

# Foundation

**GCSE**

**Physics A Gateway**

**J249/01: Paper 1 (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.

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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.

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**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.**

Level of response question on this paper is **19**.

## 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                                      |
| <b>DO NOT ALLOW</b> | Answers which are not worthy of credit                        |
| <b>IGNORE</b>       | Statements which are irrelevant                               |
| <b>ALLOW</b>        | Answers that can be accepted                                  |
| ( )                 | Words which are not essential to gain credit                  |
| —                   | Underlined words must be present in answer to score a mark    |
| <b>ECF</b>          | Error carried forward                                         |
| <b>AW</b>           | Alternative wording                                           |
| <b>ORA</b>          | 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 A:

|              | <b>Assessment Objective</b>                                                                                                                           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AO1</b>   | <b>Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.</b>                                          |
| AO1.1        | Demonstrate knowledge and understanding of scientific ideas.                                                                                          |
| AO1.2        | Demonstrate knowledge and understanding of scientific techniques and procedures.                                                                      |
| <b>AO2</b>   | <b>Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.</b>                                       |
| AO2.1        | Apply knowledge and understanding of scientific ideas.                                                                                                |
| AO2.2        | Apply knowledge and understanding of scientific enquiry, techniques and procedures.                                                                   |
| <b>AO3</b>   | <b>Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.</b> |
| <b>AO3.1</b> | Analyse information and ideas to interpret and evaluate.                                                                                              |
| AO3.1a       | Analyse information and ideas to interpret.                                                                                                           |
| AO3.1b       | Analyse information and ideas to evaluate.                                                                                                            |
| <b>AO3.2</b> | 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.                                                                                                    |
| <b>AO3.3</b> | 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.                                                                                     |

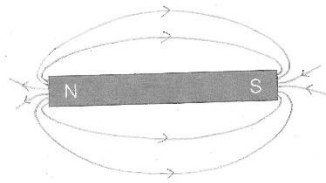
For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

| Question | Answer | Marks | AO element | Guidance                                                                                                 |
|----------|--------|-------|------------|----------------------------------------------------------------------------------------------------------|
| 1        | A      | 1     | 1.2        |                                                                                                          |
| 2        | C      | 1     | 1.1        |                                                                                                          |
| 3        | D      | 1     | 1.1        |                                                                                                          |
| 4        | C      | 1     | 1.1        |                                                                                                          |
| 5        | D      | 1     | 1.1        |                                                                                                          |
| 6        | B      | 1     | 2.1        | A: $250 \div 50$<br>B: $(50 \div 1000) \times 250$<br>C: $250 \div (50 \div 1000)$<br>D: $50 \times 250$ |
| 7        | D      | 1     | 1.1        |                                                                                                          |
| 8        | B      | 1     | 1.1        |                                                                                                          |
| 9        | B      | 1     | 1.1        |                                                                                                          |
| 10       | A      | 1     | 2.2        | A: $28 \div 4$<br>B: $30 \div 4$<br>C: $4 \times 28 \div 2$<br>D: $4 \times 28$                          |
| 11       | C      | 1     | 1.1        |                                                                                                          |
| 12       | B      | 1     | 2.1        |                                                                                                          |

| Question | Answer | Marks | AO element | Guidance                                                                                                                                                                     |
|----------|--------|-------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13       | D      | 1     | 2.2        | A: $450 \div 300$<br>B: $300 \times 3.0 \div 450$<br>C: same distance as Child A<br>D: $450 \times 3.0 \div 300$                                                             |
| 14       | C      | 1     | 2.2        |                                                                                                                                                                              |
| 15       | C      | 1     | 2.1        | A: $334000 \times 10.0 \div 10^6$ (wrong units)<br>B: $334000 \div 10.0 \div 10^3$<br>C: $334000 \times 10.0 \div 10^6$<br>D: $334000 \div 10.0 \div 10^3$ (and wrong units) |

