



...day June 20XX – Morning/Afternoon

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

J260/07 Physics (Higher 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 **1**.

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*	<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 x 1 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 considered • 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

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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>			<ul style="list-style-type: none"> • 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

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Question		Answer	Marks	AO Element	Guidance
2	(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 4 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)	2	2.2	ALLOW between 37.5 and 39.0 inclusive
		(ii)	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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Question		Answer	Marks	AO Element	Guidance
3	(a)	<p>Bubbles are further apart at the top than at the bottom of the glass/stream ✓</p> <p>Time interval between bubbles is constant/the same ✓</p> <p>Greater distance travelled in same time = greater velocity/speed therefore there is a change in velocity over time which implies an acceleration ✓</p>	3	3.1a	ORA
	(b)	(i)	1	1.1	
		(ii)	3	1.1 2.1 2.1	Correct answer 3 marks 0.00000175 or 1.7×10^{-6} gains 2 marks
	(c)	<p>Gravity/weight ✓</p> <p>Friction/(fluid)drag/viscosity/ fluid resistance ✓</p>	2	2.1 2.1	Ignore resistance or any reference to air

Question			Answer	Marks	AO Element	Guidance
4	(a)	(i)	2.5 kJ or 2500 J ✓	1	1.1	
		(ii)	Recall: Energy transferred (J,kWh) = power (W, kW) x time (s, h) ✓	1	1.1	
		(iii)	<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 0.25 (kWh) award 3 marks</p> <p>6 minutes = 0.1 Hours ✓</p> <p>2.5 kW x 0.1 h ✓</p> <p>= 0.25 (kWh) ✓</p>	3	1.1 2.1 2.1	
	(b)		<p>Particles move apart and move freely ✓</p> <p>Energy stored increases as particles move apart ✓</p> <p>No change in temperature ✓</p>	3	1.1	<p>ALLOW PE of particles increases / latent heat used to push particles apart</p> <p>Ignore particles move faster</p> <p>ALLOW stays at 100°C</p> <p>ALLOW Kinetic energy of particles stays the same as temperature stays the same</p>
	(c)		<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 1466,000 J or 1466 kJ award 5 marks</p> <p>Temperature rise: Select and apply: $\Delta E = m \times c \times \Delta T$</p> <p>= 1 x 4200 x 80 = 336,000 J or 336 kJ ✓</p> <p>Select and apply $\Delta E = m \times L$</p> <p>Boiling tray water turns to steam therefore m = 0.5 x 1kg ✓</p> <p>= 0.5 x 2260,000 = 1130,000 J or 1130 kJ ✓</p> <p>Total energy change = 336,000 + 1130,000 (J)</p> <p>= 1466,000 J or 1466 (kJ) ✓</p> <p>Units: joules or kilojoules ✓</p>	5	2.1 2.1 2.1 1.2 1.1	If units not given award 4 marks for an answer of 1466,000 or 1466

Question		Answer	Marks	AO Element	Guidance
5	(a)	<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 480 (m) award 5 marks</p> <p>Convert milliohms to ohms = 0.05Ω ✓</p> <p>Recall: potential difference = current x resistance ✓</p> <p>maximum resistance = $V \div I = 12 \text{ V} \div 0.5 \text{ A}$ ✓</p> <p>= 24Ω ✓</p> <p>maximum length = $24 \div 0.05 = 480 \text{ (m)}$ ✓</p>	5		correct substitution gains first 3 marks (if equation is missing)
	(b)	<p>The work done on each unit of charge by the battery ✓</p> <p>Must equal the work done by it on the circuit components. ✓</p>	2	1.1	ALLOW work done by the battery is the same as the work done by all the components for one mark.
	(c)	<p>Thumb ✓</p> <p>Left ✓</p> <p>Clockwise ✓</p>	3	1.2 1.2 1.2	

