Cambridge IGCSE™

PHYSICS **0625/41**

Paper 4 Theory (Extended) **May/June 2025**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	(only) acceleration **AND** velocity circled	**B1**
1(b)(i)	56 m / s braille: 55 m / s	**B1**
1(b)(ii)	accelerates **OR** speed increases **AND** (then) constant speed **AND** (then) decelerates **OR** speed decreases	**B1**
	constant acceleration **OR** constant deceleration	**B1**
1(b)(iii)	26 000 m **OR** 26 km braille: 26 125 m	**A3**
	(distance =) area under the speed–time graph **OR** (distance =) average speed × time taken	C1
	$0.5 \times 80 \times 56$ **AND** 56×400 **AND** $0.5 \times 50 \times 56$ **OR** $\frac{1}{2} \times \{400 + 530\} \times 56$ braille: 0.5 × 100 × 55 **AND** 55 × 400 **AND** 0.5 × 50 × 55 **OR** $\frac{1}{2} \times \{400 + 550\} \times 55$	C1
1(b)(iv)	any **one** from: • lower acceleration **OR** less acceleration • lower deceleration **OR** less deceleration • lower maximum speed **OR** lower average speed **OR** lower constant speed	**B1**

Question	Answer	Marks
2(a)(i)	direction (changes)	**B1**
	any **one** from: • magnitude of the velocity (changes) • speed (changes) • (there is) acceleration	**B1**
2(a)(ii)	any **one** from: • (change) size • (change) shape	**B1**
2(b)	1 place (the centre of) the metre ruler on the pivot owtte **OR** (labelled) diagram showing metre ruler on a pivot	**B1**
	2 add mass on one side (of pivot) and then add mass on other side to balance the ruler owtte	**B1**
	3 (moment =) force × <u>perpendicular</u> distance (from pivot)	**B1**
	4 sum of clockwise moments = sum of anticlockwise moments (when in equilibrium)	**B1**

Question	Answer	Marks
3(a)	<u>gravitational</u> potential to kinetic to gravitational potential	**B1**
	to thermal (store) **OR** to internal (store)	**B1**
3(b)(i)	1800 J	**A2**
	(W =) Fd **OR** (W =) $65 \times 9.8 \times 2.8$	C1

Question	Answer	Marks
3(b)(ii)	$F = \Delta p \div (\Delta)t$ **AND** Δp is change in momentum, $(\Delta)t$ is time (taken) **OR** $F = \Delta\{mv\} \div (\Delta)t$ **AND** $\Delta\{mv\}$ is change in momentum, $(\Delta)t$ is time (taken) **OR** force = rate of change in momentum **OR** force = change in momentum divided by time (taken)	**A2**
	$F = \Delta p \div (\Delta)t$ **OR** $F = \Delta\{mv\} \div (\Delta)t$ **OR** $F = I \div (\Delta)t$	C1

Question	Answer	Marks
4(a)(i)	convection	**B1**
4(a)(ii)	warm air rises **OR** less dense air rises	**B1**
	warm air is less dense (than cool air) ORA	**B1**
	any **one** from: • cold air replaces warm air • cold air falls and the process repeats owtte • there is a convection current owtte	**B1**
4(b)(i)	$P = IV$ **OR** $(I =)\ P \div V$	**B1**
	2.0 kW = 2000 W **OR** $2000 \div 230$	**B1**

Question	Answer	Marks
4(b)(ii)	10 (A) **AND** any **one** from: • smaller fuse melts in normal use (of the heater) owtte • smaller fuse stops the heater working (at all) • larger fuse allows too much current (without melting) • larger fuse may not melt before the circuit is damaged • fuse (rating) must be higher than the (normal) current • the fuse will melt if current goes too high owtte	**A2**
	any **one** from: • 10 (A) • 13 (A) **AND** fuse (rating) must be higher than (normal) current • 13 (A) **AND** 3 A / 5 A fuse melts in normal use owtte	C1

Question	Answer	Marks
5(a)	(refractive index is) the ratio of the speed of light in two different regions owtte **OR** (refractive index =) $\frac{\text{speed of light in air}}{\text{speed of light in (soap) film}}$	**B1**
5(b)(i)	$n = \frac{\sin i}{\sin r}$ **OR** $(r =) \sin^{-1}\left\{\frac{\sin i}{n}\right\}$ **OR** $1.28 = \frac{\sin 60}{\sin r}$	**B1**
	$i = 60$ (°)	**B1**
5(b)(ii)	normal drawn (at the point incident ray meets film)	**M1**
	refracted ray drawn (refraction towards normal in film) and angle of refraction labelled braille: angle identified but not labelled	**A1**
5(c)(i)	(light of) a single frequency	**B1**

