



2026 Sec 4 Physics Assignment 15B Thermistors & LDR - Answers

1 (a) The I/V ratio of the graph is the **reciprocal** of the resistance of the thermistor. The graph shows that the voltage across the thermistor increases, the current is increasing at a greater rate. Hence, the resistance of the thermistor is decreasing.

(b) (i) $I = 45 \text{ mA} = \mathbf{0.045 \text{ A}}$ **To show on graph with a horizontal dashed line!**

(ii) $R = V / I = 2.0 / 0.045 = 44.4 = \mathbf{44 \Omega}$ (2 sf)

(iii) $P = I^2 R = (0.045)^2 \times 44 = \mathbf{0.090 \text{ W}}$ (2 sf)

2 (a) (i) $\mathbf{600 \Omega}$

(ii) $\mathbf{25 \Omega}$

(b) At ice point, $V_T = 600 / (600 + 25) \times 12 = \mathbf{11.5 \text{ V}}$

At steam point, $V_T = 25 / (25 + 25) \times 12 = \mathbf{6.0 \text{ V}}$

Hence the difference in voltage is $\mathbf{5.5 \text{ V}}$.

(c) The resistance R of the thermistor changes more rapidly in the **range 0°C to 10°C** as the graph shows a **steeper gradient** in that temperature range.

OR compare actual change in values in each range!

3 (a) $V_{LDR} = 5 - 0.21 = 4.79 \text{ V}$ and $V_{\text{resistor}} = 0.21 \text{ V}$

Apply potential divider method: $\frac{R_{LDR}}{R_{LDR} + 10} = \frac{4.79}{5}$

$$5 \cdot R_{LDR} - 4.79 \cdot R_{LDR} = 47.9$$

$$R_{LDR} = \frac{47.9}{0.21}$$

$$R_{LDR} = 228.095 \text{ k}\Omega \approx \mathbf{230 \text{ k}\Omega}$$

(b) $V_{LDR} = 5 - 4.2 = 0.8 \text{ V}$ and $V_{\text{resistor}} = 4.2 \text{ V}$

Apply potential divider method: $\frac{10}{R_{LDR} + 10} = \frac{4.2}{5}$

$$4.2 \cdot R_{LDR} = 50 - 42$$

$$R_{LDR} = \frac{8}{4.2}$$

$$R_{LDR} = 1.905 \text{ k}\Omega = \mathbf{1.9 \text{ k}\Omega}$$

4 (a) When S_1 is closed,

(i) $R_E = R = V / I$

$$= 12 / 0.0060$$

$$= 2000 \Omega$$

(a) When S_2 is closed,

(ii) $R_E = V / I = 12 / 0.0030$

$$= 4000 \Omega$$

$$R_E = (1/2000 + 1/2000)^{-1} + R_T$$

$$1000 + R_T = 4000$$

$$R_T = 3000 \Omega$$

(b) As temperature increases, the resistance of the thermistor decreases.

By potential divider concept, the potential difference across the thermistor and the light bulb in parallel decreases.

Hence, the brightness of the bulb decreases.