

OCR

Oxford Cambridge and RSA

Year 10 Test

GCSE (9–1) Physics (Gateway)

J250/05/11 Physics

MARK SCHEME

Duration: 1 hour 10 minutes

MAXIMUM MARK 60

This document consists of 18 pages

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 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 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. *(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 a tick to confirm that the work has been seen.
7. Award No Response (NR) if:
 - there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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.**

If you have any questions or comments for your Team Leader, use the phone, the RM Assessor 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 **12** and **16**.

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
<u>—</u>	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.

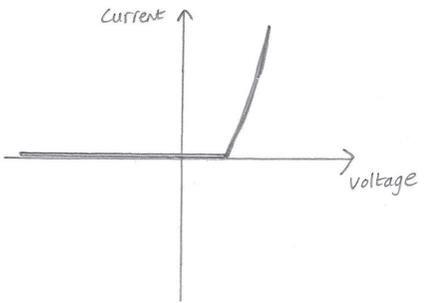
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New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

	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			B ✓	1	1.1	
2			C ✓	1	2.1	
3			D ✓	1	2.1	
4			A ✓	1	1.1	
5			D ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	Cells are facing each other / cells cancel each other out / AW ✓ Voltmeter is in series / voltmeter is not parallel with the (unknown) component ✓	2	2.2 x2	ALLOW batteries for cells ALLOW incorrect aspects indicated/circled on the diagram
		(ii)	Any one from: Turn one of the cells around / make the cells face in the same direction / AW ✓ Move the voltmeter to be in parallel with the (unknown) component / AW ✓	1	3.3a	DO NOT ALLOW batteries for cells
	(b)	(i)	Current only flows in one direction / current only flows when the potential difference is positive or above 0.5V / no current flows when the potential difference is negative ✓	1	3.1a	ALLOW higher level answers in terms of no current flows until the threshold voltage is reached
		(ii)	The component is a diode/LED ✓	1	3.2a	
		(iii)	Horizontal line along x-axis until a positive voltage ✓ Line gradient increases sharply (after the threshold voltage) ✓	2	2.2 x2	For example: 
		(iv)	FIRST CHECK THE ANSWERS ON ANSWER LINES If answers = 6.7 (Ω) and 2.7 (Ω) award 2 marks Correct numerical values of 6.7 and 2.7 ✓✓	2	2x 2.1	ALLOW unrounded values

Question			Answer	Marks	AO element	Guidance
		(v)	as the voltage increases the resistance decreases / AW ✓	1	3.2b	

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answers = 3400 (J) award 2 marks</p> <p>0.1 x 34 000 ✓ 3400 (J) ✓</p>	2	2.1 x2	
		(ii)	<p>Any two from: Insulate the funnel ✓ Complete with heater off and minus this from the result of the experiment/AW ✓ Cover the top of the funnel ✓ Improve contact of the heater to the ice/use smaller pieces of ice/keep topping up the ice so the heater is always covered ✓ Run the experiment for a shorter time (so that a smaller amount of ice is melted to reduce errors with contact of ice and heater) ✓ Run the experiment for a longer time (so that errors associated with the delay of heater transfer from the heater to the ice are reduced) ✓</p>	2	3.3b x2	
	(b)		<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answers = 8400 (J) award 2 marks</p> <p>0.1 x 4200 x 20 ✓ 8400 (J) ✓</p>	2	2.1 x2	

Question		Answer	Marks	AO element	Guidance
8	(a*)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Comparison of both materials with some quantitative analysis AND Provides a clear explanation of how this information is obtained from the graph. <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) Correct description of both materials OR quantitative description of one of the materials AND Some explanation of how this information is obtained from the graph <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) Any correct quantitative description OR Any correct qualitative description OR Any correct explanation of how the graph provides this information <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>	6	1.2 x2 2.2 x2 3.1a x2	<p>AO1.2 Explanation of the shape of the graph. For example</p> <ul style="list-style-type: none"> Elastic regions are linear Plastic deformation occurs when or after the elastic limit is reached. This is shown by a reduction in gradient on the graph. <p>AO2.2 Comparing the materials quantitatively For example</p> <ul style="list-style-type: none"> The spring constant for material A is 300 N/kg The spring constant for material B is 125 N/kg The work done before the elastic limit is reached is 0.015J for material A The work done before the elastic limit is reached is 0.10J for material B <p>AO3.1a Interpreting the information from the graph For example</p> <ul style="list-style-type: none"> Material A has a smaller elastic region The elastic region of material A ends at 3N Material B has a larger elastic region The elastic region of material B ends at 5N Both materials have an elastic region before undergoing plastic deformation Both materials undergo plastic deformation before breaking More work is done before material B undergoes plastic deformation Material A has a larger spring constant

