Cambridge International AS & A Level

PHYSICS **9702/22**

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

MARK SCHEME

Maximum Mark: 60

Published

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Question	Answer	Marks
1(a)	air temperature: K **and** air pressure: kg m^{-1} s^{-2}	**B1**
	scalar only ticked for both air temperature and air pressure	**B1**
1(b)(i)	upthrust $= 1.1 \times 9.81 \times (4\pi \times 0.90^3 / 3)$	**C1**
	$= 33$ N	**A1**
1(b)(ii)	(due to difference in height / depth there is a) difference in pressure between top and bottom (of balloon)	**B1**
	(due to pressure difference, upwards) force on bottom of balloon is greater (than downwards force on top of balloon, so resultant force is upwards)	**B1**
1(b)(iii)	$(\Sigma)F = 33 - 19$ $(= 14$ N)	**C1**
	$m = 19 / 9.81$ $(= 1.94$ kg)	**C1**
	$a = (33 - 19) / (19 / 9.81)$ $= 7.2$ m s^{-2}	**A1**
1(c)	$5 + 3 + (2 \times 4)$ $(= 16\%)$	**C1**
	absolute uncertainty in $c = 1.8 \times 0.16$ $= (\pm) 0.3$	**A1**

Question	Answer	Marks
2(a)(i)	60 × 1.6 (= 96 N m) **or** 220 × 0.40 (= 88 N m)	**C1**
	resultant moment = 96 – 88 = 8.0 N m	**A1**
2(a)(ii)	the resultant force (of A and C) is not zero **or** forces (from A and C) are not parallel **or** forces (from A and C) are not equal (magnitude) **or** forces (from A and C) are not opposite (direction) **or** forces (from A and C) act through the same point so (they are) not a couple	**B1**
2(b)	line with a positive gradient from (t_1, 0) to t_2	**B1**
	line with increasing positive gradient from t_1 to t_2	**B1**
2(c)(i)	sum / total momentum before = sum / total momentum after **or** sum / total momentum (of a system of objects) is constant	**M1**
	if no (resultant) external force / for an isolated system	**A1**

Question	Answer	Marks
2(c)(ii)	$(\Delta)p = F(\Delta)t$	C1
	$m = Ft / (\Delta)v$ $(m =)\ 5500 \times 0.36 / 8.5 = 230$ (kg)	A1
	or	
	$F = ma$ **and** $a = (\Delta)v / (\Delta)t$	(C1)
	$(m =)\ 5500 / (8.5 / 0.36) = 230$ (kg)	(A1)
2(c)(iii)	$(\Delta p =)\ 5500 \times 0.36$ (= 1980 N s) **or** $(\Delta p =)\ 230 \times 8.5$ (= 1955 N s)	C1
	$1980 = (2.5 \times 10^3 - 230)\Delta v$ **or** $1955 = (2.5 \times 10^3 - 230)\Delta v$	C1
	$\Delta v = 0.87\ \text{m s}^{-1}$ **or** $0.86\ \text{m s}^{-1}$	A1
	or	
	$a = 5500 / (2.5 \times 10^3 - 230)$ $(= 2.42\ \text{m s}^{-2})$	(C1)
	$\Delta v = 2.42 \times 0.36$	(C1)
	$\Delta v = 0.87\ \text{m s}^{-1}$ **or** $0.86\ \text{m s}^{-1}$	(A1)

