

ERUVIO MENTORING · EXTERNAL-STYLE EXAMINATION

# Physics

*Units 1 and 2 · Thermal, nuclear and electrical physics; linear motion and waves*

## Paper 1 · Section 1

MULTIPLE CHOICE · 20 MARKS

### STUDENT DETAILS

GIVEN NAME(S)

FAMILY NAME

SCHOOL

DATE

BOOK OF

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## Structure of this examination

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

### 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 1 (thermal, nuclear and electrical physics) and Unit 2 (linear motion and waves).
- **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 1

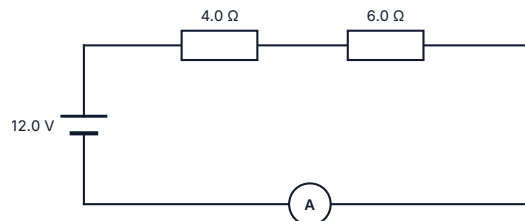
Multiple choice · 20 questions · 20 marks

- 1 Which statement best describes two objects that have reached thermal equilibrium?
  - A The average kinetic energy of their particles is the same.
  - B They contain the same amount of internal energy.
  - C All energy transfer between them has stopped.
  - D They have the same specific heat capacity.
  
- 2 A 2.0 kg block of aluminium of specific heat capacity  $9.0 \times 10^2 \text{ J kg}^{-1} \text{ K}^{-1}$  absorbs  $3.6 \times 10^4 \text{ J}$  of energy. The rise in temperature is
  - A 5.0 K
  - B 10 K
  - C 20 K
  - D 40 K
  
- 3 Ice at  $0^\circ \text{C}$  is heated until it has all become water at  $0^\circ \text{C}$ . During this process
  - A the temperature of the substance increases.
  - B the average kinetic energy of the particles increases.
  - C the internal energy of the substance is unchanged.
  - D the potential energy component of the internal energy increases.
  
- 4 A nuclide undergoes beta-minus decay. Compared with the parent nuclide, the daughter nuclide has
  - A an atomic number one less and the same mass number.
  - B an atomic number one greater and the same mass number.
  - C an atomic number two less and a mass number four less.
  - D the same atomic number and a mass number one less.
  
- 5 The activity of a radioactive sample falls from 800 Bq to 100 Bq in 24 days. The half-life of the sample is
  - A 8.0 days
  - B 12 days
  - C 16 days
  - D 24 days
  
- 6 Which statement about alpha, beta and gamma radiation is correct?
  - A Alpha particles have the greatest ionising ability and the least penetrating ability.
  - B Gamma radiation has the greatest ionising ability.
  - C Alpha particles have the greatest penetrating ability.
  - D Beta-minus particles originate in the electron shells of the atom.

- 7 A  $6.0\ \Omega$  resistor and a  $12\ \Omega$  resistor are connected in parallel. The equivalent resistance of the combination is

A  $0.25\ \Omega$   
B  $2.0\ \Omega$   
C  $4.0\ \Omega$   
D  $18\ \Omega$

- 8 In the circuit shown, the reading on the ammeter is



A  $0.83\ \text{A}$   
B  $1.2\ \text{A}$   
C  $2.0\ \text{A}$   
D  $3.0\ \text{A}$

- 9 A student measures the potential difference across a filament lamp and the current through it, and finds that the ratio  $V/I$  increases as  $V$  increases. This shows that the lamp is

A ohmic, because  $V = IR$  still applies to it.  
B ohmic, because the graph of  $V$  against  $I$  passes through the origin.  
C non-ohmic, because  $V = IR$  does not apply to it.  
D non-ohmic, because its resistance is not constant.

- 10 A battery is connected in series with two resistors of different resistance. Which statement is correct?

A The current is the same through each resistor.  
B The current is greater through the resistor of smaller resistance.  
C The potential difference is the same across each resistor.  
D The current is gradually used up as it passes through each resistor.

