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Title of the experiment:

Bandgap of a thermistor

Objective : To determine the energy gap (Eg) of a thermistor

Apparatus and other materials required :

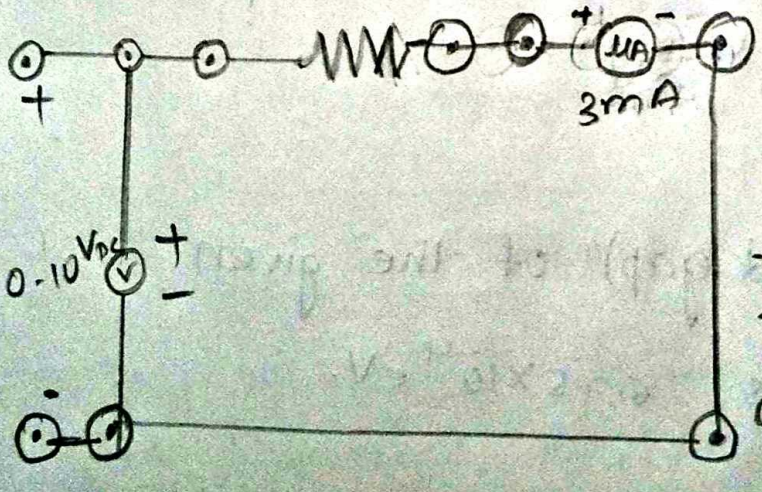
Thermistor kit, thermometer

Formula : $E_g = \frac{4.606 \times K \times m}{1.6 \times 10^{-19}}$ eV

where ; Eg = Energy gap of a given thermistor in eV

K = Boltzman constant = 1.3814×10^{-23} J/K

m = slope of the graph



Model graph :

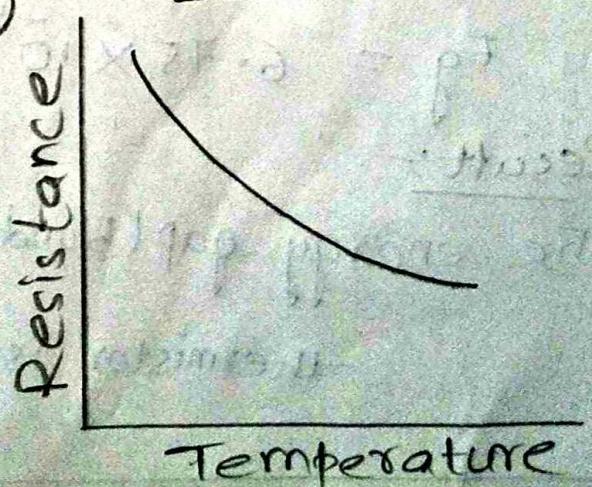


Table:-

S.No.	Temp(K) (T)	Temp(K^{-1}) ($\frac{1}{T}$)	voltage = 2V			voltage = 4V		
			I (mA)	R(Ω)	LogR	I (mA)	R(Ω)	LogR
1	303	3.3×10^{-3}	0.1	20	1.30	0.3	13.3	1.12
2.	313	3.2×10^{-3}	0.2	10	1	0.4	10	1
3.	323	3.1×10^{-3}	0.3	6.6	0.81	0.6	6.66	0.82
4.	333	3.0×10^{-3}	0.4	5	0.69	1.0	4	0.60
5.	343	2.9×10^{-3}	0.6	3.3	0.51	1.7	2.35	0.37
6.	353	2.8×10^{-3}	1.0	2	0.30	2.8	1.42	0.15
7.	363	2.7×10^{-3}	1.5	1.3	0.11	4.5	0.88	-0.05
8.	373	2.6×10^{-3}	2.2	0.9	-0.04	6.6	0.60	-0.22

