Question	Answer	Marks
2(b)(iii)	$(\Delta)E = mg(\Delta)h$ $= 0.45 \times 9.81 \times 1.6$	**C1**
	$= 7.1$ J	**A1**
2(b)(iv)	air resistance increases (and weight constant)	**B1**
	(resultant force decreases so) acceleration decreases	**B1**

Question	Answer	Marks
3(a)	force × displacement in the direction of the force	**B1**
3(b)(i)	displacement = 4.4×30	**C1**
	work done = $140 \cos 30° \times 4.4 \times 30$	**C1**
	$= 1.6 \times 10^4$ J	**A1**
3(b)(ii)	$p = F / A$	**C1**
	$F = 860 - 140 \sin 30°$ (= 790)	**C1**
	$A = 790 / 2400$ $= 0.33$ m^2	**A1**
3(b)(iii)	$\sigma = F / A$ or $F / \pi r^2$ or $4F / \pi d^2$	**C1**
	$9.6 \times 10^6 = 4 \times 140 / \pi d^2$ $d = 4.3 \times 10^{-3}$ m	**A1**

Question	Answer	Marks
3(c)	$E = ½Fx$ or $½kx^2$ or area under graph	C1
	$(\Delta)E = ½ \times (140 + 210) \times 0.20 \times 10^{-3}$ or $(\Delta)E = (½ \times 210 \times 0.60 \times 10^{-3}) – (½ \times 140 \times 0.40 \times 10^{-3})$ or $(\Delta)E = (140 \times 0.20 \times 10^{-3}) + (½ \times 0.20 \times 10^{-3} \times 70)$ or $(\Delta)E = [½\times3.5 \times 10^5 \times (0.60 \times 10^{-3})^2] – [½ \times 3.5 \times 10^5 \times (0.40 \times 10^{-3})^2]$	C1
	$\Delta E = 0.035$ J	A1

Question	Answer	Marks
4(a)(i)	distance moved by wavefront / energy during one cycle / vibration / oscillation / period (of source) or minimum distance between two wavefronts or distance between two adjacent wavefronts	B1
4(a)(ii)	maximum displacement (of particle / point on wave)	B1
4(b)(i)	1 light / waves spread (at each slit)	B1
	2 constant phase difference (between light / waves)	B1
4(b)(ii)	$n\lambda = d \sin\theta$	C1
	$d = 3 \times 650 \times 10^{-9} / \sin34°$	C1
	$d = 3.5 \times 10^{-6}$ m	A1
4(b)(iii)	wavelength of blue light is shorter (than 650 nm / red light)	M1
	so angle (between third order diffraction maxima) decreases	A1

Question	Answer	Marks
5(a)	volt / ampere	**B1**
5(b)	$R = \rho L / A$	**C1**
	$L = (1.8 \times 0.38 \times 10^{-6}) / 9.6 \times 10^{-7}$	**C1**
	$= 0.71$ m	**A1**
5(c)(i)	thermal energy is dissipated in resistor Y	**B1**
5(c)(ii)	$V / 1.2 = 1.8 / (1.8 + 0.6)$	**C1**
	$V = 0.90$ V	**A1**
	or	
	$I = 1.2 / (1.8 + 0.6)$ (= 0.50)	**(C1)**
	$V = 0.50 \times 1.8$ $= 0.90$ V	**(A1)**
5(d)(i)	remain the same	**B1**
5(d)(ii)	decrease	**B1**
5(e)(i)	$1 / R = 1 / 1.8 + 1 / 3.6$ $R = 1.2\,\Omega$	**A1**

Question	Answer	Marks
5(e)(ii)	I = 1.2 / (1.2 + 0.60)	C1
	= 0.67 A	A1
	or	
	V_Y = 1.2 × 0.60 / (1.2 + 0.60) (= 0.40)	(C1)
	I = 0.40 / 0.60 = 0.67 A	(A1)

Question	Answer	Marks
6(a)	$E = V / d$ $d = 350 / 1.4 \times 10^4$	C1
	= 0.025 m	A1
6(b)(i)	$E = F / Q$	C1
	$Q = 6.7 \times 10^{-15} / 1.4 \times 10^4$ (= 4.8×10^{-19} C) = ($4.8 \times 10^{-19} / 1.6 \times 10^{-19}$) e	C1
	= 3.0 e	A1
6(b)(ii)	mass = $8.3 \times 10^{-27} / 1.66 \times 10^{-27}$ = 5.0 u	A1
6(b)(iii)	number = 5 – 3 = 2	A1

Question	Answer	Marks
7(a)	made up of quarks (so) not a fundamental particle	**B1**
7(b)(i)	beta plus / β^+ (particle)	**B1**
	(electron) neutrino / $\nu_{(e)}$	**B1**
7(b)(ii)	kinetic energy of nucleus	**B1**
	gamma / γ radiation	**B1**