- 11 A car starts from rest and accelerates uniformly at  $3.0\ \text{m s}^{-2}$  for  $8.0\ \text{s}$ . The distance travelled during this time is

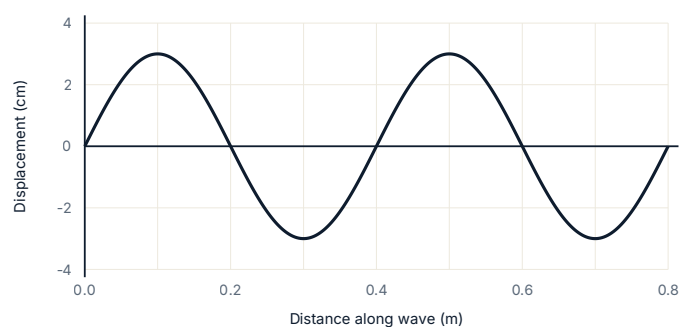
A  $12\ \text{m}$   
B  $24\ \text{m}$   
C  $48\ \text{m}$   
D  $96\ \text{m}$

- 12 The area under a velocity-time graph represents the

A acceleration of the object.  
B net force acting on the object.  
C displacement of the object.  
D average speed of the object.

- 13 A net force of 4500 N acts on a car of mass 1500 kg. The acceleration of the car is
- A  $0.33 \text{ m s}^{-2}$
  - B  $3.0 \text{ m s}^{-2}$
  - C  $3.0 \times 10^3 \text{ m s}^{-2}$
  - D  $6.8 \times 10^6 \text{ m s}^{-2}$
- 14 Two trolleys collide and move off joined together. Which quantity is always conserved in this collision?
- A Kinetic energy only.
  - B Speed only.
  - C Both momentum and kinetic energy.
  - D Momentum only.
- 15 A ball of mass 0.20 kg moving at  $15 \text{ m s}^{-1}$  is brought to rest in 0.30 s. The average force acting on the ball is
- A 0.90 N
  - B 3.0 N
  - C 10 N
  - D 50 N
- 16 A wave of frequency 400 Hz has a wavelength of 0.85 m. The speed of the wave is
- A  $2.1 \times 10^{-3} \text{ m s}^{-1}$
  - B  $340 \text{ m s}^{-1}$
  - C  $471 \text{ m s}^{-1}$
  - D  $3.4 \times 10^3 \text{ m s}^{-1}$
- 17 Light travels from air into a glass block. As it does so,
- A its frequency decreases and its wavelength decreases.
  - B its speed decreases and its wavelength decreases.
  - C its speed decreases and its frequency decreases.
  - D its speed increases and its wavelength increases.

- 18 The graph shows the displacement of a transverse wave against distance along the wave at one instant. The wavelength of the wave is



- A 0.030 m  
B 0.20 m  
C 0.40 m  
D 0.80 m
- 19 A pipe closed at one end has a length of 0.85 m. The wavelength of the fundamental standing wave in the pipe is
- A 0.21 m  
B 0.43 m  
C 1.7 m  
D 3.4 m
- 20 Two waves of equal amplitude arrive at a point with a path difference of half a wavelength. The result at that point is
- A destructive interference.  
B constructive interference.  
C refraction of both waves.  
D total internal reflection.

## Response grid

Shade or cross the box for your chosen answer

| Question | A | B | C | D |
|----------|---|---|---|---|
| 1        |   |   |   |   |
| 2        |   |   |   |   |
| 3        |   |   |   |   |
| 4        |   |   |   |   |
| 5        |   |   |   |   |
| 6        |   |   |   |   |
| 7        |   |   |   |   |
| 8        |   |   |   |   |
| 9        |   |   |   |   |
| 10       |   |   |   |   |
| 11       |   |   |   |   |
| 12       |   |   |   |   |
| 13       |   |   |   |   |
| 14       |   |   |   |   |
| 15       |   |   |   |   |
| 16       |   |   |   |   |
| 17       |   |   |   |   |
| 18       |   |   |   |   |
| 19       |   |   |   |   |
| 20       |   |   |   |   |

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END OF SECTION 1