

1.ENERGY BAND GAP OF A SEMICONDUCTOR

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Enter the Number of Observations : 8

SI No	Record of Observations	Values	Units
1	Distance between the probes(s)	0.15	cm
2	Thickness of the crystal (w)	1	mm
3	Current (I)	0.5	mA
4	Correction factor f(w/s)	2.34	

SI No.	Temperature		Voltage
	(In °C)	(In K)	(mV)
1	120	393	8.1
2	110	383	10
3	100	373	12.4
4	90	363	15.4
5	80	353	19.1
6	70	343	22.8
7	60	333	26.5
8	50	323	29.2

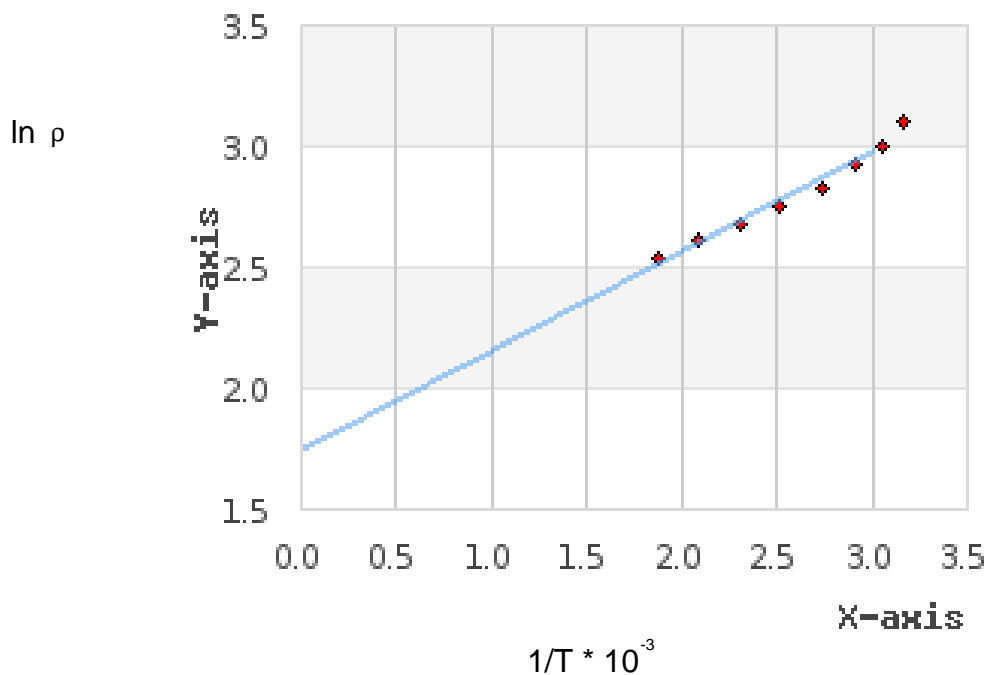
1.ENERGY BAND GAP OF A SEMICONDUCTOR

Tabulations

Sl No.	Temperature		Voltage (mV)	$\rho_o = [V/I] * 2\pi s$	$\rho = \rho_o / f(w/s)$	$\ln \rho$	$1/T$
	(in °C)	(in K)		Ohm cm	Ohm cm		$K^{-1} (10^{-3})$
1	120	393	8.1	15.2701	6.5257	1.8757	$2.54 * 10^{-3}$
2	110	383	10	18.852	8.0564	2.0865	$2.61 * 10^{-3}$
3	100	373	12.4	23.3765	9.99	2.3016	$2.68 * 10^{-3}$
4	90	363	15.4	29.0321	12.4069	2.5183	$2.75 * 10^{-3}$
5	80	353	19.1	36.0073	15.3877	2.7336	$2.83 * 10^{-3}$
6	70	343	22.8	42.9826	18.3686	2.9106	$2.92 * 10^{-3}$
7	60	333	26.5	49.9578	21.3495	3.061	$3 * 10^{-3}$
8	50	323	29.2	55.0478	23.5247	3.1581	$3.1 * 10^{-3}$

Graph :

X - axis $\Rightarrow 1/T * 10^{-3}$
Y - axis $\Rightarrow \ln \rho$



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Slope calculated from graph : 3904.08

Calculations

	Values	Units
slope(from graph)	3904.08	
k_B	1.38E-23	J/K
Energy Gap $E_g = 2 * k_B * \text{slope}$	1.07752608E-19	Joule
$E_g = 2 * k_B * \text{slope} / 1.6 * 10^{-19}$	0.6735	eV

Conclusion

The given semiconductor is Germanium crystal.

$E_g = 0.7 \text{ eV}$