Captivate
EDUCATION

Physics

Question and Answer Book

Practice examination 1 – 2027

Student name _____

Teacher _____

- Reading time is 15 minutes
- Writing time is 38 minutes (suggested)

Approved materials

- One scientific calculator
- Pre-written notes (one folded A3 sheet or two A4 sheets bound together by tape)

Materials supplied

- Question and Answer Book
- Formula Sheet
- Multiple-Choice Answer Sheet

Instructions

- Follow the instructions on your Multiple-Choice Answer Sheet.
- At the end of the examination, place your Multiple-Choice Answer Sheet inside the front cover of this book.

Students are not permitted to bring mobile phones and/or any unauthorised electronic devices into the examination room.

Contents

Section A (6 questions, 6 marks)

Section B (3 questions, 32 marks)

Practice material in the layout of the 2025 VCAA paper – generated 2027. Not a VCAA examination.

SAMPLE

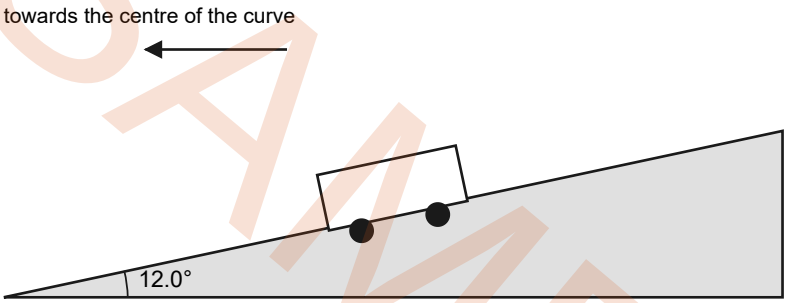
Section A – Multiple-choice questions

Instructions

- Answer **all** questions in pencil on your Multiple-Choice Answer Sheet.
- Choose the response that is correct or that best answers the question.
- A correct answer scores 1; an incorrect answer scores 0.
- Marks will not be deducted for incorrect answers.
- No marks will be given if more than one answer is completed for any question.
- Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Question 1

A car travels at constant speed around a curve of radius 85.0 m on a road banked at 12.0°, as shown below. At this speed no sideways friction acts on the tyres.
Which one of the following is closest to the speed of the car?



Not to scale

A. 13.3 m s^{-1}

B. 28.6 m s^{-1}

C. 177 m s^{-1}

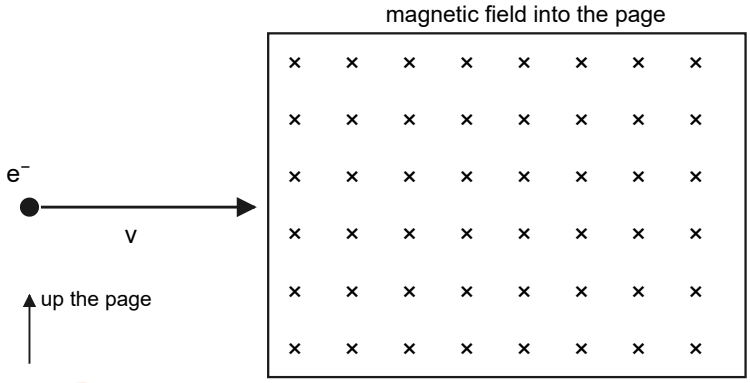
D. 4.25 m s^{-1}

SAMPLE

Question 2

An electron travelling to the right enters a region of uniform magnetic field directed into the page, as shown below.

Which one of the following best shows the direction of the magnetic force on the electron at the instant it enters the field?



A.  up the page

B.  to the left

C.  down the page

D.  to the right

Question 3

An ideal transformer has 1200 turns on its primary coil and 60 turns on its secondary coil. The primary coil is connected to a 240 V RMS supply and the secondary coil supplies 36 W to a set of garden lights.

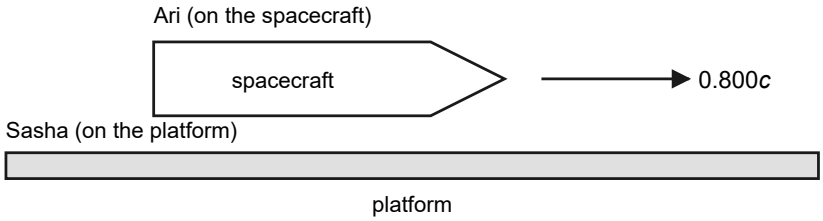
Which one of the following correctly gives the secondary voltage and the primary current?

	Secondary voltage (RMS)	Primary current (RMS)
A.	4800 V	0.0075 A
B.	12 V	0.15 A
C.	12 V	3.0 A
D.	17 V	0.15 A

SAMPLE

Question 4

Ari is on a spacecraft travelling at 0.800*c* relative to a space-station platform. Sasha, at rest on the platform, measures the platform's length to be 120 m.
Which one of the following is closest to the length of the platform as measured by Ari?



Not to scale

A. 200 m
B. 120 m
C. 43.2 m
D. 72.0 m

Question 5

Light of a single frequency, above the threshold frequency, shines on a metal plate in a photoelectric cell. The intensity of the light is then increased while its frequency is kept constant.
Which one of the following best describes the effect on the maximum kinetic energy of the emitted photoelectrons and on the photocurrent?

