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School code

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Attach your  
barcode ID label here

Book

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of

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books used

External assessment 2024

Question and response book

# Physics

## Paper 1

### Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

### General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator permitted.
- QCAA formula and data book provided.
- Planning paper will not be marked.

### Section 1 (20 marks)

- 20 multiple choice questions

### Section 2 (30 marks)

- 7 short response questions



**DO NOT WRITE ON THIS PAGE**  
**THIS PAGE WILL NOT BE MARKED**

# Section 1

## Instructions

- This section has 20 questions and is worth 20 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- Choose the best answer for Questions 1–20.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	A	B	C	D
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Ensure you have filled an answer bubble for each question.

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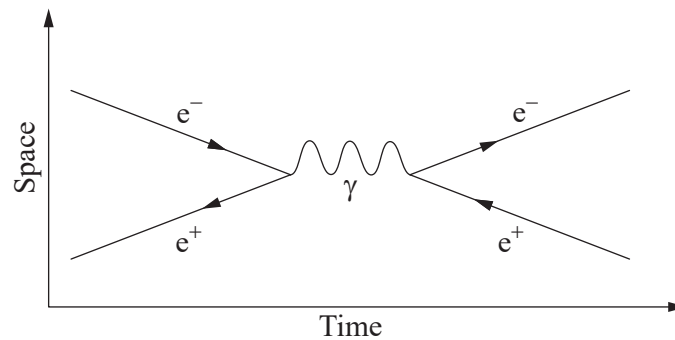
## Section 2

### Instructions

- Write using black or blue pen.
  - Marks will not be deducted for correct answers that use different units or a different number of significant figures/decimal places than those indicated in the question.
  - If you need more space for a response, use the additional pages at the back of this book.
    - On the additional pages, write the question number you are responding to.
    - Cancel any incorrect response by ruling a single diagonal line through your work.
    - Write the page number of your alternative/additional response, i.e. See page ...
    - If you do not do this, your original response will be marked.
  - This section has seven questions and is worth 30 marks.
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### QUESTION 21 (3 marks)

Describe the particle interaction shown.



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**QUESTION 22 (5 marks)**

Special relativity accounts for the observation that more muons from cosmic rays are detected near Earth's surface than expected.

Explain this phenomenon by outlining why Newtonian physics cannot explain this scenario while special relativity can. Refer to the frames of reference of both the travelling muons and the observer near the Earth's surface.

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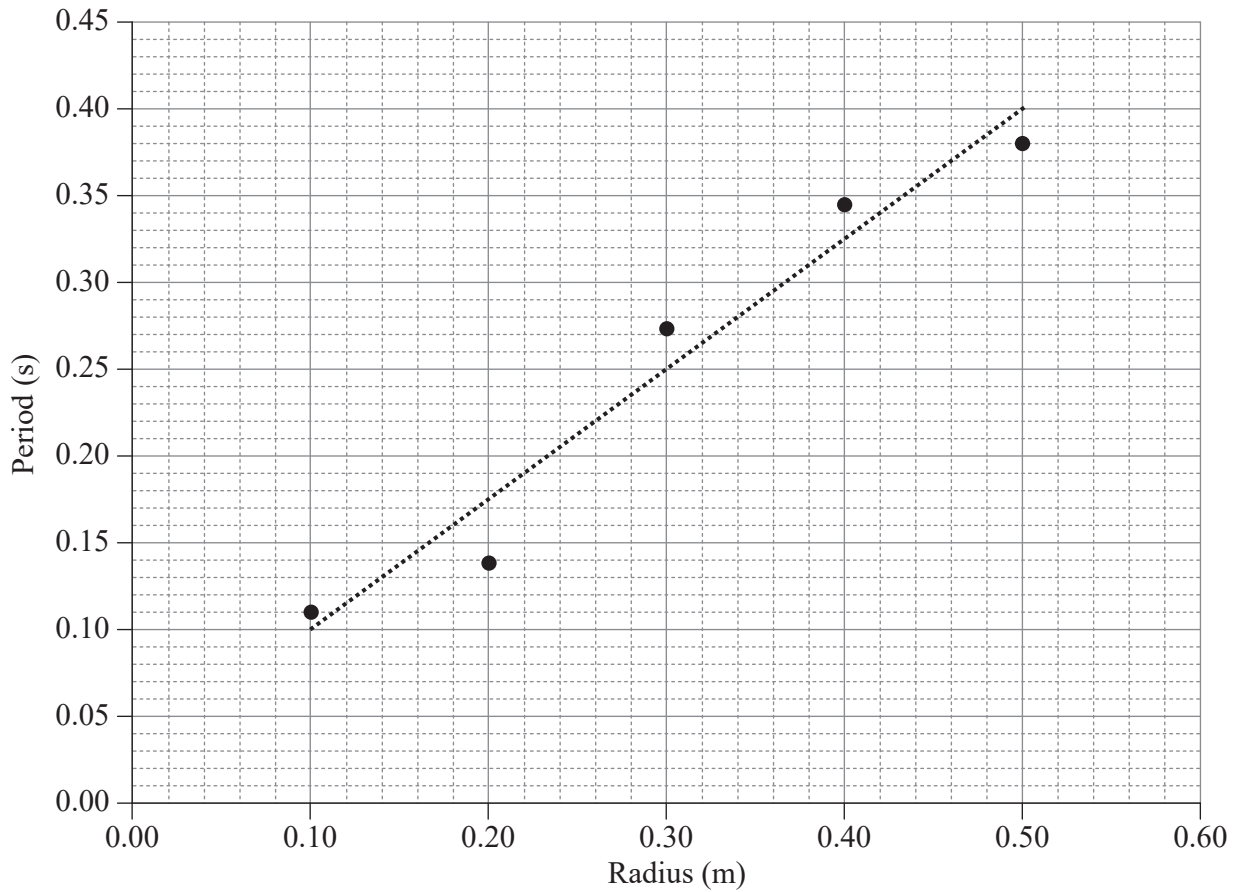
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### QUESTION 23 (4 marks)

