



...day June 20XX – Morning/Afternoon

GCSE (9–1) Combined Science B (Twenty First Century Science)

J260/03 Physics (Foundation Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 95

DRAFT

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 component. 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, 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 **8**.

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)	<p>One mark for each of these: Density is mass per unit volume ✓ Density of gas less than density of liquid ✓</p> <p>Plus any ONE of: Gas particles/molecules are: Spread far apart ✓ Moving fast ✓ No noticeable forces between particles ✓ Density of gas less than density of liquid ✓</p> <p>Plus any ONE of: Liquids particles/molecules are: Close together ✓ Sliding past each other ✓ Held together by forces ✓</p>	4	1.1	<p>ORA</p> <p>For full marks at least one point must come from each of gas and liquid.</p>
	(b) (i)	Apart ✓ Latent heat ✓ Lower ✓	3	1.1 1.1 1.1	
	(ii)	<p>One mark for each of these: Change in internal energy = mass x shc x temp change ✓ Energy to cause a change of state = mass x specific latent heat ✓</p> <p>Plus any ONE of: Energy transferred = PD x current x time ✓ OR Power = potential difference x current ✓ OR Energy transferred = charge x potential difference ✓</p>	3	1.1	

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Question	Answer	Marks	AO element	Guidance
(iii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 690 (W) award 3 marks Recall $P = I \times V$ ✓ $= 230 \times 3$ ✓ 690 (W) ✓	3	1.1 2.1 2.1	Correct substitution gains first 2 marks (if equation is missing).
(iv)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 12 (minutes) award 4 marks Rearrange the equation to give: time = charge flow \div current ✓ $= 2160 \div 3 = 720 \text{ s}$ ✓ $= 12 \times 60 \text{ s}$ ✓ $= 12 \text{ (minutes)}$ ✓	4	1.2 2.1 1.2 1.2	

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 9.6 (m/s) award 4 marks</p> <p>Recall average speed = distance ÷ time ✓</p> <p>Convert minutes to seconds: 0.1 minutes x 60 = 6 s ✓</p> <p>Average speed calculation is: 58 m ÷ 6 s ✓</p> <p>Average speed = 9.6 (m/s) ✓</p>	4		Correct substitution gains first 2 marks (if equation is missing).
		(ii)	<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = -3.0(m/s²) award 2 marks</p> <p>Deceleration = $\frac{0 - 15\text{m/s}}{5}$ ✓ = -3.0(m/s²)</p>	2	2.1	
	(b)	(i)	Stopping distance = reaction distance + braking distance ✓	1	3.1a	
		(ii)	<p>Reaction distance does get bigger as speed increases ✓</p> <p>Change in reaction distance is explained by increase in speed ✓</p>	2	3.2a	

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	Force acting upwards from the ground ✓ Equal size to downward force ✓	2	2.1	
		(ii)	Idea of forces equal in size and in opposite directions ✓	1	1.1	ALLOW every action has an equal and opposite reaction (1marks).
	(b)	(i)	Weight = mass x gravitational field strength ✓	1	1.1	ALLOW acceleration due to gravity for gravitational field strength.
		(ii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 50 (N) award 2 marks 5 x 10 ✓ 50 (N) ✓	2	2.1	
	(c)	(i)	FIRST CHECK ANSWER ON ANSWER LINE. If answer = 0.58 (N) award 2 marks = 0.058 kg x 10 m/s ² ✓ = 0.58 (N) ✓	2	2.1 2.1	
		(i)	FIRST CHECK ANSWER ON ANSWER LINE. If answer = 0.116 (J) award 2 marks K.E = $\frac{1}{2} \times 0.058 \text{ kg} \times (2.0\text{m/s})^2$ ✓ = 0.116 (J) ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	(Rate of) flow of charge ✓ A potential difference is needed / power supply / battery ✓ A closed circuit is needed ✓	3	1.1	
		(ii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 1.25 V award 4 marks Recall potential difference = current x resistance ✓ = 0.5 A x 2.5 Ω ✓ 1.25 ✓ V ✓	4	1.1 2.1 2.1 1.1	Correct substitution gains first 2 marks (if equation is missing). If units not given, award 3 marks for an answer of 1.25
	(b)	(i)	The resistance is fixed ✓ The wire is a linear part of the circuit ✓	2	3.2b	
		(ii)	Above the printed line and straight and through the origin ✓	1	2.2	

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Question			Answer	Marks	AO element	Guidance
	(c)	(i)	B ✓	1	1.2	
		(ii)	Resistance ✓	1	1.2	

SPECIMEN

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	Gives correct relationship i.e. as density increases absorption thickness decreases ✓	1	3.1a	
		(ii)	Correct relationship: Mass ÷ volume ✓	1	1.1	
	(b)		Lead ✓ Smallest thickness needed ✓ Least mass needed ✓	3	3.2b	
	(c)		FIRST CHECK ANSWER ON ANSWER LINE. If answer = 6.0 (cm³) award 4 marks Rearrange equation to give volume = mass ÷ density ✓ Select correct values from table mass = 20 g/cm ² density = 3.33 g/cm ³ ✓ = 20 g/cm ² ÷ 3.33 g/cm ³ = 6.0 (cm ³) ✓	4	1.1 3.1a 2.1 2.1	