	Maximum kinetic energy	Photocurrent
A.	unchanged	increases
B.	increases	increases
C.	unchanged	unchanged
D.	increases	unchanged

Question 6

Tomás measures the length of a stretched spring with a metre ruler whose end has worn away, so that every reading is 2 mm shorter than the true length.
Which one of the following best describes this error?

A. a random error, which is reduced by repeating the measurement
B. a random error, which cannot be reduced
C. a systematic error, which is not reduced by repeating the measurement
D. a systematic error, which is reduced by averaging repeated measurements

End of Section A

SAMPLE

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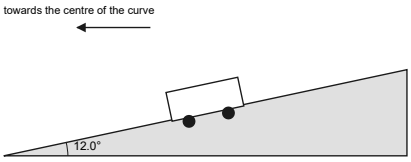
Marking scheme – teacher copy

Practice examination 1 – 2027

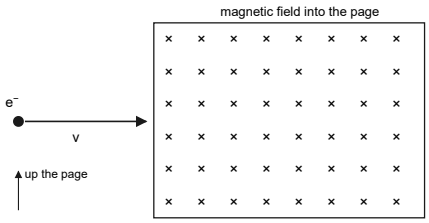
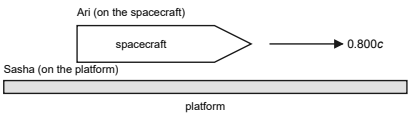
Not for distribution to students.

Section	Questions	Marks available	Marks awarded
Section A	6	6	
Section B	3	32	
Total		**38**	

Section A

Question	Key	Question	Why
1	**A**	A car travels at constant speed around a curve of radius 85.0 m on a road banked at 12.0°, as shown below. At this speed no sideways friction acts on the tyres. Which one of the following is closest to the speed of the car?  *Not to scale*	$v = \sqrt{(rg \tan \theta)} = \sqrt{(85.0 \times 9.81 \times \tan 12.0°)} = 13.3$ m s^{-1}. The horizontal component of the normal force provides the centripetal force. Option B results from using cos θ in place of tan θ; option C omits the square root; option D omits g.

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2	**C**	An electron travelling to the right enters a region of uniform magnetic field directed into the page, as shown below. Which one of the following best shows the direction of the magnetic force on the electron at the instant it enters the field? 	The right-hand slap rule gives the force on a positive charge moving right in a field into the page as up the page; the electron is negative, so the force is down the page. Option A is incorrect as it ignores the negative charge; options B and D are parallel or antiparallel to the velocity, but F = qvB is always perpendicular to v.
3	**B**	An ideal transformer has 1200 turns on its primary coil and 60 turns on its secondary coil. The primary coil is connected to a 240 V RMS supply and the secondary coil supplies 36 W to a set of garden lights. Which one of the following correctly gives the secondary voltage and the primary current?	$V_2 = V_1N_2/N_1 = 240 \times 60/1200 = 12$ V; $I_2 = P/V = 36/12 = 3.0$ A; $I_1 = I_2N_2/N_1 = 0.15$ A. Option A results from inverting the turns ratio; option C gives the secondary current; option D converts the RMS value to a peak value, which is incorrect as transformer values given as RMS stay RMS.
4	**D**	Ari is on a spacecraft travelling at 0.800*c* relative to a space-station platform. Sasha, at rest on the platform, measures the platform's length to be 120 m. Which one of the following is closest to the length of the platform as measured by Ari?  *Not to scale*	$\gamma = 1/\sqrt{(1 - 0.800^2)} = 1.67$; $L = L_0/\gamma = 120/1.67 = 72.0$ m. The 120 m is the proper length (measured in the platform's rest frame). Option A multiplies by γ ("length dilation"); option B ignores relativity; option C divides by γ twice.

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5	**A**	Light of a single frequency, above the threshold frequency, shines on a metal plate in a photoelectric cell. The intensity of the light is then increased while its frequency is kept constant. Which one of the following best describes the effect on the maximum kinetic energy of the emitted photoelectrons and on the photocurrent?	Maximum kinetic energy depends only on frequency ($E_{k\,max} = hf - \phi$), so it is unchanged; more photons per second release more photoelectrons, so the photocurrent increases. Option B is incorrect as intensity does not change the energy of each photon.
6	**C**	Tomás measures the length of a stretched spring with a metre ruler whose end has worn away, so that every reading is 2 mm shorter than the true length. Which one of the following best describes this error?	The error is the same on every reading, so it is systematic; repeating or averaging does not remove it. Repeating measurements reduces the effect of random errors only, so options A, B and D are incorrect.

Section B

Question 1a. (1 mark)

Show that the initial vertical component of the tube's velocity is 7.50 m s^{-1}.

To be awarded full marks, students were required to:

resolve the launch velocity.

$$u_v = u \sin\theta = 15.0 \times \sin 30.0° = 7.50 \text{ m s}^{-1}$$

Mark allocation: 1 mark for the substitution shown; quoting 7.50 without the working was not awarded the mark.

SAMPLE