



Cambridge International AS & A Level

PHYSICS**9702/COMP**

Paper 2 AS Level Structured Questions

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MARK SCHEME

Maximum Mark: 60

Published

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This document consists of **13** printed pages.

Question	Answer	Mark
1(a)	acceleration: vector work: scalar power: scalar <i>Three correct scores 2 marks. Two correct scores 1 mark.</i>	B2
1(b)(i)	$a = (v - u) / t$ or $a = \text{gradient}$ or $a = \Delta v / (\Delta)t$ e.g. $a = (1.40 - 0.70) / 4.0$	C1
	$= 0.18 \text{ m s}^{-2}$	A1
1(b)(ii)	distance $= 0.5 \times (0.70 + 1.40) \times 4.0$ or $(0.70 \times 4.0) + (0.5 \times 0.70 \times 4.0)$	C1
	$= 4.2 \text{ m}$	A1
1(c)(i)	(force equal to) rate of change of momentum	B1
1(c)(ii)	horizontal line starting from $t = 0$ and ending at $t = 4.0 \text{ s}$ at a positive value of F	B1
	horizontal line starting from $t = 4.0 \text{ s}$ and ending at $t = 8.0 \text{ s}$ at $F = 0$	B1
	horizontal line starting from $t = 8.0 \text{ s}$ and ending at $t = 12.0 \text{ s}$ at a negative value of F <u>and</u> the magnitude of F is larger than from $t = 0$ to 4.0 s	B1

Question	Answer	Mark
2(a)	force $\times$ displacement in the direction of the force	B1
2(b)(i)	$E = \frac{1}{2}mv^2$	C1
	(m $\Rightarrow$) $23 \times 2 / 16^2 = 0.18$ (kg)	A1
2(b)(ii)	$(\Delta)E = mg(\Delta)h$	C1
	$60 = 0.18 \times 9.81 \times h$	
	$h = 34$ m	A1
2(b)(iii)	(work done $\Rightarrow$) $60 - 23$ $= 37$ (J)	C1
	average resistive force $= 37 / 34$ $= 1.1$ N	A1
2(c)	air resistance (acting on ball) increases	B1
	resultant force (on ball) decreases or weight constant and air resistance increases	B1
	acceleration decreases	B1

Question	Answer	Mark
3(a)	Hooke's (law)	B1
3(b)(i)	$k = F / x$ or $k = \text{gradient}$ e.g. $k = 7.0 / 5.0 \times 10^{-2}$	C1
	$= 140 \text{ N m}^{-1}$	A1
3(b)(ii)	$E = \frac{1}{2} F x$ or $E = \frac{1}{2} k x^2$ or $E = \text{area under graph}$ $= \frac{1}{2} \times 5.6 \times 4.0 \times 10^{-2}$ or $\frac{1}{2} \times 140 \times (4.0 \times 10^{-2})^2$	C1
	$= 0.11 \text{ J}$	A1
3(c)(i)	(upthrust) $= 6.20 - 5.60 = 0.60 \text{ (N)}$	A1
3(c)(ii)	$\Delta p = \Delta F / A$ $= 0.60 / 1.2 \times 10^{-3}$	C1
	$= 500 \text{ Pa}$	A1
3(c)(iii)	$(\Delta)p = \rho g(\Delta)h$ $\rho = 500 / (9.81 \times 5.8 \times 10^{-2})$	C1
	$= 880 \text{ kg m}^{-3}$	A1
3(d)(i)	(upthrust) increases	B1
3(d)(ii)	(extension) decreases	B1

Question	Answer	Mark
4(a)	(two or more) waves <u>meet</u> (at a point)	B1
	(resultant) displacement is the sum of the individual displacements	B1
4(b)(i)	it is a (wave) reflector / it reflects (the wave)	B1
4(b)(ii)	$v = f\lambda$ or $c = f\lambda$	C1
	$f = 3.0 \times 10^8 / 0.040$ $= 7.5 \times 10^9$ (Hz) $= 7.5 \times 10^9 / 10^9$ (GHz)	C1
	$= 7.5$ GHz	A1
4(b)(iii)	1 distance = 0.020 m	A1
	2 number = 5	A1

Question	Answer	Mark
5(a)	$f_o = f_s v / (v + v_s)$	C1
	$f_o = 951 \times 330 / (330 + 12)$	
	$= 918$ Hz	A1
5(b)	$t = d / 12$	C1
	$= (\pi \times 2.4) / 12$	
	$= 0.63$ s	A1

Question	Answer	Mark
6(a)	<u>sum of</u> current(s) into junction = <u>sum of</u> current(s) out of junction or (algebraic) sum of current(s) at a junction is zero	B1
6(b)(i)	$I = 3.6 - 2.1$ $= 1.5$	C1
	$V = 4.4$	C1
	$R = 4.4 / 1.5$ $= 2.9 \Omega$	A1
6(b)(ii)	$12.0 = 4.4 + 3.6r$ or $12.0 = 3.6 (1.2 + r)$	C1
	$r = 2.1 \Omega$	A1
6(b)(iii)	$t = (470 \times 10^3 - 240 \times 10^3) / (12 \times 3.6)$	C1
	$= 5300 \text{ s}$	A1
6(b)(iv)	$I = Anvq$ ratio = $(360A / A) \times (2.5n / n)$ or 360×2.5	C1
	$= 900$	A1

Question	Answer	Mark
7(a)(i)	most of the atom is empty space or the nucleus (volume) is very small <u>compared to the atom</u>	B1
7(a)(ii)	the nucleus is charged	B1
	the mass is <u>concentrated</u> in nucleus / small region / small volume / small core or the <u>majority</u> of the mass is in nucleus / small region / small volume / small core	B1
7(b)(i)	proton number = 84	A1
	nucleon number = 214	A1
7(b)(ii)	up down down changes to up up down / udd → uud or down changes to up / d → u	B1