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PHYSICS

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Paper 2 AS Level Structured Questions

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MARK SCHEME

Maximum Mark: 60

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This document consists of **12** printed pages.

Question	Answer	Marks
1(a)	density and temperature indicated as scalars	B1
	acceleration and momentum indicated as vectors	B1
1(b)(i)	decelerates or speed/velocity decreases	B1
1(b)(ii)	speed = $(\Delta)d / (\Delta)t$ or gradient = e.g. $(0.56 - 0.20) / 1.5$ = 0.24 m s^{-1}	C1 A1
1(c)	displacement is zero (so) average velocity is zero	B1

Question	Answer	Marks
2(a)(i)	$(\Delta)p = \rho g(\Delta)h$ $520 = 1000 \times 9.81 \times h$ $h = 0.053 \text{ m}$	C1 A1
2(a)(ii)	(upthrust =) $(\Delta)p \times A$ = $(\Delta)p \times \pi(d/2)^2$ or $(\Delta)p \times \pi r^2$ = $520 \times \pi(0.031/2)^2 = 0.39 \text{ (N)}$	C1 A1
2(a)(iii)	$T = 0.84 - 0.39$ = 0.45 N	A1

Question	Answer	Marks
2(b)(i)	$a = (v - u) / t$ or $(\Delta)v / (\Delta)t$ or gradient	C1
	= e.g. $8.0 \times 10^{-2} / 2.0$	A1
	= $4.0 \times 10^{-2} \text{ m s}^{-2}$	
2(b)(ii)	distance = $(\frac{1}{2} \times 2.5 \times 0.10) + (\frac{1}{2} \times 1.5 \times 0.10)$ or $(\frac{1}{2} \times 4.0 \times 0.10)$ (= 0.20 (m))	C1
	depth = $0.32 - 0.20$	A1
	= 0.12 m	
2(c)(i)	viscous (force)	B1
2(c)(ii)	viscous force increases (with speed/time/depth)	B1
	(so) acceleration decreases	B1

Question	Answer	Marks
3(a)(i)	$F = kx$	C1
	$F_1 = 800 \times 0.045$ $= 36 \text{ N}$	A1
3(a)(ii)	$(E =) \frac{1}{2}kx^2$ or $\frac{1}{2}Fx$ or area under graph	C1
	$\frac{1}{2} \times 800 \times (0.045)^2$ or $\frac{1}{2} \times 36 \times 0.045 = 0.81 \text{ (J)}$	A1
3(b)(i)	efficiency = $(0.72 / 0.81) \times 100$ $= 89\%$	A1
3(b)(ii)	$E = \frac{1}{2}mv^2$	C1
	$p = mv$	C1
	$0.72 = \frac{1}{2} \times 0.020 \times v^2$ and $p = 0.020 \times v$ $p = 0.17 \text{ N s}$	A1
3(c)(i)	$(\Delta)E = mg(\Delta)h$	C1
	$h = 0.60 / (0.020 \times 9.81) = 3.1 \text{ m}$	A1
3(c)(ii)	$F = (0.72 - 0.60) / 3.1$ $= 0.039 \text{ N}$	C1
	$= 0.039 \text{ N}$	A1
3(c)(iii)	resultant force on ball is less (than that with air resistance) so time (taken) is more (than 7)	B1

Question	Answer	Marks
4(a)	(component =) $96 \sin 38^\circ = 59 \text{ (N)}$ or $96 \cos 52^\circ = 59 \text{ (N)}$	A1
4(b)	(45×2.9) or $(T \times 1.8)$ or (59×1.5)	C1
	$(45 \times 2.9) = (T \times 1.8) + (59 \times 1.5)$	C1
	$T = 23 \text{ N}$	A1

Question	Answer	Marks
5(a)	$v = f\lambda$ or $c = f\lambda$	C1
	$f = 3.0 \times 10^8 / 0.040$	C1
	$= 7.5 \times 10^9 \text{ (Hz)}$ $= 7.5 \text{ GHz}$	A1
5(b)(i)	path difference = 0.020 m	A1
5(b)(ii)	phase difference = 180°	A1
5(c)	(intensity) increases	C1
	(intensity) increases by a factor of 4	A1
5(d)(i)	minimum moves closer to the maximum or decrease in separation of maximum and minimum	B1
5(d)(ii)	the maximum and minimum exchange places or the maximum becomes a minimum and the minimum becomes a maximum	B1

Question	Answer	Marks
6(a)	$I = I_1 + I_2 + I_3$	B1
	$(V/R) = (V/R_1) + (V/R_2) + (V/R_3)$ or $(I/V) = (I_1/V) + (I_2/V) + (I_3/V)$ and $1/R = 1/R_1 + 1/R_2 + 1/R_3$	B1
6(b)(i)	current = $0.49 + 0.45$ $= 0.94 \text{ A}$	A1
6(b)(ii)	$8.0 = (0.94 \times r) + (0.45 \times 16)$	C1
	$r = 0.85 \Omega$	A1
6(c)	$I = Anvq$ $v = (0.45/0.49) \times 2.1 \times 10^{-4}$ $= 1.9 \times 10^{-4} \text{ m s}^{-1}$	C1
		A1
6(d)	total/combined resistance decreases	B1
	(current in battery increases so terminal) potential difference decreases	B1

Question	Answer	Marks
7(a)	similarity: same/equal mass or same/equal (magnitude of) charge or both fundamental (particles)	B1
	difference: opposite (sign of) charge or one is matter and the other is antimatter	B1
7(b)(i)	arrow points to the right	B1
7(b)(ii)	(electric) field strength increases or (electric) force increases acceleration increases	B1
7(b)(iii)	force (on α -particle) has twice the magnitude (of force on electron)	B1
	force (on α -particle) is in opposite direction (to force on electron)	B1