Experiment 6: Energy gap of Semiconductor

Aim: To measure energy gap of given semiconductor

Apparatus
(i) Semiconductor (thermistor with NTC)
(ii) Heating arrangement with mini-oven filled with sand powder and secondary windings of a step down transfer for controlled electrical heating,
(iii) Digital Multimeter (DMM)
(Refer Fig 7.2)

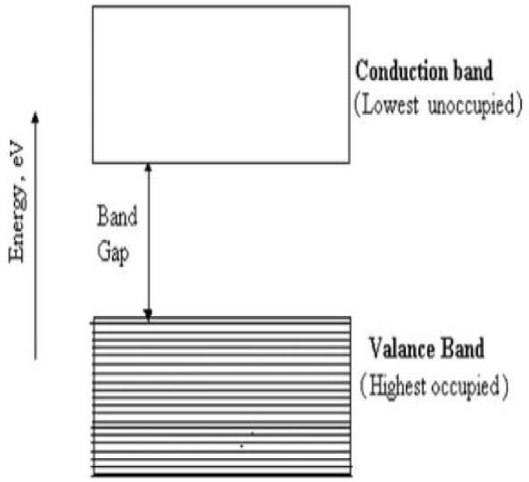


Figure 6.1: Concept of energy gap

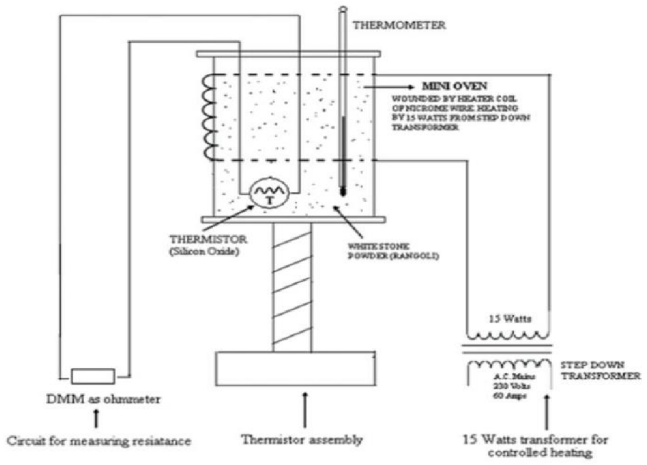


Figure 6.2: Experimental arrangement for the band gap experiment

ROUGH WORK

Observation table

Sr. No.	Observations		Calculations		
	Temperature T, ^{O}C	Resistance R_T, Ω	Temperature, T (K)	$1/T$ (Expressed in 10^{-3}) K^{-1})	$\ln R_T$
1	R.T. = 20	935278	293	3.41	13.748
2	30	660676	303	3.30	13.401
3	40	477281	313	3.19	13.075
4	50	351765	323	3.10	12.770
5	60	264075	333	3.0	12.483
6	70	201572	343	2.92	12.213
7	80	156245	353	2.83	11.959
8	90	122816	363	2.75	11.718
9	100	097625	373	2.68	11.488

Calculations:

Slope of the graph of $lnR_T\ Vs\ \frac{1}{T} = m =$ … 3.115

Energy gap, $E_g = 2Km$, where K = Boltzman's constant = 1.37×10^{-23} J/K

$= 2 \times 1.37 \times 10^{-23}\left(\frac{J}{K}\right) \times m\,(K) = 2 \times 1.37 \times 10^{-23}\left(\frac{J}{K}\right) \times$ 3.115 ()

