OCR
Oxford Cambridge and RSA

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Specimen Assessment Material

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

J259/02 Depth in physics (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 **3(c)** and **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.

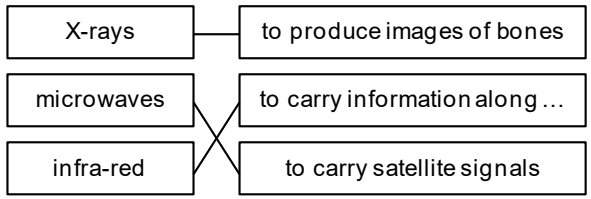
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New 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 Physics B (Twenty First Century Science):

	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)	Larger/greater/bigger ✓	1	3.1a	
		(ii)	Less/smaller ✓	1	3.1a	
	(b)		Amplitude = 0.6 ÷ 2 ✓ = 0.3 (m) ✓ Wavelength = 0.25 (m) ✓	3	3.1a	
	(c)	(i)	Frequency = 5 ÷ 10 Hz ✓ = 0.5 (Hz) ✓	2	2.1	
		(ii)	**FIRST CHECK ANSWER ON ANSWER LINE.** **If answer = 0.125 m/s award 2 marks** = 0.5 Hz x 0.25 m ✓ = 0.125 m/s ✓	2	 2.1 2.1	**ECF** own frequency and wavelength

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	Gamma ✓ Infra-red ✓ Radio ✓	3	1.1	
		(ii)	Wavelength ✓	1	1.1	
	(b)			2	2.1	All correct = 2 marks 2 correct = 1 mark 1 or 0 correct = 0 marks

Question			Answer	Marks	AO element	Guidance
3	(a)		False ✓ True ✓	2	1.1	
	(b)		(3), 2, 5, 6, 4, (1)	4	1.1	One mark for each number in the correct place unless it is repeated. Repeated numbers do not score even if one is correct
	(c) *		*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 describes the nature of galaxies **AND** Links this to a description of red-shift and may link this to Hubble's observations **AND** Links this to the relationship between the distance of each galaxy and its speed as evidence of an expanding universe model *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 describes the nature of galaxies **AND** Links this to a description of red-shift **OR** refers to galaxies moving away from us without direct reference to red-shift **OR** Describes the relationship between the distance of a galaxy and its speed as evidence of an expanding universe model	6	1.1 x2 2.1 x4	**AO1.1: Nature of galaxies** For example: • Collection of stars • In vast numbers • All the stars in a galaxy are kept together by the gravity of all the other stars • Galaxies have red-shift **AO1.1**: Basic statement about the universe started in a Big Bang **AO2.1: Description of red-shift (linked to the nature of galaxies)** For example: • Red-shift means moving away • Bigger red-shift means moving faster • Further galaxies are moving away faster **AO2.1: Hubble's observations (linked to the nature of galaxies)** For example: • Galaxies are (well) outside the Milky Way • Further galaxies have greater red-shift **AO2.1: Evidence for expanding universe model (linked to galaxies and red-shift)** For example: • Must have all started at the same place at one particular time • Galaxies have been moving apart ever since

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 describes the nature of galaxies **AND** Makes reference to galaxies moving away from us without direct reference to red-shift **OR** Makes a basic statement about how the universe started in a Big Bang *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
4	(a)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 6.5 (kWh) award 3 marks** Convert 195 minutes in hours = 3.25 h ✓ 2.0 (kW) × 3.25 (h) = 6.5 (kWh) ✓	**3**	**1.2** **2.1** **2.1**	Correct substitution gains first 2 marks (if equation is missing)
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 8 – 9 (A) and therefore appliance A award 4 marks** Recalls Power = Voltage x Current ✓ Converts 2 kW to 2000 W ✓ Rearranges to I = P/V = 2000 / 230 ✓ Gets 8 – 9 A so appliance A has largest current ✓	**4**	**1.1** **2.1** **2.1** **3.2b**	Correct substitution gains first 2 marks (if equation is missing) Or applies *P* = *IV* to appliance B (to find *P*) Which is 276 – 288 W So 2 kW (appliance A) is greatest power and so greatest current
	(b)		Insulate the tank ✓ So less heat is lost through conduction over time ✓	**2**	**2.2**	Method stated Explain why energy loss is less e.g. not heat water until needed
	(c)		**FIRST CHECK ANSWER ON ANSWER LINE.** **If answer = £0.51 award 2 marks** 16p x 3.2 kWh = 51.2 p ✓ 51.2 p ÷ 100 = (£)0.51 ✓	**2**	**2.1** **3.2b**	

