Cambridge International AS & A Level

PHYSICS **9702/21**

Paper 2 AS Level Structured Questions **October/November 2025**

MARK SCHEME

Maximum Mark: 60

Published

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Question	Answer	Marks
1(a)	rate of change of velocity	**B1**
1(b)(i)	acceleration = 320 / 20 = 16 m s^{-2}	**A1**
1(b)(ii)	$s = \frac{1}{2}((u) + v)t$ **or** distance = area under graph	**C1**
	(height) = $\frac{1}{2} \times 20 \times 320 = 3200$ m **or** 3.2 km	**A1**
1(c)(i)	$(\Delta E_P) = mg\Delta h$	**C1**
	$= 2.9 \times 10^6 \times 9.81 \times 3200$ $= 9.1 \times 10^{10}$ J	**A1**
1(c)(ii)	$(\Delta E_K) = \frac{1}{2} m\Delta(v^2)$	**C1**
	$= \frac{1}{2} \times 2.9 \times 10^6 \times 320^2$ $= 1.5 \times 10^{11}$ J	**A1**
1(c)(iii)	(power =) work done / time	**C1**
	power $= ((1.5 + 0.91) \times 10^{11}) / 20$ $= 1.2 \times 10^{10}$ W	**A1**

Question	Answer	Marks
2(a)(i)	(normal) force per (unit cross-sectional) area	**B1**
2(a)(ii)	(due to difference in depth there is a) difference in pressure between top and bottom (of ball)	**B1**
	(due to pressure difference, upwards) force on bottom of ball is greater (than downwards force on top of ball, so resultant force is upwards)	**B1**
2(b)(i)	arrow vertically downwards labelled 'weight'	**B1**
	arrow vertically upwards labelled 'upthrust'	**B1**
	arrow vertically upwards labelled '(viscous) drag'	**B1**
2(b)(ii)	SI base units of D: kg m s^{-2}	**C1**
	base units of η: kg m s^{-2} / (m $\times$ m s^{-1}) = kg m^{-1} s^{-1}	**A1**
2(c)(i)	upthrust = $920 \times (4 / 3) \times \pi \times (4.2 \times 10^{-3})^3 \times 9.81 = 2.8 \times 10^{-3}$ (N)	**A1**
2(c)(ii)	weight = drag + upthrust	**C1**
	$(2.4 \times 10^{-3} \times 9.81) = (2.8 \times 10^{-3}) + (6\pi \times 4.7 \times 4.2 \times 10^{-3} \times v)$	**C1**
	$v = 0.056$ m s^{-1}	**A1**

Question	Answer	Marks
3(a)	ratio of stress to strain	**B1**
3(b)(i)	$R_0 = \rho L / A$	**A1**
3(b)(ii)	$k = F / x$	**C1**
	$E = FL / Ax = ((F / x) \times (L / A)) = kL / A$ leading to $k_0 = EA / L$	**A1**
3(c)(i)	straight line with positive gradient starting at (0, R_0)	**B1**
3(c)(ii)	straight horizontal line starting at (0, k_0)	**B1**
3(d)(i)	$L = [0.034 \times \pi \times (0.80 \times 10^{-3})^2] / 1.8 \times 10^{-8} = 3.8$ (m)	**A1**
3(d)(ii)	$k = [1.3 \times 10^{11} \times \pi \times (0.80 \times 10^{-3})^2] / 3.8$ **or** $k = EA / [RA / \rho] = E\rho / R$ $= [1.3 \times 10^{11} \times 1.8 \times 10^{-8}] / 0.034$	**C1**
	$k = 6.9 \times 10^4$ N m^{-1}	**A1**

Question	Answer	Marks
4(a)	wave passing through gap / aperture	**B1**
	(wave) spreads (out)	**B1**
4(b)(i)	$n\lambda = d \sin\theta$	**C1**
	$\theta = \sin^{-1}[(540 \times 10^{-9}) / (5.0 \times 10^{-6})] = 6.2°$	**A1**
4(b)(ii)	$\theta = 12°$	**A1**
4(b)(iii)	peaks / maxima shown at $\theta = 0$, ±6° and ±12°	**B1**
	peaks / maxima and zero intensity in between	**B1**
	central peak / maxima at intensity I_0 and the other peaks all equal to or less than I_0	**B1**
4(c)	peaks / maxima all at the same angles (as before)	**B1**
	intensity (of all peaks / maxima) halved	**B1**

Question	Answer	Marks
5(a)	sum of current(s) into junction = sum of current(s) out junction **or** (algebraic) sum of current(s) at a junction is zero	**B1**
5(b)(i)	line with negative gradient	**C1**
	line from 0 °C to 100 °C, starting at (0, R_0) with negative gradient throughout and never reaching $R = 0$	**A1**
5(b)(ii)	(resistance of T decreases so) total resistance (of circuit) decreases	**B1**
	current in cell increases (so p.d. across internal resistance increases)	**B1**
	terminal p.d. decreases (and resistance of R is constant) so current in R decreases	**B1**
5(c)(i)	p.d. across r $= 1.50 - (6.00 \times 0.200)$ $(= 0.30\ \text{V})$	**C1**
	current in cell $= 0.30 / 0.12$ $= 2.5\ \text{A}$	**A1**
5(c)(ii)	current in thermistor $= 2.5 - 0.200$ $(= 2.3\ \text{A})$	**C1**
	resistance of T $= (6.00 \times 0.200) / 2.3$ $= 0.52\ \Omega$	**A1**

Question	Answer	Marks
6(a)(i)	numbers of protons and electrons both = 1	**A1**
	number of neutrons = 2	**A1**
6(a)(ii)	diagram shows 2 neutrons and 1 proton labelled and forming a nucleus	**B1**
	diagram shows 1 electron labelled and separated from the nucleus (not touching the proton and neutrons)	**B1**
6(b)(i)	helium nucleus: top line = 3 **and** bottom line = 2	**A1**
	beta particle: top line = 0 **and** bottom line = –1	**A1**
6(b)(ii)	(electron) antineutrino	**B1**
6(c)	proton: up up down **or** neutron: up down down	**C1**
	(tritium:) 4 up, 5 down	**A1**