An experiment was conducted to study an object undergoing circular motion, with the radius of motion acting as the independent variable and the speed kept constant.

The data comparing the period and radius of motion is shown.



- a) Identify the period expected for a 25 cm radius of motion.

[1 mark]

Period = \_\_\_\_\_ s

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b) Determine the constant speed of the object. Show your working.

[3 marks]

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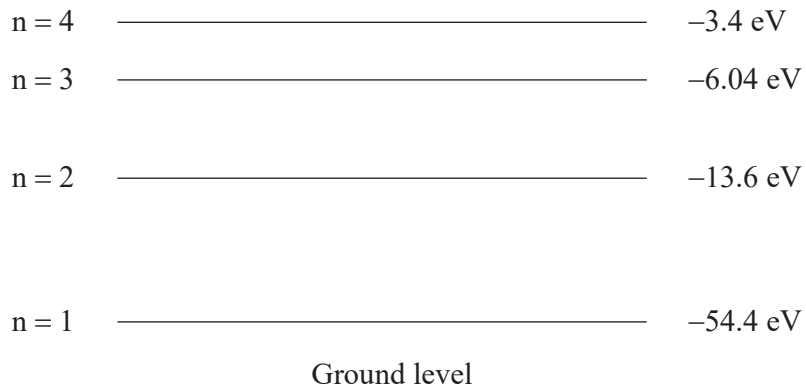
Speed = \_\_\_\_\_  $\text{m s}^{-1}$

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**QUESTION 24 (7 marks)**

The atomic energy level diagram for an unknown multi-electron ion is shown.

Not to scale



- a) Calculate the wavelength of light emitted as electrons move from  $n = 4$  to  $n = 2$ .  
Show your working.

[4 marks]

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Wavelength = \_\_\_\_\_ m

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A photon with 40.8 eV of energy is incident on the unknown ion and collides with an electron in the first energy level.

b) Explain what would happen within the ion in terms of the photon and electron. *[3 marks]*

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**QUESTION 25 (4 marks)**

A transformer with a turns ratio of 48:1 is set up to reduce a 240 V input.

- a) Explain how a transformer works in terms of Faraday’s Law and electromagnetic induction.

*[3 marks]*

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- b) Determine the output voltage.

*[1 mark]*

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Voltage = \_\_\_\_\_ V

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**QUESTION 26 (3 marks)**

The centres of two small equally positively charged metallic spheres are separated by a distance of 0.30 m and experience a force of 0.025 N between them.

Calculate the charge on each of the metallic spheres. Show your working.

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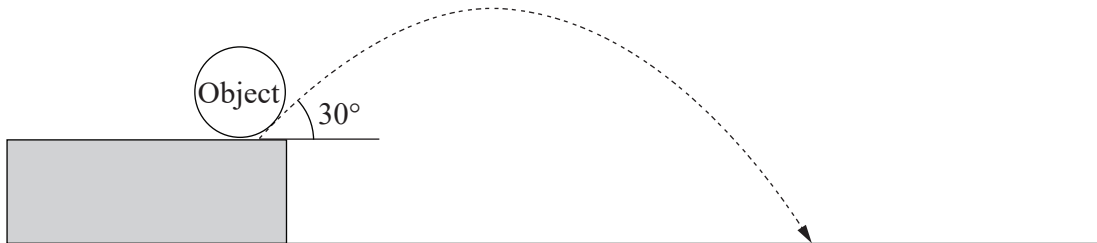
Charge = \_\_\_\_\_ C

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**QUESTION 27 (4 marks)**

On another planet, an object was projected upwards from an initial height and took 0.71 s to land.

Not to scale



The relationship between vertical displacement (m) and time (s) is  $s_y = -5.18t^2 + 3.5t$ .  
Determine the horizontal displacement of the object when it lands.

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Horizontal displacement = \_\_\_\_\_ m

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## **ADDITIONAL PAGE FOR STUDENT RESPONSES**

Write the question number you are responding to.

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**ADDITIONAL PAGE FOR STUDENT RESPONSES**

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