Question			Answer	Marks	AO element	Guidance
5	(a)		Steady speed (of 5 m/s) for 10 seconds/to start with ✓ Then decelerates (to rest) ✓ At a uniform rate ✓	3	3.1a	
	(b)		Attempts to find area under line ✓ Area under 1st 10 s = 50 m ✓ Last 10 s = triangle area = 25 m ✓ Total is rectangle + triangle = 75 (m) ✓	4	2.2 2.2 2.2 3.2b	 **ECF** own values for rectangle and triangle
	(c)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 4 (m/s) award 3 marks** Re-arrange equation to get Speed = acceleration x time✓ 0.4 x 10 ✓ = 4 (m/s) ✓	3	 1.2 2.1 2.1	Correct substitution gains first 2 marks (if equation is missing) Method is using $v=at$, evaluation = 4 (m/s) **ECF** own value of speed for second point
		(ii)	Line from (0,0) ✓ To (10,4) ✓ Line from top speed to (18,0) ✓	3	2.2	

Question			Answer	Marks	AO element	Guidance
6	(a)		A: the ground pushes the car upwards ✓ B: weight of the car ✓ C: engine/wheels push it forwards/provide driving force ✓ D: air resistance/drag/friction ✓	4	2.1	**ALLOW** 'gravity' or 'the Earth pulls it down' **ALLOW** reaction force
	(b)	(i)	C ✓	1	2.1	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 0.8 (m/s²) award 3 marks** Recall $F=ma$ and rearrange to find a ✓ $a = F \div m$ = 800 N/1000 kg ✓ = 0.8 (m/s²) ✓	3	 1.1 2.1 2.1	
		(iii)	**FIRST CHECK ANSWER ON ANSWER LINE.** **If answer = 664000 (J) award 2 marks** 830 m x 800 N ✓ = 664000 (J) ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
7	(a)		A: Nucleus ✓ B: Neutron ✓ C: Electron ✓	3	1.1	
	(b)		Alphas stopped by paper ✓ Betas penetrate paper but not Al sheet ✓ Gammas penetrate both ✓	2	1.2	Any two points (this will allow the third to be deduced)
	(c)		Can cause cancer / damage cells ✓ Make sure source is not directed towards body / is not ingested ✓	2	1.1 3.3a	**ALLOW** any hazard with relevant safety precaution

Question			Answer	Marks	AO element	Guidance
8*			*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)** Balanced explanation of both points of view linked to the risks / benefits. **AND** Judgement made as to the better argument. *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)** Explains at least one point in favour of nuclear power and one against. **AND** Makes a reasoned choice of Mia or Sundip as being right. *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)** States differences between renewable and non-renewable energy sources. **AND** Considers only one side of the argument.	**6**	**1.1 x3** **2.2 x1** **3.1b x1** **3.2b x1**	**AO1.1 Renewable vs. Non-renewable energy resources** For example: • Coal and oil are non – renewable so will run out • Nuclear is also non renewable • A renewable energy resource will not run out e.g. wind, wave, solar etc. **AO1.1 Nuclear energy hazards** **For example** • Ionising radiation can have hazardous effects, notably on human body tissue **AO2.2** Compare the ways in which the main energy resources are used to generate electricity **AO 3.1b Risk/benefit** • CO_2 contributes to global warming • nuclear waste could leak / enter the biosphere • risk small, but consequence serious • possibility of employment in new power station • which may bring money into the area • nuclear power stations don't produce CO_2 (once built) • coal / gas produce CO_2 • solar / wind / hydroelectric / tidal don't produce CO_2 • radioactive waste produced in nuclear power stations **AO3.2b** Judgement made as to the better argument

			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
9	(a)	(i)	Both points correctly plotted ✓ Smooth curve drawn ✓	2	1.2	
		(ii)	Power goes down with distance (non-uniformly) ✓	1	3.1a	**ALLOW** negative correlation correctly described
		(iii)	**FIRST CHECK ANSWER ON ANSWER LINE. If answer = 6 x 10^{-3} (A) award 4 marks.** Rearranges equation to give Current = power ÷ potential difference ✓ Converts mW to W = 0.072 W ✓ = 0.072 ÷ 12 ✓ = 6 x 10^{-3} A ✓ Or 6mA	4	 1.2 2.1 2.1 2.1	
		(iv)	**FIRST CHECK ANSWER ON ANSWER LINE. If answer = 2000 (Ω) award 3 marks.** Rearrange equation to give Resistance = Potential difference ÷ current ✓ 12v ÷ 6 x 10^{-3} A ✓ = 2000 (Ω)	3	 1.2 2.1 2.1	

Question			Answer	Marks	AO element	Guidance
	(b)		Lamp at fixed distance from photocell and read I and V ✓ Repeat reading at each distance ✓ Repeat for any outliers ✓ Take mean I and V for each distance ✓	4	3.3a 3.3b 3.3b 3.3a	
	(c)		Recognises that James's photocell is getting less light ✓ Suggested reason ✓	2	3.2a 3.2b	e.g. Beth was near a window (so more light) while James was in a dark corner; allow systematic mismeasurement of distance by one or the other if correctly justified e.g. the end of Beth's ruler wasn't near the actual lamp but some distance from it, so all her distances are too small **ALLOW** any situation where James would receive less light than Beth

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