Question	Answer	Marks
5(c)(ii)	4.4×10^{14} Hz	**A3**
	(speed of light / e-m waves is approximately) 3.0×10^{8} m / s (in air)	C1
	$v = f\lambda$ **OR** (f =) $3.0 \times 10^{8} \div 680 \times 10^{-9}$	C1

Question	Answer	Marks
6(a)	any **one** from: • magnetic materials are attracted to magnets • non-magnetic materials are not attracted to magnets • magnetic materials experience a force in magnetic fields • non-magnetic materials don't experience a force in magnetic fields	**B1**
6(b)	any **one** from: • steel as it stays magnetised • steel makes a permanent magnet	**B1**
6(c)	N and S poles correctly labelled braille: north to south owtte	**B1**
6(d)	field lines close(r) indicates strong(er) (magnetic) field owtte ORA	**B1**

Question	Answer	Marks
7(a)(i)	diode	**B1**
	there is only a current (in diode) when the voltage is increased in one direction owtte **OR** only a current in one direction	**B1**
7(a)(ii)	 braille: symbol A identified	**B1**

Question	Answer	Marks
7(b)(i)	59 Ω	**A2**
	$V = IR$ **OR** $(R =)\ V \div I$ **OR** $(R =)\ 230 \div 3.9$	C1
7(b)(ii)	270 000 J **OR** 2.7×10^5 J	**A3**
	$(E =)\ IVt$	C1
	$(t =)\ 5 \times 60$ seen	C1
7(b)(iii)	7.8 A	**B1**
	any **one** from: • identical heaters (each with p.d. of 230 V) so 3.9 A in each branch • $I = I_1 + I_2$ • $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ in any form	**B1**

Question	Answer	Marks
8(a)(i)	(A is carbon) brushes	**B1**
	(B is) slip rings	**B1**
8(a)(ii)	strengthens the magnetic field (of the magnet)	**B1**
8(b)	graph is sinusoidal with positive and negative e.m.f.	**B1**
	graph shows minimum of one cycle completed in 0.5 s	**B1**
	e.m.f. is a maximum at 0.00 s, curves to a minimum at 0.25 s and curves to maximum at 0.50 s **OR** e.m.f. is a minimum at 0.00 s and curves to a maximum at 0.25 s and curves to a minimum at 0.50 s braille: e.m.f. starts at time zero at either maximum or minimum value	**B1**

Question	Answer	Marks
8(c)(i)	**either:** less power loss (for same power transmission) **AND** (because) $P = I^2R$ **OR** low current (for same power transmission) **AND** (allows) thinner / cheaper cables	**A2**
	any **one** from: • less power loss (for same power transmission) • $P = I^2R$ • low current (for same power transmission) • thinner / cheaper cables	C1
8(c)(ii)	5400	**A2**
	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$ **OR** $(N_s =) \frac{N_p V_s}{V_p}$ **OR** $(N_s =) \frac{450 \times 300\,000}{25\,000}$	C1

Question	Answer	Marks
9(a)(i)	(stable isotope) has fewer neutrons **AND** radioactive isotopes (usually) have an excess of neutrons **OR** (stable isotope) has fewer neutrons AND radioactive isotopes are <u>too</u> heavy	**A2**
	any **one** from: • (stable isotope) has fewer neutrons • radioactive isotopes (usually) have more neutrons • radioactive isotopes are <u>too</u> heavy	C1
9(a)(ii)	$^{90}_{39}Y$	**B1**
	$^{0}_{-1}\beta$	**B1**
9(a)(iii)	<u>ionising</u> radiation is harmful (to humans) **OR** beta particles are <u>ionising</u> and harmful (to humans)	**A2**
	any **one** from: • radiation is / beta particles are harmful • beta particles ionise • it ionises **AND** is harmful	C1
9(b)(i)	$72 \leqslant$ half-life $\leqslant 76$ (h) braille: 80 h (mark based on candidate choice of halving)	**A3**
	evidence of count rate halved e.g. $48 \div 2 = 24$	C1
	evidence on graph or in working that Fig. 9.1 is used to find time for count rate to halve	C1
9(b)(ii)	any **one** from: • table includes <u>background</u> radiation owtte • graph does not have <u>background</u> count rate owtte • graph has <u>corrected</u> count rate	**B1**

Question	Answer	Marks
10(a)	Jupiter is gaseous	**B1**
	Earth is rocky	**B1**
10(b)(i)	(gravitational) force per unit mass **OR** (g =) $\frac{\text{weight}}{\text{mass}}$ in this form	**A2**
	(gravitational) force on a mass **OR** $W = mg$	C1
10(b)(ii)	mass	**B1**
10(c)	(orbital speed of) Jupiter is slower ORA	**B1**
	Jupiter is further from the Sun ORA **OR** orbital speeds of planets decrease as distance from the Sun increases ORA	**B1**
	gravitational field (strength) of Sun decreases with distance (from Sun) ORA	**B1**