Question			Answer	Marks	AO element	Guidance
			0 marks <i>No response or no response worthy of credit.</i>			
	(b)	(i)	It is greater for more massive objects/depends on mass ✓ It is greater for objects closer together/depends on distance apart ✓	2	1.1 x2	
		(ii)	Any one from: weight = mass x gravitational field strength ✓ weight is the product of mass and gravitational field strength ✓ weight is the force on a mass due to the gravitational field strength ✓	1	1.1	ALLOW $W=mg$ ✓

Question			Answer	Marks	AO element	Guidance
9			D ✓	1	1.1	
10			B ✓	1	2.1	
11			B ✓	1	2.1	
12			C ✓	1	2.1	
13			A ✓	1	2.2	

Question		Answer	Marks	AO element	Guidance
14	(a)	Both points correctly plotted ✓ Correct line of best fit drawn ✓	2	2.2x2	
	(b)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 300 (m) award 3 marks 10 x 10.0 = 100 (m) ✓ $\frac{1}{2} \times 40 \times 10.0 = 200$ (m) ✓ 100 + 200 = 300 (m) ✓	3	2.1 2.1 1.2	Credit possible ecf from Qu 14a(i).
	(c)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.25 (m/s²) award 2 marks (10-0) ÷ 40 ✓ 0.25 ✓ m/s/s OR m/s ² OR ms ⁻² ✓	3	2.1 1.2 1.1	ALLOW -10 ÷ 40 ALLOW -0.25 for 2 marks

Question	Answer	Marks	AO element	Guidance
15 (*)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) A clear and detailed experimental procedure is given with some justification. AND Some consideration of minimising errors to increase accuracy/processing data. <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 detailed description of an experimental procedure is given. OR A simple description is given with some consideration of minimising errors to increase accuracy or processing data. <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 simple description of a suitable experimental procedure is given. <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 <i>No response or no response worthy of credit.</i></p>	6	1.2 x3 2.2 x3	<p>AO1.2 Identification of equipment and simple procedures</p> <ul style="list-style-type: none"> • Use an LDR, lamp, ruler and ohm-meter • Move the LDR different distances from the lamp • Measure distance and resistance <p>AO2.2 Accurate and detailed experimental procedure and processing of results.</p> <ul style="list-style-type: none"> • Move lamp at 10cm (or any sensible value) intervals from the LDR • Measure resistance using a multi-meter (set to ohms) • Measure the distance using a ruler • Always keep the LDR parallel with the lamp • Minimise external light sources / complete in a darkened room • Repeat experiment and calculate a mean in order to avoid anomalies/random error • Plot a graph of resistance versus distance • Hypothesis will be proved if there is a trend/pattern shown by the graph • If the resistance increases with distance, then the LDR resistance increases with decreasing light levels • If the resistance decreases with distance, then the LDR resistance decreases with decreasing light levels

Question		Answer	Marks	AO element	Guidance
16	(a)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2000 (J) award 2 marks</p> <p>$500 \times (20 \times 0.2) \checkmark$ $2000 \text{ (J)} \checkmark$</p>	2	2.1 x2	ALLOW 200 000 \checkmark (ie. $500 \times 20 \times 20$)
	(b)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 67 (W) award 3 marks</p> <p>power = work done \div time \checkmark $2000 \div 30 \checkmark$ $67 \text{ (W)} \checkmark$</p>	3	1.1 2.1 x2	ALLOW ECF ALLOW 66.7 for 2 marks
	(c)	60 seconds / twice the time / AW \checkmark	1	2.2	ALLOW ECF

Question		Answer	Marks	AO element	Guidance
17	(a)	1.5 ✓	1	1.2	
	(b)	<p>Any two from: The (mean) time taken to fall through A is greater than B or C ✓ The (mean) time taken to fall through B and C is (nearly) the same ✓ The total time of fall for each attempt for B is very accurate / consistent /AW ✓ The total time of fall for attempt A is NOT very accurate or consistent /AW ✓</p> <p>Any one from: The speed/velocity increases through A ✓ Terminal speed/velocity is reached for B and C ✓</p>	3	<p>2x3.1a</p> <p>1x3.2b</p>	ALLOW precise
	(c)	<p>Any one from: Use a larger measuring cylinder with bigger distances for A, B and C / AW ✓</p> <p>Use a light gate ✓</p> <p>Video the ball falling (with a stop-clock/AW) in view and use this to determine the exact times ✓</p>	1	3.3b	ALLOW other practical ways of timing more precisely