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INTERNATIONAL
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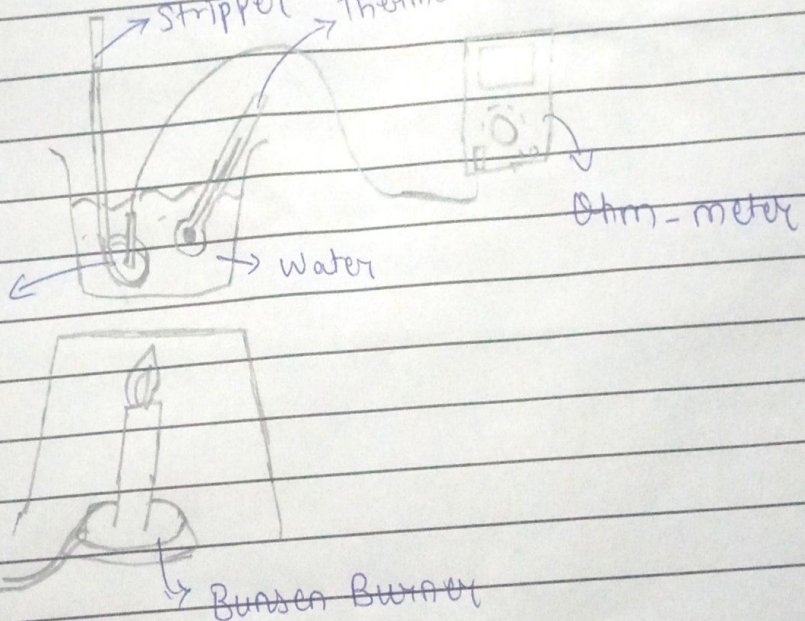
PRACTICAL - 7

Thermistor (virtual)

Aim: To study the characteristics of thermistors

Apparatus: NTC Thermistor, DC Power Supply, Multimeter, heating source, thermometer, connecting wires, Beaker

Diagram:



Observations

1) Room temperature = T_0 = 25 °C 298 kelvin
2) Voltage = V = 1 V
3) Resistance at room temperature = R_0 = 100 Ω

Observations from graph

1. The graph of 1/T vs ln(R) for an NTC thermistor should be linear, with a -ve slope indicating the inverse relationship b/w resistance b/w resistance and temperature.