Calculations:-

From graph:

$$y(\text{slope}) = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0.5}{0.3}$$

$$= 1.66 \simeq 1.7$$

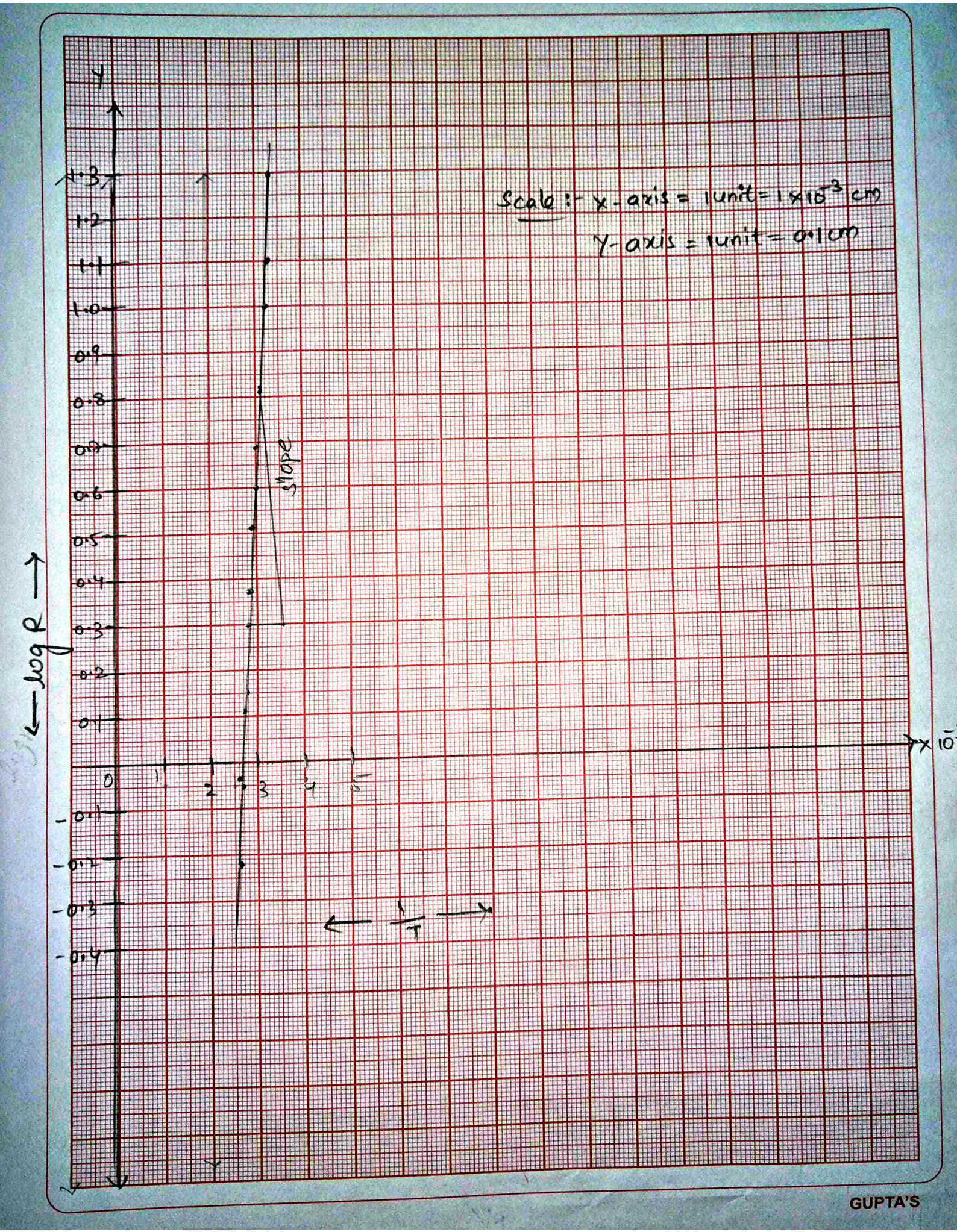
$$E_g = \frac{4.606 \times k \times m}{1.6\times10^{-19}}\ eV$$

$$= \frac{4.606\times1.381\times10^{-23}\times1.7}{1.6\times10^{-19}}\ eV = \frac{10.81\times10^{-23}}{1.6\times10^{-19}}$$

$$E_g = 6.75\times10^{-4}\ eV$$

Result:-

The energy gap (band gap) of the given thermistor is 6.75×10^{-4} eV.


Y
1·3
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
1
2
3
4
5
- 0·1
- 0·2
- 0·3
- 0·4
log R
Slope
Scale :- x-axis = 1unit = 1 × 10⁻³ cm
Y-axis = 1unit = 0·1cm
1/T
Y