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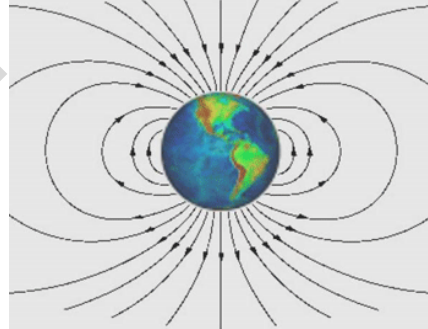
Question		Answer	Marks	AO Element	Guidance
6	(a)	Refers to both vehicle speed and reaction distance ✓ A correlation / is proportional/ has a linear relationship ✓	2	3.1b	
	(b)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 7 or 8 or 9 (kN) award 4 marks Recall: Force = work done ÷ distance ✓ Uses table to find braking distance travelled at 100km/hr = 85 m ✓ 675 kJ ÷ 85 m ✓ Estimate as 7 or 8 or 9 ✓	4	1.1 3.1a 2.1 2.1	Ignore a calculated answer to more than one significant figure.
	(c)	Any one from: mass of car / condition of brakes / weather conditions ✓	1	1.1	ALLOW reference to condition of tyres / condition of road or reduced braking force applied to pedal

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Question		Answer	Marks	AO Element	Guidance
7	(a)	Risk is damage to cells / DNA ✓	1	1.1	
	(b) (i)	Electrons <u>in atoms</u> ✓ Lose energy ✓	2	1.1	
	(ii)	A denser material will have more mass/matter/atoms in the same volume ✓ X-rays are absorbed by electrons in atoms ✓ Hence more atoms means more absorption ✓	3	2.1	
	(c)	Any 3 Bias in sample/samples not matched/no control group e.g. all had cancer ✓ Small sample size ✓ Apparent <u>correlation</u> ✓ Idea that there is a mechanism for the X-rays causing cancer ✓	3	3.3a	

Question			Answer	Marks	AO Element	Guidance
8	(a)	(i)	Held horizontally held vertically ✓ At various places on the earth's surface ✓	2	1.2	
		(ii)	Lines as around a bar magnet ✓ Arrows on field lines pointing from south to north ✓	2	2.1	e.g. 
	(b)	(i)	FIRST CHECK THE ANSWER ON THE ANSWER LINE. If answer = 0.012 N award 3 marks Select and Apply: Force = magnetic field strength x current x length of conductor $40 \mu\text{T} = 40 \times 10^{-6} \checkmark$ $40 \times 10^{-6} \times 15 \times 20 \checkmark$ Correct answer = 0.012 N ✓	3	1.2 2.1 2.1	
		(ii)	West ✓	1	2.2	
		(iii)	Stated comparison e.g. much smaller ✓ Calculation or estimate of mg for wire $20 \times 0.01 \times 10 = 2 \text{ N} \checkmark$	2	1.1 2.1	ALLOW ecf from part bi

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Question		Answer	Marks	AO Element	Guidance
9	(a)	<p>Nuclear energy used to heat water into steam ✓</p> <p>Steam used to turn turbine ✓</p> <p>Hydroelectric, water drives turbine directly ✓</p> <p>Both use turbine to drive generator to produce electricity ✓</p>	4	1.1	
	(b)	(i)	2	1.2	
		<p>148 ✓</p> <p>56 ✓</p>			
		(ii)	3	1.2 2.1 2.1	ALLOW maximum of two marks if answer correct but not quantitative
	(c)	(i)	2	1.1	
		(ii)	1	1.1	
		(Idea that) it is not possible to predict when an individual atom will decay			

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Question	Answer	Marks	AO element	Guidance
10	<p>FIRST CHECK ANSWER ON ANSWER LINE. If answer = 8.16 (m/s) award 5 marks</p> <p>Combined mass after collision = 4360 kg + 1200 kg = 5560 kg ✓</p> <p>Recall Momentum = mass x velocity ✓</p> <p>= 5560 kg x 6.4 m/s = 35584 kg m/s ✓</p> <p>After collision (momentum conserved)</p> <p>Rearrange equation to get Velocity = momentum ÷ mass ✓</p> <p>= 35584 kg m/s ÷ 4360 kg</p> <p>= 8.16 (m/s) ✓</p> <p>Statement to say the apparatus is wrong and that the actual initial velocity of the lorry is less. ✓</p>	6	<p>1.2</p> <p>1.1</p> <p>2.1</p> <p>1.2</p> <p>2.1</p> <p>3.2a</p>	