Question	Answer	Marks
6(a)	energy transferred per (unit) charge (from electrical to other forms)	B1
6(b)	same/equal current (in X and Y)	B1
	$P = I^2R$ (and $R_X > R_Y$) **or** $P = VI$ **and** $V_X > V_Y$	M1
	(so) X (dissipates more power)	A1
6(c)(i)	$I = Q / t$	C1
	= 650 / 540 = 1.2 A	A1
6(c)(ii)	$V = W / Q$ **or** W / It	C1
	= 4800 / 650 **or** 4800 / (1.2 × 540) = 7.4 V	A1
	or	
	$V = P / I$ **and** $P = W / t$	(C1)
	= 8.9 / 1.2 = 7.4 V	(A1)
6(c)(iii)	I = 4.5 + 1.2 (= 5.7 A)	C1
	9.0 = 7.4 + 5.7r **or** 9.0 = 5.7 (1.3 + r) r = 0.28 Ω	A1

Question	Answer	Marks
6(a)(i)	$P = VI$	C1
	I = 36 / 8.0 = 4.5 A	A1
6(a)(ii)	charge = 4.5 × 50 = 225	C1
	number = 225 / 1.6 × 10^{-19} = 1.4 × 10^{21}	A1
6(a)(iii)	$R = V^2 / P$ or $R = V / I$ or $R = P / I^2$ = 8.0^2 / 36 or = 8.0 / 4.5 or = 36 / 4.5^2	C1
	= 1.8 Ω	A1

Question	Answer	Marks
6(b)	$R = \rho L / A$	C1
	L = (1.8 × 0.25 × 10^{-6}) / 1.4 × 10^{-6} = 0.32 m	A1
6(c)	(larger cross-sectional area, same length, same resistivity and so) less resistance	M1
	(same p.d. and more current so) more power (dissipated)	A1
6(d)	current (in wire) is the same	M1
	(same p.d. across wire so) power stays the same	A1

Question	Answer	Marks
6(a)	$V = V_1 + V_2 + V_3$	B1
	$IR = IR_1 + IR_2 + IR_3$ **or** $(V/I) = (V_1/I) + (V_2/I) + (V_3/I)$ **and** $R = R_1 + R_2 + R_3$	B1
6(b)(i)	$V / 8.0 = 6.0 \times 10^3 / (4.0 \times 10^3 + 6.0 \times 10^3)$ **or** $I = 8.0 / (4.0 \times 10^3 + 6.0 \times 10^3) = 8.0 \times 10^{-4}$ $V = 8.0 \times 10^{-4} \times 6.0 \times 10^3$	C1
	$V = 4.8$ V	A1
6(b)(ii)	total resistance in parallel = 3.0×10^3 (Ω) **or** 3.0 (kΩ)	C1
	current = $8.0 / (3.0 \times 10^3 + 6.0 \times 10^3)$ = 8.9×10^{-4} A	A1
6(c)	thermistor resistance increases	B1
	(thermistor resistance increases so total resistance increases so) current decreases (in battery)	M1
	($P = EI$ and E constant so) power decreases	A1

Question	Answer	Marks
5(a)	(they travel in) opposite directions	B1
5(b)(i)	straight line from A to B, labelled P	B1
	line that is 'mirror image' of given line, labelled Q	B1
5(b)(ii)	$\lambda = 0.80 / 2$ (= 0.40 m)	C1
	$v = \lambda / T$ **or** $v = f\lambda$ **and** $f = 1 / T$	C1
	$v = 0.40 / 0.016$ **or** 62.5×0.40 = 25 m s^{-1}	A1
5(c)(i)	$I_1 / I_0 = \cos^2 30°$	C1
	= 0.75	A1
5(c)(ii)	$I_2 / I_1 = \cos^2 60°$ $I_2 / I_0 = \cos^2 30° \times \cos^2 60°$ **or** $0.75 \times \cos^2 60°$	C1
	= 0.19	A1

Question	Answer	Marks
5(a)(i)	(two) waves travelling (at same speed) in opposite directions overlap	B1
	waves (of the same type) have same frequency/wavelength	B1
5(a)(ii)	phase difference = 0	A1

Question	Answer	Marks
5(b)(i)	$f_O = f_S\, v / v – v_S$ 543 = $f \times$ 334 / (334 – 13)	C1
	f = 522 Hz	A1
5(b)(ii)	(the speed is) decreasing	B1
5(c)(i)	$I \propto A^2$	B1
	$I_T / I_0 = \cos^2 20°$ or $A_T / A_0 = \cos 20°$	C1
	ratio = 0.94	A1
5(c)(ii)	angle = 140°	A1