

Foundation

GCSE

Physics B Twenty First Century Science

J259/01: Breadth in physics (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2025

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

© OCR 2025

MARKING INSTRUCTIONS**PREPARATION FOR MARKING****RM ASSESSOR**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM 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 available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

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 RM Assessor 50% and 100% (traditional 40% 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 RM Assessor messaging system.

5. Crossed-Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple-Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

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 the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.
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 is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **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.**
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.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
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

13. 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:

	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.

[illegible]

Question			Answer	Marks	AO Element	Guidance
2	(a)		Thermal ✓	1	1.1	Fourth box ticked.
	(b)	(i)	2000 W ✓	1	1.1	Bottom box ticked.
		(ii)	more ✓ energy ✓	2	2.1	
	(c)		constant ✓ closed ✓	2	2.1	
	(d)		3.0 kWh = 1.5 kW × 2 h ✓	1	2.2	Top box ticked.
	(e)	(i)	thermal ✓ radiation ✓	2	2.1	
		(ii)	First check the answer on the answer line. If answer = 10 award 2 marks. Comparison of power between Lamp and another device e.g. Fan has 10× the power of the lamp. ✓ So time of use (must be 10× as much) = 10 (hours) ✓ OR Select equation power = energy transferred ÷ time OR time = energy ÷ power OR 0.5 ÷ 0.05 ✓ (Calculate time for lamp = 0.5 kWh ÷ 0.05 kW =) 10 (hours) ✓	2	3.1b	If nothing is written on the answer line check the table for a response. ALLOW 0.5 ÷ 50 (W) for first mark.

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	A ✓	1	1.1	
		(ii)	C ✓	1	1.1	
		(iii)	Period ✓	1	1.1	Second box ticked.
	(b)	(i)	Damage to eye / retina (from light reflecting into eye) ✓	1	3.3a	ALLOW cause blindness, damage to sight. IGNORE damage to skin or other parts of the body. IGNORE dangerous (too vague).
		(ii)	First check the answer on the answer line. If answer = 39 award 2 marks $(39 + 40 + 38) \div 3$ ✓ $= 39$ ✓	2	2.2	If nothing is written on the answer line check the table for a response. IGNORE calculation of the mean of the three numbers in the last column (34.5)
		(iii)	60° (or value very close to 60°) ✓ The angle of incidence is equal to / very close to the angle of reflection ✓	2	3.2b	ALLOW answer which rounds to 60 to 1sf. ALLOW the same or approximately equal ALLOW every time the angle of incidence goes up (by 10) the angle of reflection goes up (by about 10).

Question			Answer	Marks	AO element	Guidance
	(c)		First check the answer on the answer line. If answer = 4×10^{14} award 3 marks. $3 \times 10^8 \div 750 \times 10^{-9} \checkmark$ $= 4 \times 10^{14}$ OR 4000000000000000 $\checkmark$ Final answer written in standard form. $\checkmark$ 4×10^{14} (Hz).	3	2 × 2.2 1.2	ALLOW 4×10^n or 4 with any number of zeros for first mark as evidence of correct division. Power must be correct for second mark point. ALLOW 1 mark for clear evidence of an incorrectly calculated answer correctly converted to standard form. Some working <u>must</u> be shown. An answer on the answer line in the form 4×10^n where $n \neq 14$ AND working is clearly shown gets 2 marks.

Question			Answer	Marks	AO element	Guidance
4	(a)		A magnet ✓	1	2.1	Third box ticked.
	(b)	(i)	 ✓	1	1.1	ALLOW correct symbol drawn on the circuit diagram on any of the connecting wires. DO NOT ALLOW symbol drawn on top of another component or junction in the circuit.
		(ii)	5 V ✓	1	1.2	
		(iii)	current ✓ open ✓	2	1.1	
	(c)	(i)	Straight (by eye) LOBF drawn ✓	1	2.2	Line should go through all the plots (and through the origin) with a tolerance of $\pm$ half a small square in either x- or y-direction. Line should not be thicker than half a small square and should be straight.
		(ii)	1000 ± 10 (rpm) ✓	1	2.2	ALLOW ECF. If the answer on the line is not 1000 ± 10 read off their line at 5V. Value should be correct to $\pm$ half a small square.
	(d)	(i)	First check the answer on the answer line. If answer = 600 (C) award 2 marks (charge =) 0.5×1200 ✓ = 600 (C) ✓	2	2.2	

Question			Answer	Marks	AO element	Guidance
4	(d)	(ii)	Current ✓	1	1.2	Second box ticked.
		(iii)	FIRST CHECK THE ON ANSWER LINE If answer = 10 award 4 marks If answer = 10000 award 3 marks Select Energy transferred = charge $\times$ potential difference ✓ OR $E = QV$ Substitution ($E =$) 2000×5 ✓ Answer ($E =$) 10 000 (J) ✓ Conversion to kJ = 10 (kJ) ✓	4	1.1 2 $\times$ 2.2 1.2	ALLOW potential difference = work done (energy transferred) $\div$ charge ALLOW any calculated value for energy clearly seen, converted correctly to kJ for final mark. ALLOW 2000 C converted to 2 kC