| Question |     |     | Answer    | Marks | AO element | Guidance                                           |
|----------|-----|-----|-----------|-------|------------|----------------------------------------------------|
| 16       | (a) | (i) | <p>✓✓</p> | 2     | 2 × 1.1    | 1 mark for 1 or 2 correct<br>2 marks for 3 correct |
|          | (b) |     | Gas ✓     | 1     | 1.1        |                                                    |
|          | (c) |     | Gas ✓     | 1     | 1.1        |                                                    |
|          | (d) |     | Solid ✓   | 1     | 1.1        |                                                    |

| Question |     |      | Answer                                                        | Marks | AO element               | Guidance                                                                                                                                                                        |
|----------|-----|------|---------------------------------------------------------------|-------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (e) | (i)  | stays the same ✓<br>decreases ✓<br>decreases ✓<br>decreases ✓ | 4     | 1.1<br>2.1<br>2.1<br>2.1 |                                                                                                                                                                                 |
|          | (e) | (ii) | It becomes crushed / its volume decreases / AW ✓              | 1     | 3.2b                     | <b>ALLOW</b> (it) collapses (in on itself) / compress(ed) / shrink / shrivel up / scrunch up / implode<br><b>IGNORE</b> deforms/changes<br><b>DO NOT ALLOW</b> it breaks/bursts |

| Question |     |       | Answer                                                                                                                                                                                                                       | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17       | (a) |       | <p>A minimum of 2 lines drawn correctly between N and S of the magnet ✓</p> <p>A minimum of 4 lines drawn correctly between N and S of the magnet ✓</p> <p>Correct direction drawn on (some of) the N to S field lines ✓</p> | 3     | 3 × 1.2    | <p><b>Lines must be on both sides of the magnet</b></p> <p>e.g.</p>  <p><b>IGNORE</b> lines that originate from between the letter N and the letter S.</p> <p><b>DO NOT ALLOW</b> crossing N-S lines</p> <p><b>DO NOT ALLOW</b> any arrows drawn in the wrong direction</p> <p><b>IGNORE</b> any lines drawn inside the magnet.</p> |
|          | (b) | (i)   | <p><b>Any one from:</b></p> <p>It is not magnetic <b>ORA</b> ✓</p> <p>It would not interfere with the experiment <b>ORA</b> ✓</p> <p>It would not attract the magnet <b>ORA</b> ✓</p>                                        | 1     | 3.3a       | <p><b>ALLOW</b> not pulled towards stand / not aligned with stand.</p> <p><b>IGNORE</b> not stuck to the stand</p>                                                                                                                                                                                                                                                                                                     |
|          |     | (ii)  | North-south ✓                                                                                                                                                                                                                | 1     | 1.2        |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          |     | (iii) | It lines up with the Earth's magnetic field ✓                                                                                                                                                                                | 1     | 1.1        |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | (c) | (i)   | Induced ✓                                                                                                                                                                                                                    | 1     | 2.2        |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          |     | (ii)  | <p>(Paperclip has been placed) in the magnetic field (of the bar magnet) ✓</p> <p><b>OR</b></p> <p>When paperclip is removed from the magnetic field of the bar magnet, its magnetism (appears to be) lost ✓</p>             | 1     | 2.2        | <p><b>ALLOW</b> in contact with magnet for in magnetic field</p> <p><b>ALLOW</b> paperclip is magnetised by the magnet</p> <p><b>ALLOW ECF</b> for permanent box ticked in (c)(i) e.g. steel does not lose its magnetism when removed from a magnetic field.</p> <p><b>DO NOT ALLOW ECF</b> for solenoid box ticked in (c)(i)</p>                                                                                      |

