Cambridge Assessment International Education

Cambridge International AS & A Level

PHYSICS **9702/23**

Paper 2 AS Level Structured Questions **May/June 2021**

MARK SCHEME

Maximum Mark: 60

Published

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[Turn over

Question	Answer	Marks
1(a)(i)	two correct scalar quantities e.g. time, mass, distance, temperature	**B1**
	two correct vector quantities e.g. force, acceleration, velocity, displacement	**B1**
1(a)(ii)	magnitude	**B1**
	unit	**B1**
1(b)(i)	north component of velocity = 11 m s^{-1}	**A1**
	east component of velocity = 7.5 m s^{-1}	**A1**
1(b)(ii)	velocity = 7.5 – 2.7 = 4.8 m s^{-1}	**A1**
1(b)(iii)	velocity = $\sqrt{(11^2 + 4.8^2)}$	**C1**
	= 12 m s^{-1}	**A1**
1(b)(iv)	angle = $\tan^{-1}$ (4.8 / 11)	**C1**
	= 24°	**A1**

Question	Answer	Marks
2(a)	change in velocity / time (taken)	**B1**
2(b)(i)	air resistance increases (with speed/with time)	**B1**
	resultant force decreases (as speed increases/with time) so acceleration decreases (as speed increases/with time)	**B1**
	when air resistance equals the weight the speed/velocity/v becomes constant	**B1**
2(b)(ii)	speed = 36 m s^{-1}	**A1**
2(b)(iii)	height given by area under the curve	**C1**
	height = 950 m *Round to two significant figures and award 2 marks for a value in the range 920–980 m and 1 mark for a value in the range 900–910 m or 990–1000 m.*	**A2**
2(b)(iv)	line starting at (0, 9.8)	**B1**
	curve with negative gradient between t = 0 and t = 20 s	**B1**
	line showing zero acceleration between t = 20 s and t = 30 s	**B1**

Question	Answer	Marks
3(a)	force × distance	**M1**
	perpendicular distance of (line of action of) force from the point	**A1**
3(b)(i)	distance moved by pointer = 123 – 86 (= 37 mm)	**C1**
	(extension =) 37 × (1.8 / 52.6) = 1.3 (mm) **or** sin or tan θ = 37 / 526 (so θ = 4.0° so extension =) sin or tan θ × 18 = 1.3 (mm)	**A1**
3(b)(ii)	moment = $0.472 \times 9.81 \times 6.2 \times 10^{-2}$	**C1**
	= 0.29 N m	**A1**
3(b)(iii)	$(\Delta)F \times 1.8 \times 10^{-2} = 0.29$	**C1**
	ΔF = 16 N	**A1**
3(b)(iv)	$k = F / x$	**C1**
	= $16 / (1.3 \times 10^{-3})$ = 1.2×10^{4} N m^{-1}	**A1**

Question	Answer	Marks
4(a)	(when two or more) waves meet/overlap (at a point)	**B1**
	(resultant) displacement is sum of the individual displacements	**B1**
4(b)	intensity $\propto$ amplitude^2	**C1**
	maximum intensity = $9I$	**A1**
4(c)(i)	$x = \lambda D / a$	**C1**
	$= (550 \times 10^{-9} \times 1.2) / (0.35 \times 10^{-3})$	**C1**
	$= 1.9 \times 10^{-3}$ m	**A1**
4(c)(ii)	red light has longer wavelength (than 550 nm) so distance (between fringes) increases	**B1**

Question	Answer	Marks
5(a)	energy per unit charge	**B1**
	energy transferred by source driving charge around the complete circuit **or** energy transferred from other forms to electrical energy	**B1**
5(b)	there is a p.d. across the internal resistance/r	**B1**
	change in current/I results in a change in p.d. across the internal resistance	**B1**
	$V = E$ – p.d. across internal resistance **or** change in p.d. across r causes a change in V (as e.m.f. is constant)	**B1**
5(c)(i)	$E = 7.4$ V	**A1**
5(c)(ii)	maximum current = 0.92 A	**A1**
5(c)(iii)	$r = E / I_{MAX}$ **or** (–)gradient	**C1**
	e.g. $r = 7.4 / 0.92$ $= 8.0\ \Omega$	**A1**
5(d)	straight line with negative gradient that is smaller in magnitude than the original line	**B1**
	line which would have intercept on V-axis below the original line	**B1**

Question	Answer	Marks
6(a)(i)	up up down	**B1**
6(a)(ii)	up down down	**B1**
6(a)(iii)	(alpha-particle is) 2 protons and 2 neutrons	**C1**
	6 up, 6 down	**A1**
6(b)(i)	most of an atom is empty space **or** the nucleus (volume) is (very) small compared with the atom	**B1**
6(b)(ii)	the nucleus is charged	**B1**
	the majority of the mass of atom is in the nucleus	**B1**
6(c)	$F = Eq$ **and** $a = F / m$	**C1**
	$a = Eq / m$ ratio = $(e / m) / (2e / 4m)$ = 2	**A1**