External assessment 2023

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 (44 marks)

- 8 short response questions

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 response box.

- 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.

DO NOT WRITE ON THIS PAGE

### THIS PAGE WILL NOT BE MARKED

Do not write outside this box.

QUESTION 1 (3 marks)

Describe the effects of relativistic travel on an object.

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QUESTION 2 (5 marks)

In a frictionless system, object A rests on an inclined plane and object B undergoes horizontal circular motion. The two objects are connected by a length of string as shown.
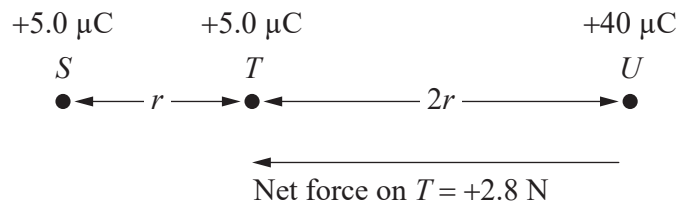
26 cm

B
3.0 kg

Glass tube →

Pulley →

7.0 kg

A

30°

Not to scale
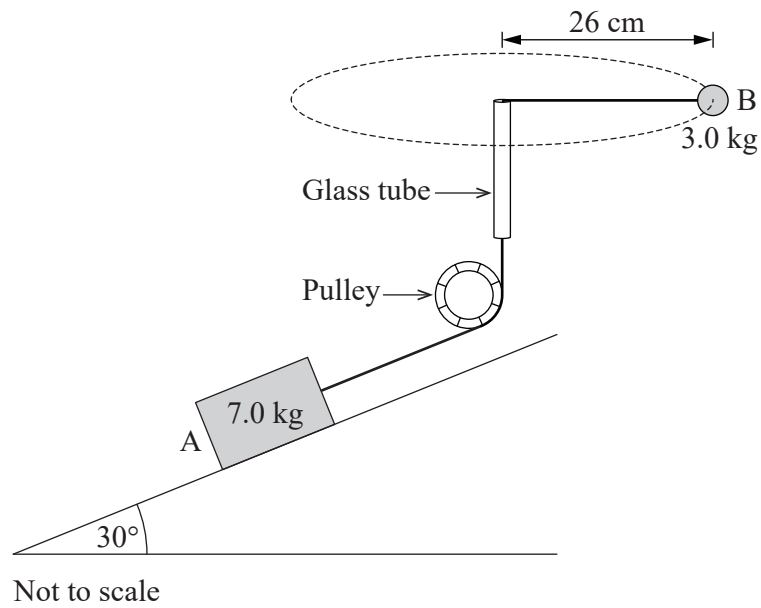
Determine the speed of object B needed for object A to remain stationary. Show your working.

Speed = _____ m s^{-1} (to two significant figures)

QUESTION 3 (8 marks)

Three charges are in a straight line as shown.

$$+5.0\ \mu C \qquad +5.0\ \mu C \qquad\qquad +40\ \mu C$$

$$S \qquad\qquad T \qquad\qquad\qquad U$$

$$\bullet \longleftarrow r \longrightarrow \bullet \longleftarrow \quad\quad 2r \quad\quad \longrightarrow \bullet$$

$$\longleftarrow$$

Net force on $T = +2.8$ N

a) Calculate the electric field strength at T. Show your working.   *[2 marks]*

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Electric field strength = _____ N C^{-1} (to two significant figures)

b) Determine the value of r. Show your working.   *[6 marks]*

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r = _____ m (to two significant figures)

QUESTION 4 (3 marks)