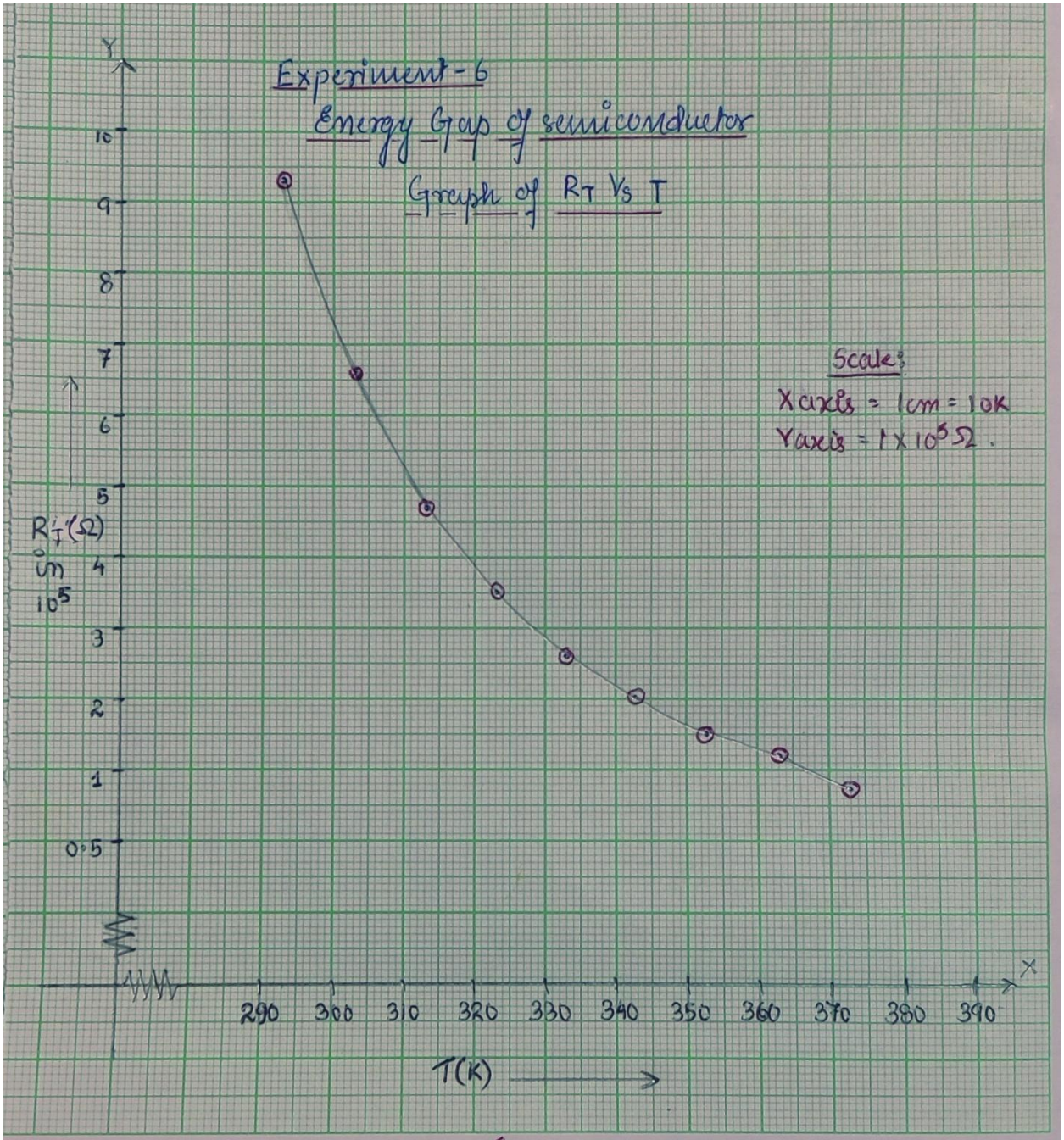
= …. $8.5351*10^{-23}$ $= \frac{8.5351*10^{-23}}{1.6\times10^{-19}\frac{J}{eV}} =$ $5.33*10^{-5}$

Result: The energy gap of given semiconductor (thermistor) is . $5.33*10^{-5}$

Experiment - 6

Energy Gap of semiconductor

Graph of R_T Vs T



Scale:

X axis = 1cm = 10K

Y axis = $1 \times 10^5 \Omega$.

