For example • Increase time before volume measured • Increased volume of acid • Increased surface area of magnesium • more magnesium **AO3.3b explanation of how the data will be improved** For example • Volume of gas will be greater • more precise measurement of volume • Larger spread of data • Less overlap of ranges

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) *Correctly evaluates the quality of the data as being poor with a valid reason.* **And** *makes one suggestion for the development of the method with no explanation.* *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.			
9	**(a)**		gaps are for undiscovered elements ✓ he predicted properties / new elements matched his predictions / new elements had the properties he predicted ✓	**2**	**1.1**	
	(b)		Cd and Zn / cadmium and zinc ✓ transition metals ✓	**2**	**2.1**	Both elements required for 1 mark