LUI | | | | | | | | | | | School code | | | | |

School name

Given name/s

Family name

Attach your barcode ID label here

Book of books used

External assessment 2021

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 (32 marks)

- 9 short response questions

Clear zone — margin trimmed off after completion of assessment

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

DO NOT WRITE ON THIS PAGE

THIS PAGE WILL NOT BE MARKED

Section 1

Instructions

- 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 (3 marks)

A charge of 2.8×10^{-7} C experiences an electrostatic force of 5.2×10^{-1} N when placed near a charge of 3.2×10^{-7} C.

Calculate the distance between the two charges.

Distance = _____ m (to 2 significant figures)

Do not write outside this box.

QUESTION 2 (1 mark)

List the four gauge bosons in the Standard Model.

1. _____

2. _____

3. _____

4. _____

QUESTION 3 (3 marks)

An object undergoes uniform circular motion in a path with a radius of *r*.

Determine the effect on the radius if the mass of the object is doubled, but the centripetal force and velocity remain unchanged.

Do not write outside this box.

QUESTION 4 (4 marks)

A spacecraft is located between two large asteroids, Asteroid A and Asteroid B, that are 120 km apart. Asteroid A's mass is approximately four times the mass of Asteroid B.

Determine the distance of the spacecraft from Asteroid B if it experiences no net gravitational force from the two asteroids.

Distance from Asteroid B = _____ km (to the nearest whole number)

Do not write outside this box.

QUESTION 5 (4 marks)

An alpha particle with a charge of $+3.2 \times 10^{-19}$ C moves through an electric field, accelerating from rest through a potential difference of 240 V.

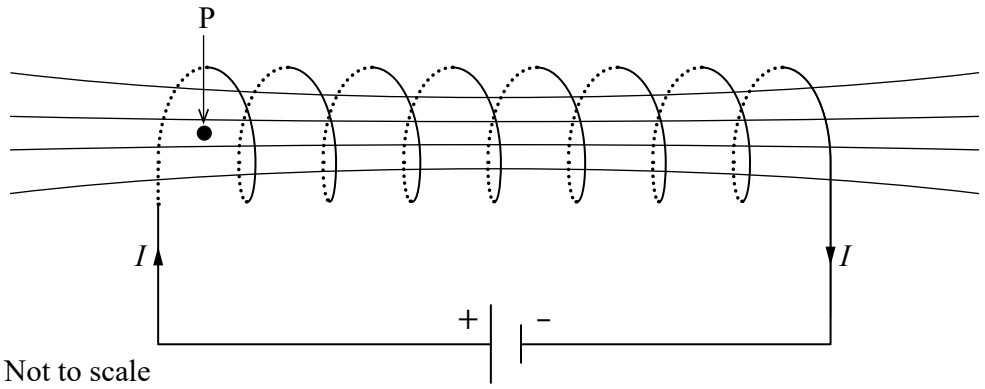
Determine the velocity of the particle at the end of its acceleration, expressing your answer in scientific notation.

Velocity = _____ m s^{-1} (to 2 significant figures)

Do not write outside this box.

QUESTION 6 (4 marks)

The diagram shows the magnetic field lines inside a solenoid carrying a current of 2 A.



a) Calculate the number of turns per metre that would produce a magnetic field strength of 300 μT at Point P. *[3 marks]*

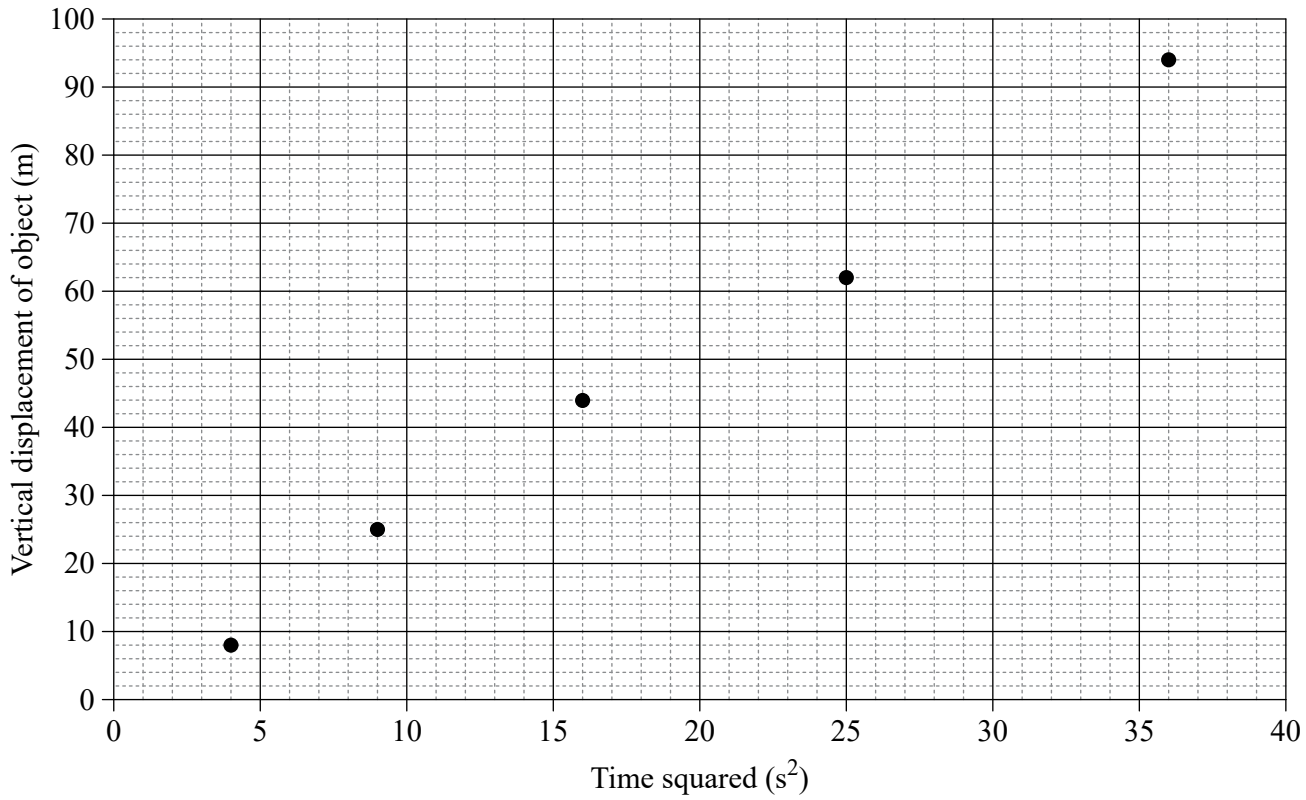
b) Determine the direction of the magnetic field produced by the solenoid. *[1 mark]*