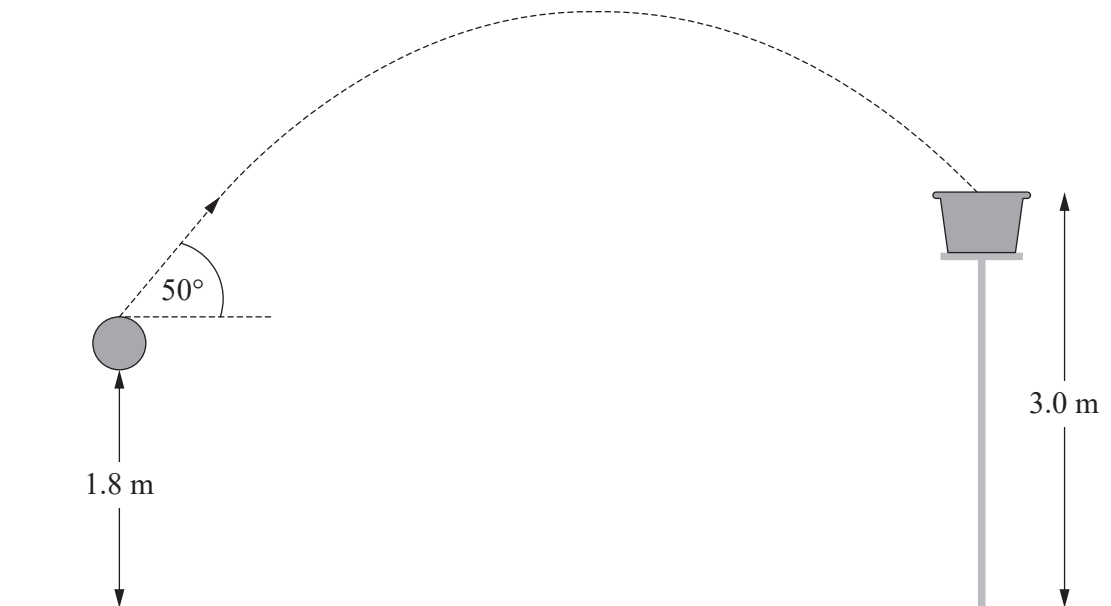Two objects on different planets experience different accelerations due to gravity.

Object	Mass (kg)	Acceleration due to gravity (m s^{-2})
A	79	1.6
B	32	3.7

Determine which object has the greatest force acting on it. Show your working.

QUESTION 5 (4 marks)

Describe what happens when light is shone onto a metallic surface in the context of the photoelectric effect.

QUESTION 6 (10 marks)

A ball is thrown with an initial velocity of 8.0 m s^{-1} into a bucket as shown.

Not to scale

a) Calculate the time taken for the ball to reach its maximum height. Show your working.   *[4 marks]*

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Time = _____ s (to two significant figures)

b) Calculate the magnitude of the ball's final velocity when it enters the bucket.
Show your working. *[6 marks]*

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Final velocity = _____ m s^{-1} (to two significant figures)

QUESTION 7 (5 marks)

Discuss the nature of light by describing evidence from two key experiments.

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QUESTION 8 (6 marks)

A length of wire, AB, is placed across an incomplete loop sitting within a magnetic field as shown. Wire AB then moves with a constant velocity of 40 m s^{-1}, creating an induced EMF of 23 μV.

Not to scale
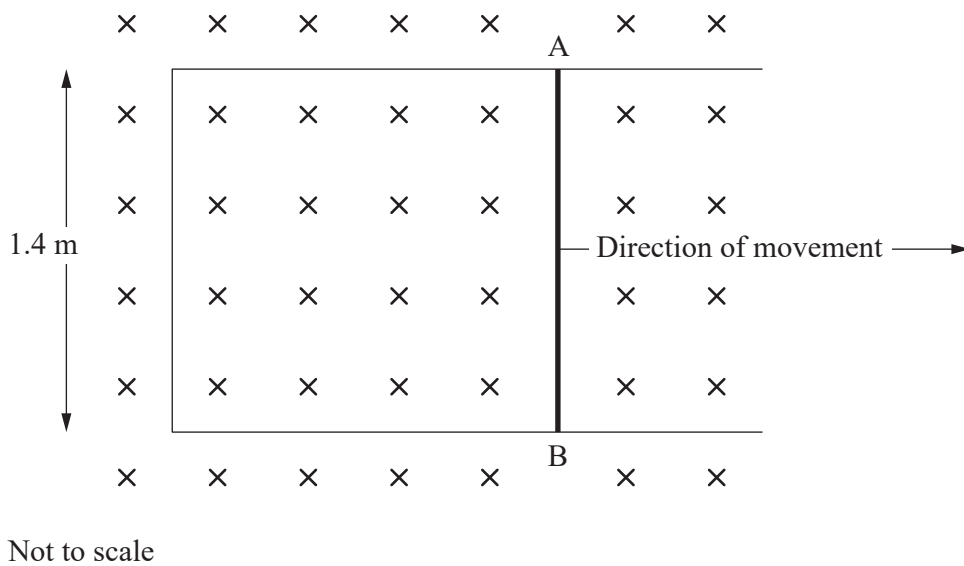
a) Determine the magnitude of the magnetic field strength experienced by the loop.
Show your working.   *[4 marks]*

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Magnetic field strength = _____ T (to two significant figures)

b) Draw a conclusion about the direction of the induced current within the loop.
Justify your reasoning.   *[2 marks]*

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END OF PAPER

ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

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Write the question number you are responding to.

Do not write outside this box.

Clear zone — margin trimmed off after completion of assessment