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Experiment - 3

Objective : To estimate the band gap energy (E_g) of Ge crystal from resistivity vs temperature measurements using four probe technique.

Apparatus : Digital ammeter, digital voltmeter, probes, graph, DC current source.

Formula used : $\ln V = (E_g / 2kT) + A$

$\rho = \rho_0 / G$

Result :

$R = 62\ \Omega$

$\rho_0 = 90.77\ \Omega\,cm$

$\rho_c = 11.35\ \Omega\,cm$

Teacher's Signature _____

Name :- 10200325

Aim: To estimate band gap energy (E_g) of Ge crystal from resistivity vs temperature measurements using four probe technique

Apparatus: Digital ammeter, digital voltmeter, probes, graph, dc current source.

Formula used: $\ln V = (E_g / 2kT) + A$; $\rho = \rho_0 / q$

Observations & Result: Given $I = 1.5$ mA

Sr. No.	Temperature	$1/T\ (10^{-3})$	V(mV)	ln V
1.	306	3.267	121	4.796
2.	316	3.164	114	4.736
3.	326	3.067	99	4.595
4.	336	2.976	81	4.395
5.	346	2.890	62	4.127
6.	356	2.808	47	3.850
7.	366	2.732	36	3.583
8.	376	2.659	28	3.332

Band Gap = Slope * 2 * k

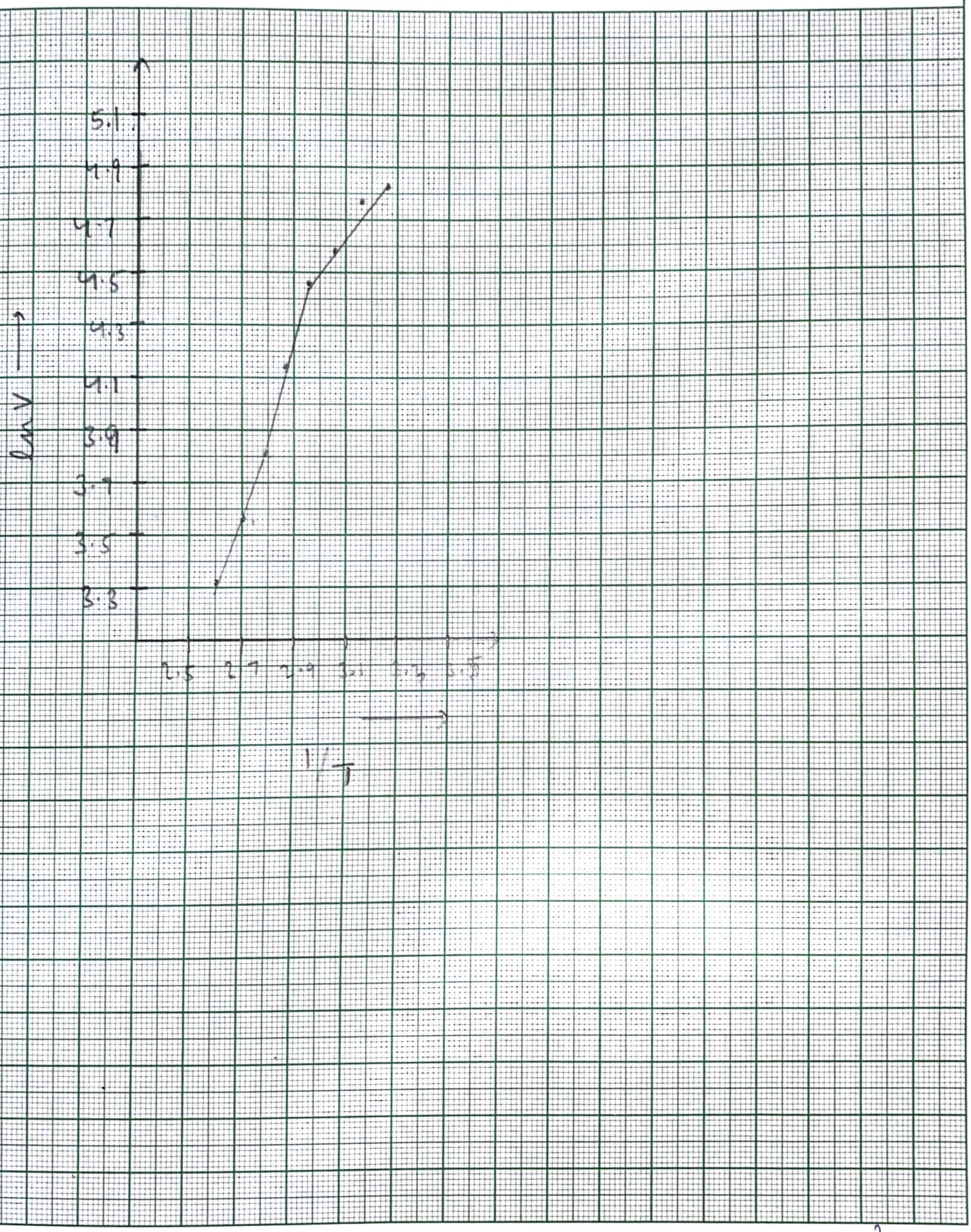
$= 21.60 \times 10^{-5}$ eV/k

k = Boltzmann's Constant $= 1.38 \times 10^{-23}$ J/K $= 8.617 \times 10^{-5}$ eV/k

Also, $R = V/I = 62\ \Omega$

$\rho_0 = 2\pi s (V/I) = 90.77\ \Omega$ cm

$\rho_c = \rho_0 / q = 90.77/8\ \Omega$ cm $= 11.35\ \Omega$ cm


5.1
4.9
4.7
4.5
4.3
4.1
3.9
3.7
3.5
3.3
log V
2.5
2.7
2.9
3.1
3.3
3.5
1/T