| Question |     |  | Answer                                                                                                                                                                                                                       | Marks | AO element | Guidance                                                                                                                                                                                                                                                   |
|----------|-----|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18       | (a) |  | <p>Bohr</p> <p>Rutherford</p> <p>Thomson</p> <p>developed the plum pudding model of the atom</p> <p>discovered electrons can only move in fixed orbits called shells</p> <p>fired alpha particles at gold foil</p> <p>✓✓</p> | 2     | 2 × 1.1    | <b>ALLOW</b> 1 mark for 1 or 2 correct                                                                                                                                                                                                                     |
|          | (b) |  | <p><b>Any one from:</b></p> <p>More/new information ✓</p> <p>Peer review/Checks from other scientists ✓</p>                                                                                                                  | 1     | 3.1b       | <b>ALLOW</b> technology advances / make the model more accurate / better equipment / correcting mistakes in the model / have a better model / have more knowledge / scientific research gets better / older models have limitations <b>or</b> a new theory |
|          | (c) |  | <p>A ✓</p> <p>B ✓</p>                                                                                                                                                                                                        | 2     | 2 × 1.1    |                                                                                                                                                                                                                                                            |
|          | (d) |  | <p>positively charged ✓</p> <p>negatively charged ✓</p>                                                                                                                                                                      | 2     | 2 × 1.1    |                                                                                                                                                                                                                                                            |

|  |     |                                                                                                                                                                                                                                                |          |                                  |                                                                               |
|--|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|-------------------------------------------------------------------------------|
|  | (e) | <p><b>First check the answer on the answer line</b><br/> <b>If answer = <math>5 \times 10^{-9}</math> (m) award 2 marks</b></p> <p>Length = <math>50 \times 1 \times 10^{-10}</math> ✓</p> <p>Length = <math>5 \times 10^{-9}</math> (m) ✓</p> | <b>2</b> | <b><math>2 \times 2.1</math></b> | <b>ALLOW</b> 0.000 000 005 / $50 \times 10^{-10}$ / $0.5 \times 10^{-8}$ etc. |
|--|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|-------------------------------------------------------------------------------|

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks | AO element                     | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19       | <p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><b>Level 3 (5–6 marks)</b></p> <p>Detailed description <b>AND</b> analysis of the journey (including suitable correct calculations)</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><b>Level 2 (3–4 marks)</b></p> <p>Clear description <b>AND</b> analysis of the journey (including calculations)</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><b>Level 1 (1–2 marks)</b></p> <p>Basic description <b>AND</b> analysis of the journey (including an attempt at a calculation)</p> <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><b>0 marks</b></p> <p><i>No response or no response worthy of credit.</i></p> | 6     | 2 × 3.1a<br>2 × 2.2<br>2 × 2.1 | <p><b>A2.1: Description of the journey.</b></p> <p>For example</p> <ul style="list-style-type: none"> <li>as the time increases the distance increases</li> <li>the distance increases (steadily) at first</li> <li>the distance remains the same in the middle section</li> <li>there is no change in distance in the middle section</li> <li>the distance increases (steadily) in the final section</li> </ul> <p><b>AO3.1a: Analysis of the journey.</b></p> <p>For example</p> <ul style="list-style-type: none"> <li>The student has a constant speed/velocity for the first 40 seconds</li> <li>The student moves 200m in the first 40 seconds</li> <li>The student remains stationary/does not move for the next 60 seconds (between 40 and 100 seconds)</li> <li>The student has a constant speed/velocity for the final 40 seconds (between 100 and 140 seconds)</li> <li>The student moves 200m in the first 40 seconds</li> <li>The speed/velocity in the first 40 seconds is the same as the speed/velocity in the final 40 seconds</li> <li>The overall distance travelled is 400m</li> <li>The first and last sections were the same speed</li> </ul> <p><b>AO 2.2: Calculations</b></p> |

