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School code

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School name

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Given name/s

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Family name

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Attach your
barcode ID label here

Book

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books used

External assessment 2025

Question and response book

Physics

Paper 2

Time allowed

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

General instructions

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

Section 1 (50 marks)

- 9 short response questions



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

Section 1

Instructions

- 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.
-

QUESTION 1 (2 marks)

An anti-hydrogen atom is composed of the anti-particles of the corresponding components of a hydrogen atom. A hydrogen atom contains one proton in the nucleus and one electron.

Identify two components of an anti-hydrogen atom.

1. _____

2. _____

Do not write outside this box.

QUESTION 2 (5 marks)

A rock with a mass of 0.15 kg is tied to a piece of string and spun in a horizontal circle in the air.

- a) Explain how the rock can travel at a constant speed and accelerate at the same time. *[2 marks]*

A force of 4.0 N is exerted on the string, and the rock moves at a constant speed of 6.2 m s^{-1} .

- b) Calculate the length of the string in metres. Show your working. *[3 marks]*

Length of string = _____ m

Do not write outside this box.

QUESTION 3 (5 marks)

A spaceship travels at a velocity of $0.8c$ towards a distant planet. The spaceship sends a light beam signal to the planet.

- a) Draw a conclusion about the speed of the signal as seen by observers on the planet. Justify your response. *[2 marks]*

Observers on the spaceship measure the spaceship's length as 35 m.

- b) Calculate the length of the spaceship as seen by observers on the planet. Show your working. *[3 marks]*

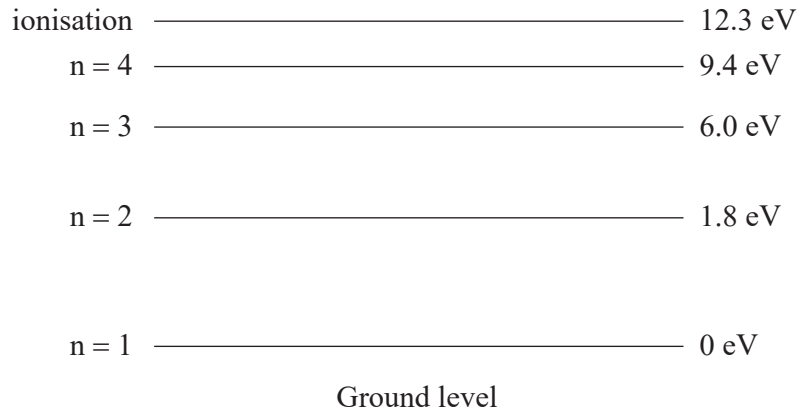
Length of spaceship = _____ m

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QUESTION 4 (8 marks)

An energy level diagram for an atom is shown.

Not to scale



An electron (e_1) transitions from the $n = 4$ energy level to the $n = 2$ energy level and emits a photon.

- a) Calculate the magnitude of the energy change of the electron. *[1 mark]*

Magnitude of energy change = _____ eV

A different electron (e_{ii}) also transitions from $n = 4$ to $n = 2$, but it emits two photons.

- b) Explain how the transitions of electrons e_1 and e_{ii} result in three different photons. *[3 marks]*

Do not write outside this box.

c) Determine the maximum wavelength of a photon that could be produced by the transitions of the two electrons in Questions 4a) and 4b). Show your working.

[4 marks]

Maximum wavelength = _____ m

Do not write outside this box.

Magnitude of net force = _____ N

Direction of net force = _____

Do not write outside this box.

QUESTION 6 (11 marks)

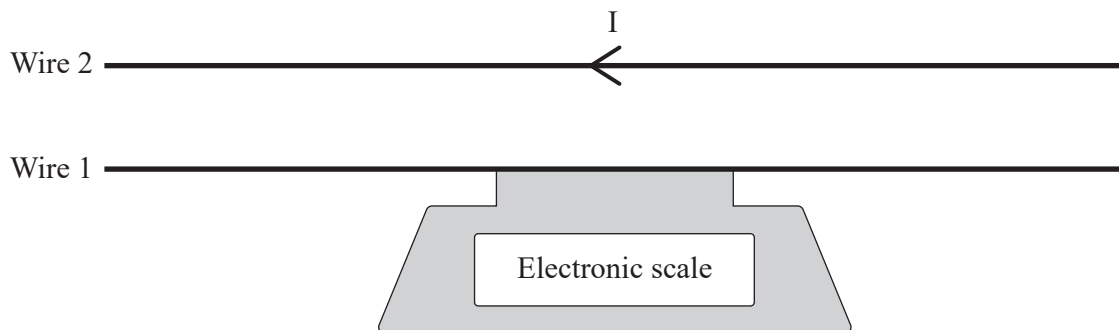
A current through a wire is coming out of the page.

- a) Describe the direction and shape of the magnetic field produced by the current-carrying wire. [2 marks]

- b) Identify the theoretical trend between distance from the wire and magnetic field strength. [1 mark]

A 0.90 m wire (wire 1) is placed on an electronic scale which then reads 8.0×10^{-6} kg. A second wire (wire 2) of the same length is secured 0.015 m above wire 1, and has a current of 25 A running through it, as shown.

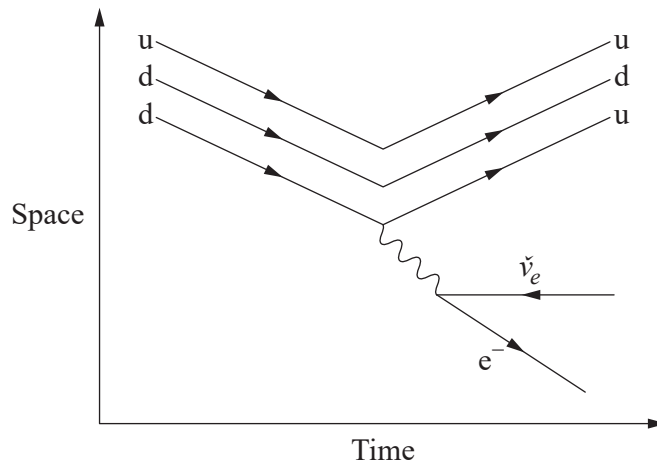
Not to scale



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QUESTION 8 (4 marks)

A Feynman diagram is shown.



a) Identify the two quarks that are present in the diagram. [1 mark]

1: _____

2: _____

b) Deduce the boson involved in the interaction. [1 mark]

c) Describe the significance of symmetry in particle interactions. [2 marks]

Do not write outside this box.



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