

ERUVIO MENTORING · EXTERNAL-STYLE EXAMINATION

Physics

Units 3 and 4 · Gravity and electromagnetism; revolutions in modern physics

Paper 1 · Section 1

MULTIPLE CHOICE · 20 MARKS

STUDENT DETAILS

GIVEN NAME(S)

FAMILY NAME

SCHOOL

DATE

BOOK OF

DO NOT WRITE ON THIS PAGE

Structure of this examination

PAPER	SECTION	QUESTION TYPE	TIME	MARKS
Paper 1	Section 1	Multiple choice, 20 questions	10 min perusal 90 min working	20
	Section 2	Short response, 5 questions		30
Paper 2	Section 1	Short response, 9 questions	10 min perusal 90 min working	50
Total		34 questions	200 minutes	100

Instructions

- **Perusal time: 10 minutes. Working time: 90 minutes.**
- You may use a QCAA-approved scientific or graphics calculator. The QCAA Physics formula and data book is provided.
- Write using black or blue pen. Planning paper will not be marked.
- All questions are drawn from Unit 3 (gravity and electromagnetism) and Unit 4 (revolutions in modern physics).
- **Section 1 contains 20 multiple choice questions.** Choose the best answer for each and record it on the response grid provided.

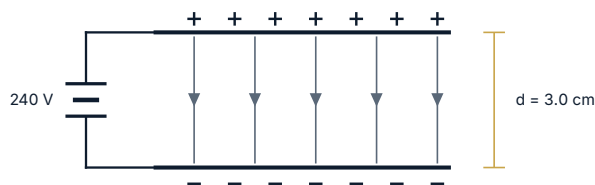
Answers must be recorded on the response grid on the final page. Marks are not deducted for incorrect answers, so attempt every question.

Section I

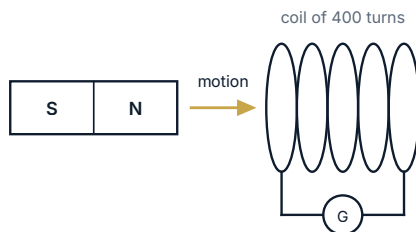
Multiple choice · 20 questions · 20 marks

- 1 A ball is projected horizontally from the top of a cliff 20 m high with a speed of 12 m s^{-1} . Air resistance is negligible. The time taken for the ball to reach the ground is
 - A 1.4 s
 - B 2.0 s
 - C 2.9 s
 - D 4.1 s
- 2 An object moves in a horizontal circle at constant speed. The net force acting on the object is
 - A tangent to the circle, in the direction of motion.
 - B tangent to the circle, opposite to the direction of motion.
 - C directed away from the centre of the circle.
 - D directed towards the centre of the circle.
- 3 A car of mass 1200 kg travels around a horizontal circular track of radius 50 m at a constant speed of 15 m s^{-1} . The magnitude of the net force acting on the car is
 - A 4.5 N
 - B $3.6 \times 10^2 \text{ N}$
 - C $5.4 \times 10^3 \text{ N}$
 - D $2.7 \times 10^5 \text{ N}$
- 4 A satellite in a circular orbit around a planet is moved to a new circular orbit of four times the radius. Compared with the original orbit, the period of the new orbit is
 - A one eighth as long.
 - B twice as long.
 - C four times as long.
 - D eight times as long.
- 5 A block slides down a smooth plane inclined at 30° to the horizontal. The magnitude of the acceleration of the block is
 - A 4.9 m s^{-2}
 - B 8.5 m s^{-2}
 - C 9.8 m s^{-2}
 - D 19.6 m s^{-2}
- 6 Two point charges of $+2.0 \text{ } \mu\text{C}$ and $+3.0 \text{ } \mu\text{C}$ are held 0.20 m apart in air. The magnitude of the electrostatic force between them is
 - A 0.27 N
 - B 1.3 N
 - C 2.7 N
 - D 5.4 N

- 7 Two parallel plates separated by 3.0 cm are connected to a 240 V supply, as shown. The magnitude of the electric field between the plates is



