OCR
Oxford Cambridge and RSA

H

…day June 20XX – Morning/Afternoon

GCSE (9–1) Combined Science B (Twenty First Century Science)
J260/08 Combined Science (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 75

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 question on this paper is **4(a)**.

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 Combined Science 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)	(i)	Different panels may have different characteristics / produce different voltages ✓	1	2.2	
		(ii)	**Any one from** Type / intensity of light source ✓ Distance of light source from panel ✓ Temperature ✓	1	2.2	
	(b)	(i)	Points plotted correctly ✓✓	2	2.2	All four points plotted correctly – 2 marks 2-3 plotted correctly – 1 mark
		(ii)	Points joined appropriately ✓	1	2.2	
		(iii)	Increase in voltage with increasing area ✓ Non-linear / graph levelling off ✓	2	3.1a	
	(c)		Circuit has ammeter in series ✓ Voltmeter in parallel ✓ Suitable load, e.g. light bulb, resistor ✓ Use of equation to calculate the power output of the solar cell: power in watts = voltage / potential difference in volts x current in amps ✓	4	2.2 x3 2.1	One mark for circuit diagram without elaboration / description

Question			Answer	Marks	AO element	Guidance
	(d)		**Any four from** Other types currently more efficient ✓ Only developed since 2013 ✓ Rate of improvement in efficiency suggests that these will be most efficient type of cell by 2016 / exceed efficiency of monocrystalline silicon by 2016 / data on efficiency data to support ✓ Other factors to consider e.g. cost, environmental impact, toxicity ✓ But we don't know how they will perform in non-laboratory situations ✓	**4**	**3.2b**	

Question			Answer	Marks	AO element	Guidance
2	(a)		Less chance of coming into contact with the disease / reference to herd immunity ✓ (More) communicable diseases are more likely to be passed on / spread ✓	2	1.1	
	(b)		✓ The results could not be repeated by other scientists ✓ The sample size was too small	2	2.2	
	(c)	(i)	**Any three from** Amir is correct because after the MMR vaccination is introduced, the number of cases increased ✓ *Beth is correct because:* We don't know the factors affecting the population / named fa factor, e.g. birth rate, immigration, death rate, migration ✓ (Numbers affected by) increased awareness of condition / increased diagnosis / better reporting ✓ The data doesn't show / account for any variations in the age of the person at which the condition was diagnosed / developed ✓ The data doesn't take into account the percentage of children vaccinated ✓	3	3.1a	
		(ii)	**Suitable** / **Not suitable** Select a sample from the population to monitor. ✓ / Ensure that all the children have had the MMR vaccination. / ✓ Ensure that there is no record of autism in the family. / ✓	3	3.3b	

Question			Answer	Marks	AO element	Guidance
	(d)		**Any three from** If autism develops in one identical twin the probability of it developing in the other is high ✓ A connection with pesticides means there is an environmental link to autism ✓ Human genome analysis suggests genetic component ✓ (But) not all inherited / pass down in families as 3% of cases arise by mutation ✓ Range of genetic contribution revealed ✓	**3**	**3.1a** **3.2b x2**	Award 1 mark for studies suggest environmental and genetic links **ALLOW** further DNA / genomic studies needed

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE IF** answer = 2 (N / m) award 5 marks Recall formula – force exerted by a spring = extension (m) x spring constant (N / m) ✓ Interpolate extension / 4 X 10^{-4} ✓ Convert 8 mN value into N / 0.0008 N / 8.0 x 10^{-4} N ✓ Rearrangement 0.0008 ÷ 0.0004 / 8 x 10^{-4} ÷ 4 x 10^{-4} ✓ Answer = 2 (N / m) ✓	**5**	**1.1** **2.2 x4**	Answer = 5 marks
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE IF** answer = 1.6 x 10^{-7} (J) award 2 marks Substitute values in the formula Energy (j) = 0.5 x spring constant (N / m) x (extension (m))^2 E = 0.5 x 2 x 0.0004^2 ✓ Answer = 1.6 x 10^{-7} (J) ✓	**2**	**2.2**	ALLOW non-standard form answer, e.g. 0.16 x 10^{-6} ECF for the spring constant from (a)(i)
	(b)		**Any one from** Strength reduced / described ✓ Intermolecular forces / bonds broken ✓ **AND** Chains of molecules will separate / molecular structure changed ✓	**2**	**3.2b** **2.1**	Answer must include a description and an explanation

Question			Answer	Marks	AO element	Guidance
	(c)		**Any four from** *In loading* Extension less for larger loads ✓ Because molecular chains are straightening / untangling so easier to stretch ✓ *In unloading* The thread does not recover its original length ✓ As molecular chains do not return to original positions ✓ Area between curves shows that not all energy stored in the thread is recovered during unloading ✓	**4**	**3.2b**	
	(d)		Silk stretches as insect flies into it ✓ Stays stretched so that insect does not bounce from web ✓	**2**	**3.1a** **3.2b**	