| Question |  |  | Answer | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|--|--|--------|-------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |  |  |        |       |            | <p>For example</p> <ul style="list-style-type: none"> <li>• The speed/velocity of the student in the first 40 seconds is 5 m/s</li> <li>• The speed/velocity of the student between 40 and 100 seconds is 0 m/s</li> <li>• The speed velocity of the student in the final 40 seconds (between 100 and 140 seconds) is 5 m/s</li> <li>• The average speed of the journey is 2.9 m/s</li> </ul> |

| Question |     |     | Answer                                                                                                                                                                                                                                                                                 | Marks | AO element            | Guidance                                                                                                                                                                                                                                                                                                |
|----------|-----|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20       | (a) |     | <p>Rubber band may snap/fly off (and hit someone on the face/eyes) ✓</p> <p>Wear safety goggles/glasses / don't add too many weights ✓</p> <p><b>OR</b></p> <p>Weights may fall and damage feet ✓</p> <p>Suspend above the desk / keep feet away from area / wear (robust) shoes ✓</p> | 2     | 2 × 3.3a              | <p><b>ALLOW</b> fail/break/split etc. for snap</p> <p><b>ALLOW</b> wear eye protection</p> <p><b>ALLOW</b> suitable method for stopping elastic band flying off e.g. clamp it. / <b>AW</b></p> <p><b>IGNORE</b> thicker elastic band</p> <p><b>ALLOW</b> something to catch the weights / <b>AW</b></p> |
|          | (b) |     | 9.0 (cm) ✓                                                                                                                                                                                                                                                                             | 1     | 2.1                   | <b>ALLOW</b> 9 (cm)                                                                                                                                                                                                                                                                                     |
|          | (c) |     | <p>False</p> <p>False</p> <p>True</p> <p>✓✓</p>                                                                                                                                                                                                                                        | 2     | 2 × 3.2a              | <p>2 correct award one mark</p> <p>3 correct award two marks</p>                                                                                                                                                                                                                                        |
|          | (d) | (i) | <p><b>First check the answer on the answer line</b></p> <p><b>If answer = 0.81 (J) award 2 marks</b></p> <p><math>(E = \frac{1}{2} ke^2)</math></p> <p><math>E = \frac{1}{2} \times 50 \times 0.18^2</math> ✓</p> <p><math>E = 0.81(J)</math> ✓</p>                                    | 2     | <p>2.1</p> <p>2.1</p> |                                                                                                                                                                                                                                                                                                         |

| Question |  |      | Answer                                                                                                                                                                                                      | Marks | AO element                           | Guidance                                                                                                                                           |
|----------|--|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
|          |  | (ii) | <b>First check the answer on the answer line</b><br><b>If answer = 8.6 (N) award 4 marks</b><br><br>$F = ke$ ✓<br><br>$F = 48 \times 0.18$ ✓<br><br>$E = 8.64 \text{ (N)}$ ✓<br><br>$E = 8.6 \text{ (N)}$ ✓ | 4     | 1.1<br><br>2.1<br><br>2.1<br><br>1.1 | <b>ALLOW</b> force = spring constant x extension<br><br><br><br><br><br><b>ALLOW</b> clear evidence of correct rounding of incorrect answer to 2sf |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                             | Marks | AO element                                  | Guidance                                                                                                                                                                                                                                                                                 |
|----------|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21       | (a) | (i)  | <p><b>First check the answer on the answer line</b><br/> <b>If answer = 450 (kg) award 4 marks</b></p> <p><math>(W = mg)</math></p> <p><math>m = W / g \checkmark</math></p> <p><math>g = 10 \text{ (N/kg)} \checkmark</math></p> <p><math>m = 4500 / 10 \checkmark</math></p> <p><math>m = 450 \text{ (kg)} \checkmark</math></p> | 4     | <p>1.2</p> <p>1.1</p> <p>2.1</p> <p>2.1</p> | <p>45000 kg scores 1 mark (incorrect use of g)</p> <p><b>ALLOW</b> mass = gravitational force / gravitational field strength</p> <p><b>ALLOW</b> 9.8 or 9.81</p> <p><b>ALLOW</b> 4500 = mass x 10/9.8/9.81 for 2 marks</p> <p><b>ALLOW</b> answers between 458.7 and 460 for 4 marks</p> |
|          |     | (ii) | <p><b>First check the answer on the answer line</b><br/> <b>If answer = 54000 (J) award 2 marks</b></p> <p><math>(W = Fd)</math></p> <p><math>W = 4500 \times 12 \checkmark</math></p> <p><math>W = 54000 \text{ (J)} \checkmark</math></p>                                                                                        | 2     | <p>2.1</p> <p>2.1</p>                       |                                                                                                                                                                                                                                                                                          |