Do not write outside this box.

QUESTION 7 (6 marks)

An object on a planet is launched horizontally from a cliff. Its vertical displacement is measured over 6 seconds.

The graph shows the object's vertical displacement with respect to time squared.



a) Determine the mathematical relationship between vertical displacement (s) and time (t). *[3 marks]*

Do not write outside this box.

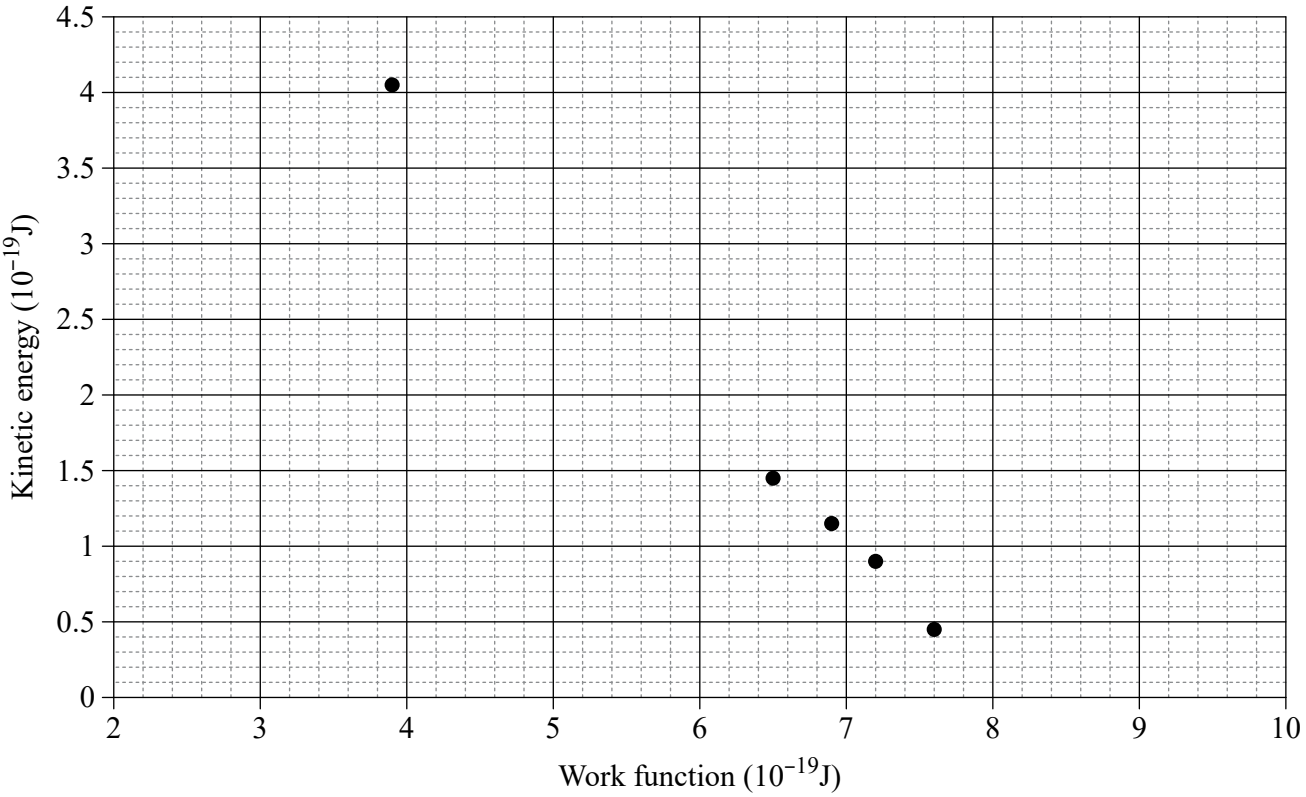
b) Calculate the acceleration due to gravity on the planet. *[3 marks]*

Acceleration = _____ m s^{-2} (to 2 significant figures)

Do not write outside this box.

QUESTION 8 (4 marks)

A photoelectric effect experiment was conducted by shining light from a laser at one frequency on five different metals with known work functions. The graph shows the maximum kinetic energy of the photoelectrons ejected from each metal with respect to their work functions.



Determine the wavelength of the light emitted by the laser.

Do not write outside this box.

Wavelength = _____ nm (to the nearest whole number)

Do not write outside this box.

QUESTION 9 (3 marks)

Explain how Young's double slit experiment provides evidence for the wave model of light.

END OF PAPER

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

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