

ERUVIO MENTORING · EXTERNAL-STYLE EXAMINATION

Physics

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

Paper 1 · Section 2

SHORT RESPONSE · 30 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
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 1 (thermal, nuclear and electrical physics) and Unit 2 (linear motion and waves).
- **Section 2 contains 5 short response questions.** Answer all questions in the spaces provided. Show all working.

Show all working. Marks are awarded for method as well as for the final answer, so a response with no working cannot receive full marks.

Section 2

Short response · 5 questions · 30 marks

- 1 An electric heater of constant power 750 W is used to heat 0.80 kg of ice that is initially at $-15\text{ }^{\circ}\text{C}$. Assume all of the energy from the heater is transferred to the ice. [6 marks]

(a) Calculate the energy required to raise the temperature of the ice to $0\text{ }^{\circ}\text{C}$. [2]

WORKING

Energy = _____ J _____

(b) Calculate the energy required to melt the ice at $0\text{ }^{\circ}\text{C}$. [2]

WORKING

Energy = _____ J _____

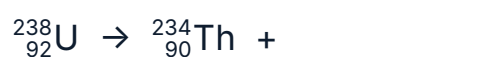
(c) Determine the total time taken for the heater to complete both stages. [2]

WORKING

Time = _____ s _____

- 2 Uranium-238 decays to thorium-234. [6 marks]

(a) Complete the decay equation below by identifying the missing particle. [1]



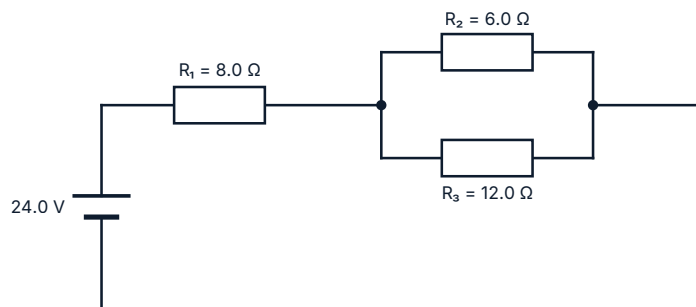
- (b) Explain, in terms of the strong nuclear force and electrostatic repulsion, why nuclei with a large number of protons tend to be unstable. [3]

- (c) Thorium-234 has a half-life of 24 days. Calculate the fraction of a sample of thorium-234 remaining after 96 days. [2]

WORKING

Fraction = _____

- 3 The circuit below contains three resistors. The battery has negligible internal resistance. [6 marks]



- (a) Calculate the total resistance of the circuit. [2]

WORKING

$R_t = \text{_____} \, \Omega$

(b) Calculate the current drawn from the battery.

[1]

WORKING

$I = \text{_____ A}$ _____

(c) Calculate the power dissipated in R_1 .

[2]

WORKING

$P = \text{_____ W}$ _____

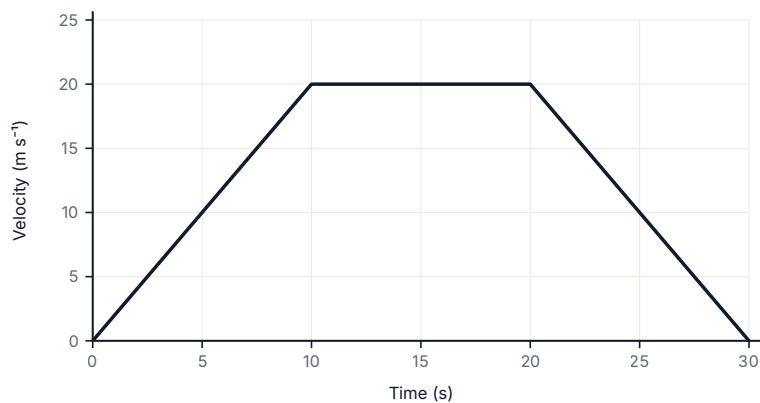
(d) Determine the potential difference across R_3 .

[1]

WORKING

$V = \text{_____ V}$ _____

4 The velocity-time graph below shows the motion of a vehicle of mass 1200 kg travelling in a straight line. [6 marks]



(a) Calculate the acceleration of the vehicle during the first 10 s.

[1]

WORKING

$a = \text{_____ m s}^{-2}$

(b) Calculate the total displacement of the vehicle over the 30 s shown.

[2]

WORKING

$s = \text{_____ m}$

(c) Calculate the magnitude of the net force acting on the vehicle during the final 10 s and state its direction relative to the motion.

[2]

WORKING

$F = \text{_____ N}$ Direction _____

(d) Determine the average velocity of the vehicle over the 30 s.

[1]

WORKING

$v = \text{_____ m s}^{-1}$

5 This question is about waves.

[6 marks]

- (a) A sound wave of frequency 512 Hz travels through air at 346 m s^{-1} . Calculate the wavelength of the sound. [2]

WORKING

$\lambda = \text{_____ m}$ _____

- (b) Explain, in terms of the speed of the wave, why light changes direction when it enters a glass block at an angle to the normal. [3]

- (c) State one difference between a transverse wave and a longitudinal wave. [1]

END OF PAPER