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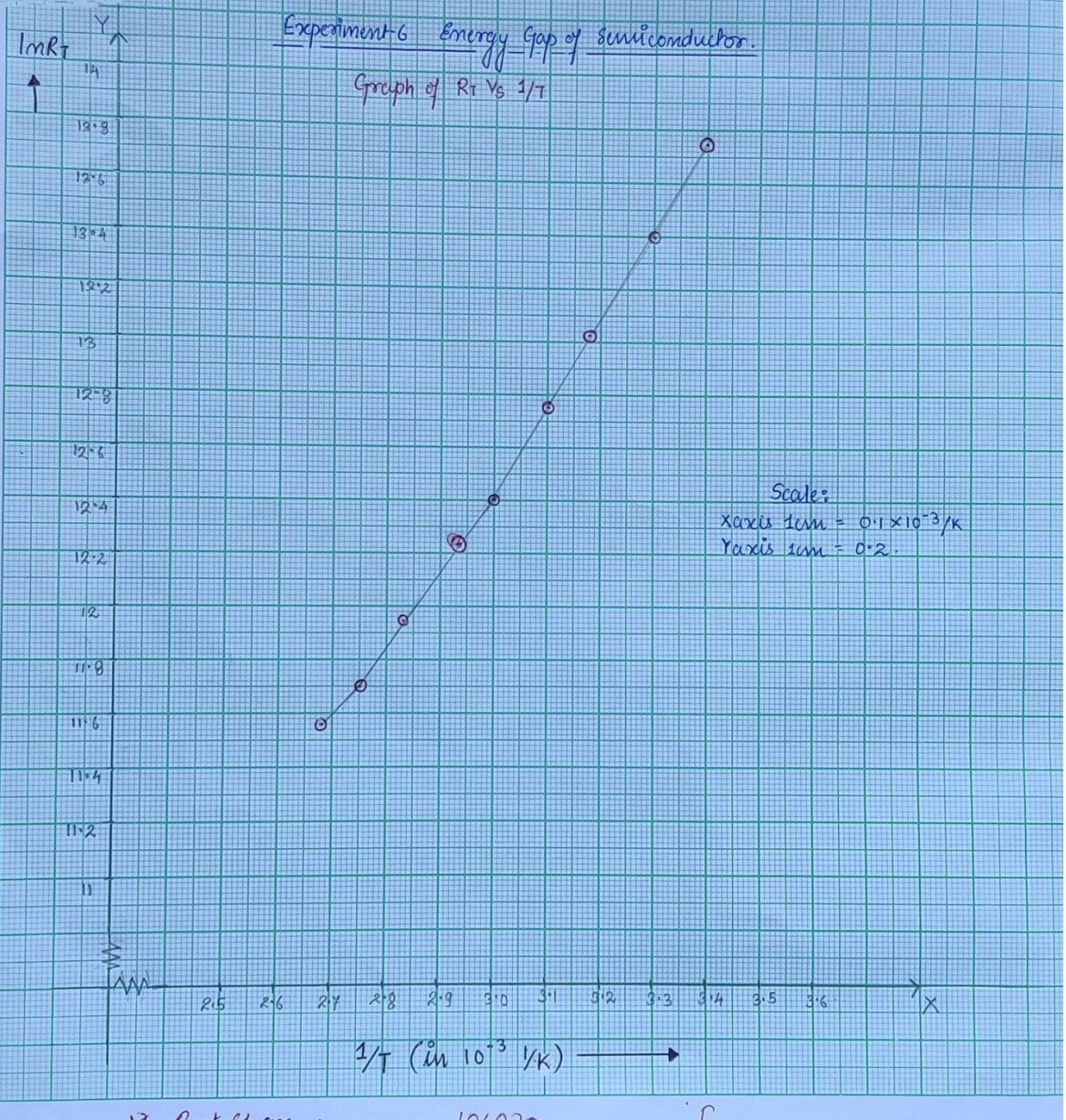
Experiment-6 Energy Gap of Semiconductor.

Graph of R_T Vs $1/T$



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