Question	Answer	Marks
3(a)	an arrow horizontally on the page to the left labelled F	**B1**
	two arrows horizontally on the page to the right each labelled T	**B1**
3(b)(i)	$T = 110 / 2$ $= 55$ N	**A1**
3(b)(ii)	$x = F / k$	**C1**
	$= 110 / 250$ $= 0.44$ m	**A1**
3(c)(i)	extension $= 55 / 250$ **or** $110 / (2 \times 250)$	**C1**
	extension $= 0.22$ m	**A1**
3(c)(ii)	$E = \frac{1}{2} Fx$ **or** $E = \frac{1}{2} kx^2$ **or** $E = \frac{1}{2} F^2 / k$	**C1**
	$E_1 / E_2 = (\frac{1}{2} \times 110 \times 0.44) / (2 \times (\frac{1}{2} \times 55 \times 10.22))$ **or** $E_1 / E_2 = (\frac{1}{2} k \times 0.44^2) / (2 \times (\frac{1}{2} k \times 0.22^2))$ **or** $E_1 / E_2 = (\frac{1}{2} \times 110^2 / k) / (2 \times (\frac{1}{2} \times 55^2 / k))$ $E_1 / E_2 = 2.0$ (no ECF from **3(b)(ii)** and **3(c)(i)**)	**A1**

Question	Answer	Marks
4(a)	light diffracts / spreads (at slit(s))	**B1**
	light (from each slit) superposes / interferes (at screen)	**B1**
	when phase difference is 0 / path difference is $n\lambda$ (where n is an integer) a bright fringe is formed **or** when phase difference is 180(°) / path difference is $(n + 1)\lambda / 2$ (where n is an integer) a dark fringe is formed	**B1**
4(b)	$\lambda = ax / D$	**C1**
	$\lambda = 1.0 \times 10^{-3} \times 3.3 \times 10^{-3} / 4.8$ $(= 6.875 \times 10^{-7}$ m)	**C1**
	$f = v / \lambda$	**C1**
	$= 3.0 \times 10^{8} / 6.875 \times 10^{-7}$ $= 4.4 \times 10^{14}$ Hz	**A1**
4(c)	the light / beams (have different frequencies so) are not coherent / do not have constant phase difference	**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)	$(V =) E - Ir$	**C1**
	$(V =) 5.0 - (38 \times 10^{-3} \times 4.7) = 4.8$ (V)	**A1**
5(b)(ii)	$R_{(Z)} = 120\ \Omega$	**C1**
	$I_2 = 38 \times 10^{-3} - (4.8 / (100 + 120))$	**C1**
	$I_2 = 0.016$ A	**A1**
	or	
	$R_{(Z)} = 120\ \Omega$	**(C1)**
	$R_{(EXT)} = 4.8 / 38 \times 10^{-3}$ $(= 126\ \Omega)$ $1 / R_{(Y)} = 1 / 126 - 1 / (120 + 100)$ $(R_{(Y)} = 297\ \Omega)$ $I_2 = 4.8 / 297$	**(C1)**
	$I_2 = 0.016$ A	**(A1)**

Question	Answer	Marks
5(b)(iii)	$P = IV$ **or** $P = I^2R$ **or** $P = V^2 / R$	**C1**
	$P = 0.016 \times 4.8$ **or** $P = 0.016^2 \times (4.8 / 0.016)$ **or** $P = 4.8^2 / (4.8 / 0.016)$ $P = 0.077$ W	**A1**
5(b)(iv)	resistance of the LDR / Z increases (as light intensity decreases)	**B1**
	total resistance (of the circuit) increases **or** current in the battery decreases	**M1**
	(potential difference across the internal resistor decreases so) the terminal potential difference increases	**A1**

Question	Answer	Marks
6(a)	(a particle that) cannot be divided / subdivided (into smaller particles)	**B1**
6(b)(i)	any combination of one quark and one antiquark	**C1**
	up / charm / top **and** antiup / anticharm / antitop **or** down / strange / bottom **and** antidown / antistrange / antibottom	**A1**
6(b)(ii)	$E_{(K)} = \frac{1}{2} mv^2$	**C1**
	$2.1 \times 10^{-16} = \frac{1}{2} \times 0.67 \times 1.66 \times 10^{-27} \times v^2$	**C1**
	$v = 6.1 \times 10^5$ m s^{-1}	**A1**
6(c)(i)	number of electrons = 88	**A1**
6(c)(ii)	(number of nucleons = 228 – 5 × 4 = 208) number of protons = 88 – (5 × 2) + 4 = 82	**A1**
	number of neutrons= 208 – 82 = 126 = 126	**A1**