| Question |  |       | Answer                                                                                                                                                                                                                                       | Marks | AO element                                  | Guidance                                                                                                                                                                                                                                                                                           |
|----------|--|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |  | (iii) | <p><b>First check the answer on the answer line</b><br/> <b>If answer = 750(W) award 3 marks</b></p> <p><math>(P = W/t)</math></p> <p>1.2 minutes = 72 seconds ✓</p> <p><math>P = 54000 / 72</math> ✓</p> <p><math>P = 750 (W)</math> ✓</p>  | 3     | <p>1.2</p> <p>2.1</p> <p>2.1</p>            | <p><b>ALLOW</b> “answer from 21aii ÷ 72” <b>ECF</b><br/> <b>ALLOW</b> “answer from 21aii ÷ 1.2” <b>ECF</b><br/> <b>ALLOW</b> correct result of above <b>ECF</b><br/> <b>ALLOW</b> 54 000 ÷ 1.2/incorrect conversion seen for 1 mark <b>ECF</b><br/> <b>ALLOW</b> 45 000 for 2 marks <b>ECF</b></p> |
|          |  | (b)   | <p><b>First check the answer on the answer line</b><br/> <b>If answer = 4(.0) (A) award 3 marks</b></p> <p><math>P = IV</math> ✓</p> <p><math>I = P / V</math> ✓</p> <p><math>I = 920 / 230</math> ✓</p> <p><math>I = 4(.0) (A)</math> ✓</p> | 4     | <p>1.2</p> <p>1.2</p> <p>2.1</p> <p>2.1</p> | <p><b>Substitution and rearrangement can be in any order</b></p> <p><b>ALLOW</b> equation in any form</p> <p><b>ALLOW</b> values substituted correctly into equation in any form e.g. <math>920=230 \times I</math> (MP3)</p>                                                                      |



| Question |     |  | Answer                                                                                                                                                                                                                                           | Marks | AO element                | Guidance                                                                                                                                                                                       |
|----------|-----|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23       | (a) |  | (Measure the mass of the block using a mass) balance ✓<br><br><b>AND any two from:</b><br><br>Measure three dimensions of the block ✓<br><br>Using a (metre)ruler/tape measure ✓<br><br>(Multiply) length x width x height / LxWxH / <b>AW</b> ✓ | 3     | 3 × 3.3a                  | <b>ALLOW</b> scales<br><b>IGNORE</b> weigh(ing)<br><br><b>ALLOW</b> three of: height, depth, base, width, breadth, length throughout<br><br><b>IGNORE</b> Displacement methods e.g. Eureka can |
|          | (b) |  | <b>First check the answer on the answer line</b><br><b>If answer = 0.012 (m<sup>3</sup>) award 3 marks</b><br><br>Density = mass ÷ volume ✓<br><br>Volume = $\frac{0.60}{50}$ ✓<br><br>= 0.012 (m <sup>3</sup> ) ✓                               | 3     | 1.2<br><br>2.1<br><br>2.1 | <b>ALLOW</b> equation in any form<br>e.g. Volume = $\frac{\text{mass}}{\text{density}}$<br>MP2 is rearrange AND substitute<br><br><b>ALLOW</b> 1.2 x 10 <sup>x</sup> for 2 marks               |

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