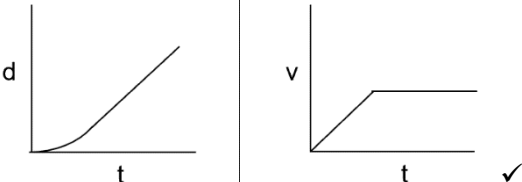
Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	9 particles similar in size to particles in liquid further apart than in the liquid ✓ Randomly arranged / not lined up ✓	2	1.1	ALLOW 8 or 10 similarly sized particles. DO NOT ALLOW 3 or fewer particles (cannot assess randomness).
		(ii)	First check the answer on the answer line. If answer = 1.5 (g/cm³) award 3 marks Select: Density = mass ÷ volume ✓ (Substitute: Density =) 0.45 ÷ 0.3 ✓ (Answer: Density) = 1.5 (g/cm ³) ✓	3	1.1 2 × 2.2	
		(iii)	Any two from: Statement about the (relative) distance between particles in liquid and gas, e.g. particles are close(r) together (in liquid) AW ✓ (Liquid) has more particles / matter / mass in the same volume / space OR the same mass occupies less volume as a liquid ORA, AW ✓ Correct calculation of gas density 0.45 ÷ 4 = 0.1125 (g/cm ³) ✓	2	3.2a	IGNORE random arrangement OR movement of particles

Question			Answer			Marks	AO element	Guidance										
5	(b)		First check the answer on the answer line. If answer = 90 award 3 marks Selection/use of: (Energy to change state) = mass $\times$ specific latent heat ✓ Substitution: (Energy)= 200 000 $\times$ 0.00045 ✓ Answer: Energy = 90 (J). ✓			3	1.1 2 $\times$ 2.2											
	(c)		<table><tr><td></td><td>True</td><td>False</td></tr><tr><td>The change of state is a chemical change.</td><td></td><td>✓</td></tr><tr><td>The liquid and the gas are two different substances.</td><td></td><td>✓</td></tr><tr><td>The mass of the liquid is the same as the mass of the gas.</td><td>✓</td><td></td></tr></table>		True	False	The change of state is a chemical change.		✓	The liquid and the gas are two different substances.		✓	The mass of the liquid is the same as the mass of the gas.	✓		2	1.1	2 correct = 1 mark 3 correct = 2 mark
	True	False																
The change of state is a chemical change.		✓																
The liquid and the gas are two different substances.		✓																
The mass of the liquid is the same as the mass of the gas.	✓																	

Question			Answer	Marks	AO element	.
6	(a)	(i)	The number of undecayed nuclei decreases. ✓	1	1.1	Third box ticked.
		(ii)	2000 ± 100 ✓	1	2.2	If the answer line is blank, check the graph for a marked value.
		(iii)	First check the answer on the answer line. If answer = 1600 ± 50 award 2 marks Pairs of read-offs from the graph showing halving the activity e.g. (6000 cps at 0 years and) 3000 cps at 1600 years ✓ Half-life calculated by subtracting the two values of years = 1600 ✓	2	2.2	ALLOW Other pairs of read-offs with activity halving to within ± half a square. e.g. 5000 cps at 400 years and 2500 cps at 2000 years, 4000 cps at 920 years and 2000 cps at 2530 years, etc ALLOW lines drawn on graph for first mark point.
		(iv)	The nuclei decay (very) slowly OR the half-life is long OR not many nuclei decay (in 100 years) OR activity drops by a small amount (in 100 years) OR the activity is still high ✓ Quantitative comparison of data: ✓ a drop of 200 cps is very small compared to 6000, or it only drops by about 3% AW OR 100 years is only a small proportion / about 6% of the half-life AW	2	3.2a	First mark is for a general statement but not repeating the question stem. DO NOT ALLOW half-life changes.
	(b)	(i)	undecayed ✓ contaminated ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
		(ii)	[To lower the risk from alpha radiation] Any one from: • Wear gloves ✓ • Use tongs ✓ • Stay a few cm away ✓ • Use a glove box ✓ [To lower the risk from gamma radiation] Any one from: • Stay much further away / far away ✓ • Use lead-glass screen ✓ • Wear lead-gloves / lead-apron ✓	2	1.1	DO NOT ALLOW the same answer for both types of radiation. Award 1 mark for saying the same thing twice. ALLOW stay (further) away without any detail for one answer only. DO NOT ALLOW stand in another room, store in lead lined box. IGNORE protective clothing, goggles for either answer. ALLOW any other sensible suggestion that would protect from alpha radiation, e.g. no physical contact, don't breathe close to it. ALLOW any other sensible suggestion that would protect from gamma radiation. ALLOW place lead in the way (to credit the knowledge, even though it obscures view) If no other marks awarded ALLOW one mark (max) for describing a precaution for gamma as a precaution for alpha.