Observation Table

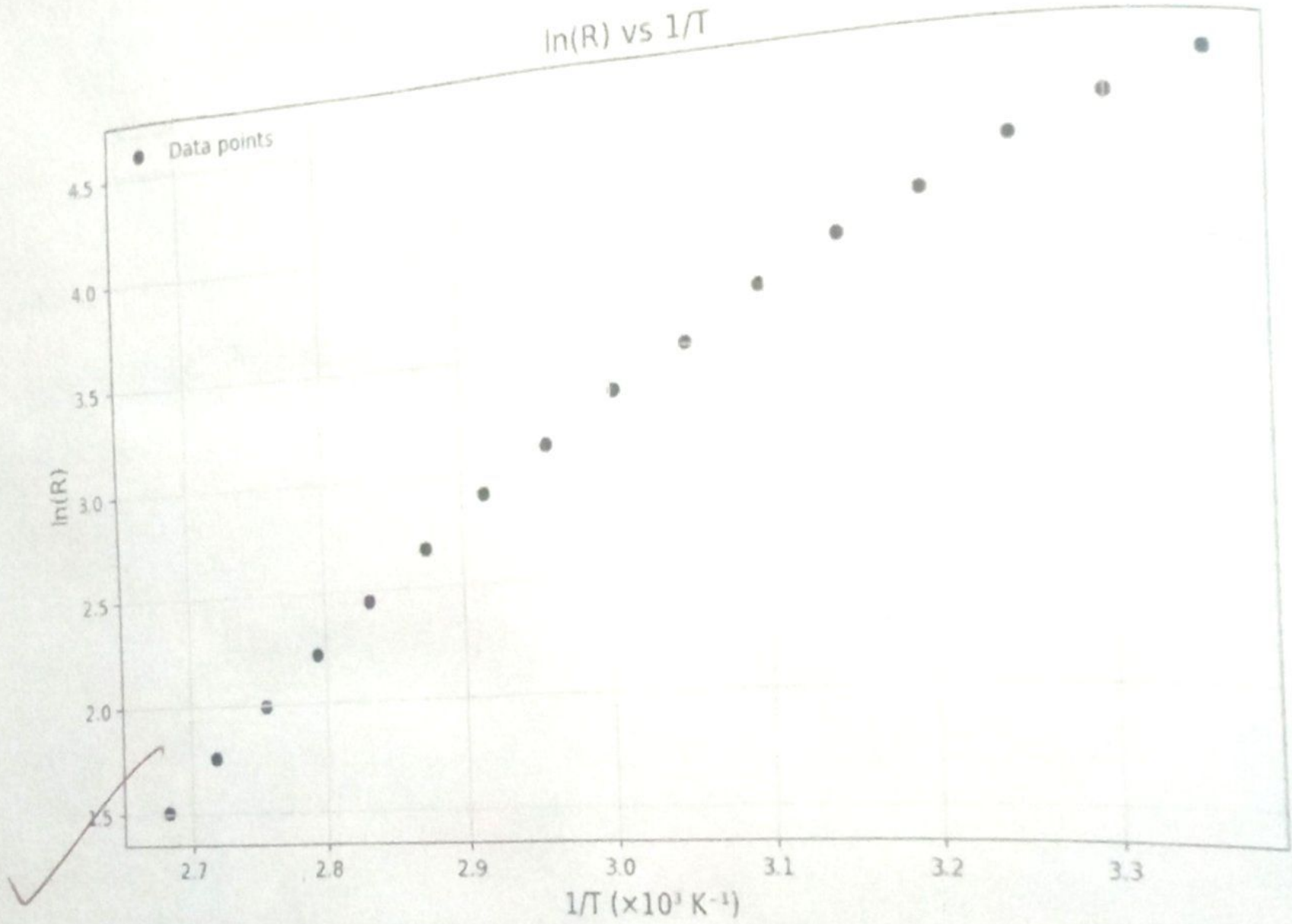
Temperature(T) °C	Temperature(T) Kelvin	1/T (K^{-1})	Current (I) mA	Thermistor Resistance	ln R
25	298	0.003357	1	100	4.6
30	303	0.0033003	1.2	83.33	4.4
35	308	0.0032468	1.4	71.4	4.2
40	313	0.0031949	1.7	58.8	4.0
45	318	0.0031447	2	50	3.9
50	323	0.003096	2.4	41.6	3.7
55	328	0.0030488	3	33.3	3.5
60	333	0.003003	3.6	27.7	3.3
65	338	0.0029586	4.5	22.2	3.1
70	343	0.0029155	5.5	18.18	2.9
75	348	0.0028736	6.9	14.4	2.6
80	353	0.0028736	8.6	11.6	2.4
85	358	0.0028329	10.8	9.2	2.2
90	363	0.0027548	13.6	7.3	1.9
95	368	0.0027174	17.3	5.7	1.7
100	373	0.002681	22.1	4.5	1.5

Conclusion

NTC thermistors show a negative temperature coefficient (NTC) meaning the resistance decreases as the temperature increases.

Procedure

Start the virtual lab simulation using the link below and connect all the connections given in the diagram. Switch the POWER ON.


ln(R) vs 1/T
Data points
4.5
4.0
3.5
3.0
2.5
2.0
ln(R)
2.7
2.8
2.9
3.0
3.1
3.2
3.3
1/T (×10³ K⁻¹)

Set the initial temperature (e.g. 35°C) using the temperature control module
use the multi-meter to measure and record the thermistor's resistance at the set temperature
change the temperature and take corresponding readings of current to find the resistance of the thermistor.
Take temperature with a difference of 5°C
Measure and record the resistance at each new temp
Plot graph of 1/T vs ln(R)

Theory

A thermistor is a type of time independent dependent resistor whose resistance varies significantly with temperature. Thermistors are widely used in temperature sensing, ckt protection and temperature compensation due to their high sensitivity to temperature changes.

There are two main types thermistors :-

1. PTC (Positive Temperature Coefficient) : In a PTC thermistor the resistance. These are often used in over-current protection devices, where they all limit the current flowing through a ckt when it becomes too high, effectively preventing damage to the system.

2. NTC (Negative Temperature Coefficient) :

↳ In an NTC thermistor, the resistance decreases as the temperature increases. This is the most common type of thermistor used in applications such as temperature sensors, where the resistance change with temperature is needed to measure or regulate temperature.

$$T \propto \frac{1}{R}$$

Bonafide
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