- A 0.125 V m⁻¹
B 7.2 V m⁻¹
C $8.0 \times 10^3 \text{ V m}^{-1}$
D $8.0 \times 10^4 \text{ V m}^{-1}$
- 8 A straight conductor of length 0.50 m carries a current of 3.0 A at right angles to a uniform magnetic field of magnitude 0.40 T. The magnitude of the force on the conductor is
- A 0.067 N
B 0.27 N
C 0.60 N
D 2.4 N
- 9 The north pole of a bar magnet is moved towards a coil connected to a galvanometer, as shown. While the magnet is moving, the induced current in the coil



- A flows so that the face of the coil nearest the magnet becomes a north pole.
B flows so that the face of the coil nearest the magnet becomes a south pole.
C is zero, because the magnet does not touch the coil.
D flows in the same direction as it would if the magnet were withdrawn.
- 10 An ideal transformer has 1200 turns on its primary coil and 60 turns on its secondary coil. When the primary coil is connected to a 240 V alternating supply, the secondary voltage is
- A 3.0 V
B 12 V
C 48 V
D $4.8 \times 10^3 \text{ V}$

- 11 Which statement is a postulate of the special theory of relativity?
- A The speed of light in a vacuum depends on the speed of its source.
 - B Time passes at the same rate for all observers.
 - C The laws of physics apply only to observers who are at rest.
 - D The speed of light in a vacuum is the same for all observers in inertial frames of reference.
- 12 A clock aboard a spacecraft moving at $0.80c$ relative to the Earth records an interval of 1.0 s. The interval measured by an observer on the Earth is
- A 0.60 s
 - B 1.25 s
 - C 1.7 s
 - D 2.8 s
- 13 A rod has a proper length of 100 m. Measured by an observer for whom the rod moves at $0.60c$ along its length, the rod is
- A 36 m
 - B 64 m
 - C 80 m
 - D 125 m
- 14 The energy equivalent of a mass of 2.0×10^{-3} kg is
- A 6.0×10^5 J
 - B 1.8×10^{11} J
 - C 6.0×10^{13} J
 - D 1.8×10^{14} J
- 15 Monochromatic light of a frequency above the threshold frequency falls on a metal surface. The intensity of the light is doubled while its frequency is unchanged. As a result,
- A the number of photoelectrons emitted per second doubles and their maximum kinetic energy is unchanged.
 - B the maximum kinetic energy of the photoelectrons doubles and the number emitted per second is unchanged.
 - C both the number emitted per second and the maximum kinetic energy double.
 - D neither the number emitted per second nor the maximum kinetic energy changes.
- 16 The energy of a photon of light of wavelength 400 nm is
- A 1.55 eV
 - B 3.11 eV
 - C 4.97 eV
 - D 6.22 eV

- 17 Light of frequency 8.0×10^{14} Hz falls on a metal of work function 3.3×10^{-19} J. The maximum kinetic energy of the emitted photoelectrons is
- A 2.0×10^{-19} J
 - B 3.3×10^{-19} J
 - C 5.3×10^{-19} J
 - D 8.6×10^{-19} J
- 18 An electron has a momentum of 3.3×10^{-24} kg m s⁻¹. Its de Broglie wavelength is
- A 2.2×10^{-57} m
 - B 2.0×10^{-10} m
 - C 4.5×10^{-10} m
 - D 5.0×10^9 m
- 19 The quark composition of a neutron is
- A two up quarks and one down quark.
 - B three down quarks.
 - C one up quark and one down quark.
 - D one up quark and two down quarks.
- 20 A free neutron decays according to the equation $n \rightarrow p + e^- + \bar{\nu}_e$. The fundamental interaction responsible for this decay and the particle that mediates it are
- A the weak nuclear interaction, mediated by a W boson.
 - B the strong nuclear interaction, mediated by a gluon.
 - C the electromagnetic interaction, mediated by a photon.
 - D the gravitational interaction, mediated by a graviton.

Response grid

Shade or cross the box for your chosen answer

Question	A	B	C	D
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END OF SECTION 1