Mark scheme for Support Worksheet – Topic 5, Worksheet 3

1 **a** As the intensity of light increases the resistance of the LDR decreases and so the potential difference across it decreases; hence the potential difference across *R* increases. [2]

b As the temperature increases the resistance of the thermistor decreases and so the potential difference across it decreases; hence the potential difference across *R* increases. [2]

2 **a** The resistance of A decreases as the current increases; and the resistance of B increases. [2]

b From the graph the voltages at 2.4 A are $18\ \Omega$ and $8.0\ \Omega$; so
$P_A = 2.4 \times 18 = 43.2 \approx 43$ W and $P_B = 2.4 \times 8.0 = 19.2 \approx 19$ W [2]

c The potential difference across the internal resistor is $30 - 8.0 - 18 = 4.0$ V; and so the internal resistance $r = \frac{V}{I} = \frac{4.0}{2.4} = 1.7\ \Omega$ [2]

3 **a** $P = VI$ and so $I = \frac{P}{V} = \frac{12}{6.0} = 2.0$ A [1]

b $R = \frac{V}{I} = \frac{6.0}{2.0} = 3.0\ \Omega$ [1]

c The resistance of AB is $\frac{2R}{3}$ and that of BC is $\frac{R}{3}$. The total resistance of the light bulb and AB must equal that of BC; so $\frac{3}{2R} + \frac{1}{3} = \frac{9+2R}{6R} \Rightarrow R_T = \frac{6R}{9+2R}$.
$\frac{6R}{9+2R} = \frac{R}{3} \Rightarrow 18 = 9 + 2R \Rightarrow R = 4.5\ \Omega$ [2]

4 As the temperature of the thermistor increases its resistance, and hence its potential difference, decreases; therefore the potential difference across the lamp increases; and so does its brightness. [3]