Question			Answer	Marks	AO element	Guidance
4	(a*)		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 identifies investigation into the effect on the rate of reaction of changes in lactic acid concentration. **AND** Provides a method detailing the majority of the main points required in plan needed to conduct this investigation. **AND** Includes details of how to develop the practical work further by detailing how results would be processed. *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 identifies investigation into the effect on the rate of reaction of changes in lactic acid concentration. **AND** Provides a method detailing the majority of the main points required in plan needed to conduct this investigation. **OR** Includes how to develop the practical work by providing information on how results would be processed.	**6**	**1.2** **2.2 x4** **3.3a**	**AO1.2: Prediction based on hypothesis** An increase in concentration of lactic acid increases the rate of reaction (between lactic acid and calcium carbonate) **AO2.2 Method** For example: • control variable – volume of acid, mass of calcium carbonate, temperature • dependent variable – measurement of calcium carbonate remaining (mass/dimensions) at the end of the reaction after a specified time • independent variable – different concentrations of acid • selection of appropriate equipment • justification of appropriate equipment **AO3.3a Development and processing** For example: • Plot change in mass over independent variable, graphical or mathematical calculation of reaction rate by (initial) gradient of graph or amount of reactant used up/time or amount of product produced/time

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)** Correctly predicts an increase in concentration of lactic acid will increase the rate of reaction and plans investigation into the effect on the rate of reaction of changes in acid lactic acid concentration. **AND** Provides a basic method detailing some of the main points required in plan needed to conduct this investigation. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*			

Question	Answer	Marks	AO element	Guidance
(b)	**Any three from** *Benefits:* PLA biodegradable ✓ (nanoparticles prevent microbe growth so) reduce deaths / food poisoning / illness ✓ *Risks:* Nanoparticles may enter food ✓ May be enhanced by biodegradability ✓ Nanoparticles may be absorbed into bloodstream (from gut / digestive system) ✓ Possible health risks ✓ Owing to size and surface area ✓	**3**	**2.1**	

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	Chemical / compound that kills microorganisms / bacteria / prevents their growth ✓	1	1.1	
		(ii)	**Any four from** A mutation / change in base sequence / DNA / variation ✓ (Causes) bacteria to become resistant ✓ When the antibiotic is used, the resistant bacteria are more likely to survive ✓ To reproduce / resistance is passed on to the next generation ✓ The number of resistant bacteria increases ✓ The antibiotic is the selection pressure ✓	4	1.1	**ALLOW** 1 mark for referral to antibiotic resistance
	(b)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE IF** answer = 64 mm^2 award 2 marks 4.5 x 4.5 x 3.14 ✓ Answer = 64 mm^2 ✓	2	1.2	
		(ii)	Extract C, Test 6 is outlier / 25 in Test 6 **AND** value not consistent with the other data / other values 14 – 16 mm ✓	1	3.1b	Both extract and justification needed for 1 mark

Question			Answer	Marks	AO element	Guidance
	(c)		*Kai* Likely to be / could be some inhibition of bacteria by ethanol ✓ **OR** (Area of clear zone) must be excluded to get a true value for inhibition by the (potential) antibiotic ✓ *Jack* With variation in depth of agar, antibiotic will diffuse more / less far ✓ *Mia* (With irregular area) difficult to determine area / clear zone ✓	**3**	**3.1b**	One mark should be awarded for a comment on each action
	(d)		✓ A concentration of greater than 0.3 μg / cm^3 is required to inhibit the growth of the bacteria	**1**	**3.1a**	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	$H^+ + OH^- \rightarrow H_2O$ ✓✓	2	1.1	**ALLOW** correct formula of reactants in either order for 1 mark **ALLOW** correct formula of product for 1 mark
		(ii)	Relative formula mass of sodium hydroxide = 23.0 + 16.0 + 1.0 = 40 ✓	1	2.2	
		(iii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE IF** answer = 0.1 (g) award 2 marks 0.4 g in 1dm^3 ✓ 0.1 (g) in 250 (cm^3) ✓	2	2.2	**ALLOW ECF** for RFM in (i)
	(b)	(i)	**Any two from** To get a rough estimate of the volume of hydrochloric acid required to neutralise the alkali required ✓ So she can slow down on subsequent titrations and approach the endpoint with care ✓ Doesn't overshoot the endpoint ✓	2	3.3b	
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE IF** answer = 0.0053 mol / dm^3 award 4 marks Correct substitution of values into formula ✓ Rearrangement of formula to make acid concentration subject ✓ Answer = 0.0053 ✓ Units: mol / dm^3 ✓	4	1.1 2.2 x3	Correct answer gains first 3 marks (if units are missing)

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website