



2022 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 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: $\frac{10}{R_{LDR}+10} = \frac{4.2}{5}$

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

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

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