Lab 2: Prelab

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Part 1:

Resistance of Thermistor at 20C = 12488 Ω
Resistance of Thermistor at 40C = 5330 Ω

Voltage Divider Equation:

$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$

Calculations for Configuration in Figure 3a:

At 20C:

$V_{in} = 5V \quad R_1 = 12488\,\Omega \quad R_2 = 10k\,\Omega$

$$V_{out} = 5V \cdot \frac{10000\,\Omega}{12488\,\Omega + 10000\,\Omega} = \boxed{2.223\,V}$$

At 40C:

$V_{in} = 5V \quad R_1 = 5330\,\Omega \quad R_2 = 10k\,\Omega$

$$V_{out} = 5V \cdot \frac{10000\,\Omega}{5330\,\Omega + 10000\,\Omega} = \boxed{3.262\,V}$$

Calculations for Configuration in figure 3b:

At 20C:

$V_{in} = 5V \quad R_1 = 10k\,\Omega \quad R_2 = 12488\,\Omega$

$$V_{out} = 5V \cdot \frac{12488\,\Omega}{10000\,\Omega + 12488\,\Omega} = \boxed{2.777\,V}$$

At 40C:

$V_{in} = 5V \quad R_1 = 10K\Omega \quad R_2 = 5330$

$$V_{out} = 5V \cdot \frac{5330\,\Omega}{10000\,\Omega + 5330\,\Omega} = \boxed{1.738\,V}$$

Part 2:
Resistance Estimate at 10 lux ≈ 15 kΩ
Resistance Estimate at 500 lux ≈ 200 Ω

Calculations for Configuration in 3a:
At 10 lux:
$V_{in} = 5V \quad R_1 = 15000\Omega \quad R_2 = 10000\Omega$
$V_{out} = 5V \cdot \frac{10000\Omega}{15000\Omega + 10000\Omega} = \boxed{2V}$

At 500 lux:
$V_{in} = 5V \quad R_1 = 200\Omega \quad R_2 = 10000\Omega$
$V_{out} = 5V \cdot \frac{10000\Omega}{200\Omega + 10000\Omega} = \boxed{4.902V}$

Calculations for Configuration in 3b:
at 10 lux:
$V_{in} = 5V \quad R_1 = 10000\Omega \quad R_2 = 15000\Omega$
$V_{out} = 5V \cdot \frac{15000\Omega}{10000\Omega + 15000\Omega} = \boxed{3V}$

At 500 lux:
$V_{in} = 5V \quad R_1 = 200\Omega \quad R_2 = 10000\Omega$
$V_{out} = 5V \cdot \frac{200\Omega}{10000\Omega + 200\Omega} = \boxed{0.098V}$