Question			Answer	Marks	AO element	Guidance
7	(a)		Gravitational (force). ✓	1	1.1	ALLOW Gravity IGNORE field strength DO NOT ALLOW gravitational energy
	(b)	(i)	Every force has a reaction force equal in size and opposite in direction. ✓	1	1.1	Second box ticked.
		(ii)	Any two from: The thruster exerts a force on the gas ✓ The gas exerts a (opposite) force on the satellite / thruster ✓ Force causes an acceleration / increase in speed ✓ The gas and the thruster / satellite are moving in opposite directions ✓	2	1.1	If a candidate uses 'it', we need to be clear what 'it' is referring to.
	(c)		Acceleration: Data includes change in speed and time OR acceleration = change in speed ÷ time ✓ Force: <u>mass</u> data is needed (e.g. for $F = ma$) AW ✓	2	3.1a	ALLOW correct calculation of acceleration $40000 \div 2 \times 10^{-16}$ OR 2×10^{20} . DO NOT ALLOW incorrect equations e.g. change in speed $\times$ time, (final) speed ÷ time.

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	First check the answer on the answer line. If answer = 2000 award 2 marks Measurement of both AB (4cm) and AC (10cm) seen / ratio of two measured lengths seen ✓ 2000 m ✓	2	1 × 1.2 1 × 2.2	ALLOW 4 ± 0.2 (cm) and 10 ± 0.2 (cm) ALLOW final answer from 2370 to 1670
		(ii)	First check the answer on the answer line. If answer = 1.1(111...) award 3 marks time $30 \times 60 = 1800$ s ✓ their distance (ECF) ÷ time e.g. $2000 / 1800$ ✓ = 1.1 (m/s) ✓	3	1.1 2 × 2.2	ALLOW substitution seen of unconverted time (30) or incorrect time as a denominator = 1 mark Max. DO NOT ALLOW final mark from unconverted or incorrect time. ALLOW answer to 1SF only if working or unrounded value shown.
	(b)			1	2.1	Third box ticked.

Question			Answer	Marks	AO element	Guidance
	(c)		First check the answer on the answer line. If answer = 0.05 award 3 marks Gradient method recalled or attempted (e.g. triangle drawn) ✓ Correct read-offs from the line used to calculate gradient ✓ e.g. $(1.2 - 0.8) \div 8$ OR $(1.1 - 0.9) \div (6 - 2)$ OR $0.4 \div 8$ = 0.050 (m/s²) ✓	3	1.1 2 × 2.2	ALLOW correct equation seen e.g. $(v-u)/t = a$ or any $\Delta v \div \Delta t$ for 1st marking point. DO NOT ALLOW speed ÷ time ALLOW mark point 1 also if gradient calculation shown. Read-offs should be correct to ± half a square. ALLOW answer in range 0.045 to 0.055.
	(d)		12 m/s ✓	1	1.1	Second box ticked.

Question			Answer	Marks	AO element	Guidance
9	(a)		unstable ✓ fission ✓	2	1.1	
	(b)	(i)	Any one from: Neutrons add mass / make it heavier (when captured) ✓ Fermi was famous ✓ Fermi had experimental data / evidence ✓ (Noddack) had little or no evidence / no experimental data ✓ Idea related to the historical views or status of female scientists in early 20th century ✓	1	2.1	DO NOT ALLOW Fermi confirmed nuclei could be split. IGNORE conservation of mass or energy
		(ii)	(in 1939) there was new / more evidence / idea that Fermi's experiment was shown to be repeatable AW ✓ AND Any one from: (Specific evidence:) - barium is lighter than uranium ✓ (Hahn's results) identified barium / a lighter nucleus as a product ✓ - Meitner's calculation / confirmation that energy is conserved ✓	2	3.1b	IGNORE science evolves / more theories / peer review. ALLOW more experiments were carried out to prove / test the theory e.g. Haan did experiments. ALLOW atoms or particles as AW for nuclei. ALLOW Barium not present before. IGNORE just energy is conserved i.e. it was the calculation that increased confidence in the theory not the statement.

Question			Answer	Marks	AO element	Guidance
	(c)		The neutrons released are absorbed by other uranium nuclei. ✓	1	1.1	First box ticked.
	(d)		As kinetic energy of the new particles. ✓ By emission of ionising radiation. ✓	2	1.1	First box ticked. Last box ticked.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit



ocr.org.uk/qualifications/resource-finder



ocr.org.uk



Twitter/ocrextams



/ocrextams



/company/ocr



/ocrextams



CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2025 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

Registered company number 3484466. OCR is an exempt charity.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please [contact us](#).

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our [Expression of Interest form](#).

Please [get in touch](#) if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.