Question		Answer	Marks	AO element	Guidance
6	(a)	<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 7500 m/s or 7.5 km/s award 4 marks</p> <p>Recall: Speed = frequency x wavelength ✓ = 500 (m) x 15 (Hz) ✓ 7500 or 7.5 ✓ (7500) m/s or (7.5) km/s ✓</p>	4	1.1 2.1 2.1 1.1	<p>Correct substitution gains first 2 marks (if equation is and units missing).</p> <p>If units not given award 3 marks for an answer of 7500 or 7.5</p>
	(b) (i)	<p>Reflection: Change in direction ✓ Does not pass through boundary ✓</p>	2	1.1	ALLOW bounces back for 2 marks.
	(ii)	<p>Refraction: (May) change direction ✓ Wave passes through boundary ✓</p>	2	1.1	<p>ALLOW bends at boundary for 2 marks. ALLOW change in speed for 2 marks.</p>
	(iii)	<p>S-wave ✓</p> <p>Any 1 of: Transverse waves cannot travel through liquids ✓</p> <p>Because the particles will not be pulled from side to side / forces between particles are too weak ✓</p>	2	1.1 2.2	

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Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	(Gamma radiation) damages tissue in patient ✓ (short half-life) means small dose / less gamma radiation exposure ✓	2	1.1	
		(ii)	Idea of half-life e.g. 3 x 6 hours ✓ 18 (hrs) ✓	2	2.1	
	(b)		Alpha and beta are not very penetrating / easily absorbed ✓ Hence will not be detected outside body ✓ Absorption by body will damage tissues/cells ✓	3	1.2	
	(c)		Mass number = 124 ✓ Atomic number = 50 ✓	2	2.1	

Question	Answer	Marks	AO element	Guidance
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Question	Answer	Marks	AO element	Guidance
8*	<p><i>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</i></p> <p>Level 3 (5–6 marks) A minimum of 3 energy resources are considered. AND The energy resources are linked to an interpretation of the data in the table. AND The interpretation of the data is used to draw conclusions.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) A minimum of 2 energy resources are considered. AND The energy resources are linked to an interpretation of the data in the table. AND/OR The interpretation of the data is used to draw conclusions.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) A minimum of 2 energy resources are considered. AND Minimal interpretation of the data of the table AND/OR Generic conclusions which may or may not be specifically linked to energy resources included in the candidates answer.</p>	6	1.1 x 2 3.1a 3.2b x 3	<p>Indicative scientific points may include:</p> <p>AO1.1 use knowledge of energy resources For example:</p> <ul style="list-style-type: none"> • wind - little environmental cost/renewable • waves/tidal - little environmental cost/renewable • nuclear - well established technology/small amounts of fuel needed • oil - high cost/CO₂ pollution from burning • nuclear - safety issues/disposal of radioactive waste - very high set up costs <p>AO3.1a Analyse data to interpret For example:</p> <ul style="list-style-type: none"> • energy consumption to increase by 2880000 in the future • oil - high energy density/already established <p>AO3.2b Analyse data to draw conclusions For example:</p> <ul style="list-style-type: none"> • all oil is imported, this is expensive but system already in place • currently no renewable resources being used on the island therefore these resources should be

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Question	Answer	Marks	AO element	Guidance
	<p><i>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.</i></p> <p>0 marks No response or no response worthy of credit.</p>			<p>considered</p> <ul style="list-style-type: none"> • peat is being used up quickly and should be reduced for a small island • a wind farm can be installed offshore to increase amount of energy produced by wind • waves/tidal should be possible on an island • nuclear possible • comparison of running costs of renewable vs non-renewable • wind - high set up costs • waves/tidal - technology still undeveloped/high set up costs • hydro - no evidence to say whether possible or not

Question		Answer	Marks	AO element	Guidance
9	(a)	Arrow downwards from pedal ✓ Arrow to right from the bottom of either wheel ✓	2	2.1	
	(b)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 3400 (N/m) award 3 marks Recall: $F=kx$ or $k = f \div x$ ✓ Converts 15 cm into 0.15 m ✓ $510 \text{ (N)} \div 0.15 \text{ (m)}$ ✓ 3400 (N/m) ✓	4	1.1 1.1 2.1 2.1	Correct substitution gains first 2 marks (if equation is missing).
	(c) (i)	Calculation showing area under the graph e.g. $(0.15 \times 500) \div 2$ ✓ $38.25 \pm 0.75 \text{ (J)}$ ✓	2	2.2	ALLOW between 37.5 and 39.0 inclusive.
	(ii)	Idea of finding area under the graph ✓	1	2.2	
	(d)	Energy input to turn pedal ✓ Transferred to kinetic energy ✓ Some energy transferred to spring, not available as kinetic energy. ✓ Less kinetic energy results in less speed ✓	4	2.1	

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