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Slope $= \frac{\Delta y}{\Delta x} = \frac{0.08}{0.30} = 0.26\ K$

$\therefore E_g = 2 \times K \times 2.3026 \times 1000 \times$ slope (in eV)

(K is boltzmann constant ($8.6 \times 10^{-5}\ eV K^{-1}$))

$= 2 \times 8.6 \times 10^{-5} \times 2.3026 \times 1000 \times 0.26$

$= 0.10\ eV$

$\therefore E_g = 0.10\ eV$ (Ans)

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OBSERVATION TABLE :-

SL NO	TEMPERATURE in °C.	TEMPERATURE in K	VOLTAGE (mV)	CURRENT (mA)	RESISTIVITY ρ (ohm-metre)	$\frac{1000}{T}$ (K^{-1})	log ρ
1	25	298	87.24	3	6.19	3.35	0.79
2	30	303	85.16	3	6.04	3.30	0.78
3	35	308	82.70	3	5.87	3.24	0.76
4	40	313	80.38	3	5.70	3.19	0.75
5	45	318	78.20	3	5.55	3.14	0.74
6	50	323	76.15	3	5.40	3.09	0.73
7	55	328	74.21	3	5.26	3.04	0.72
8	60	333	72.37	3	5.13	3.00	0.71
9	65	338	70.63	3	5.01	2.95	0.69
10	70	343	68.99	3	4.89	2.91	0.68
11	75	348	67.42	3	4.76	2.87	0.67
12	80	353	65.94	3	4.68	2.83	0.67
13	85	358	64.53	3	4.48	2.79	0.66
14	90	363	63.18	3	4.48	2.75	0.65
15	95	368	61.90	3	4.39	2.71	0.64

CALCULATION :-

We know $\rho_0 = \left(\frac{V}{I}\right)(S)$

And after including correction factor $\rho = \frac{\rho_0}{4\pi (W/S)}$

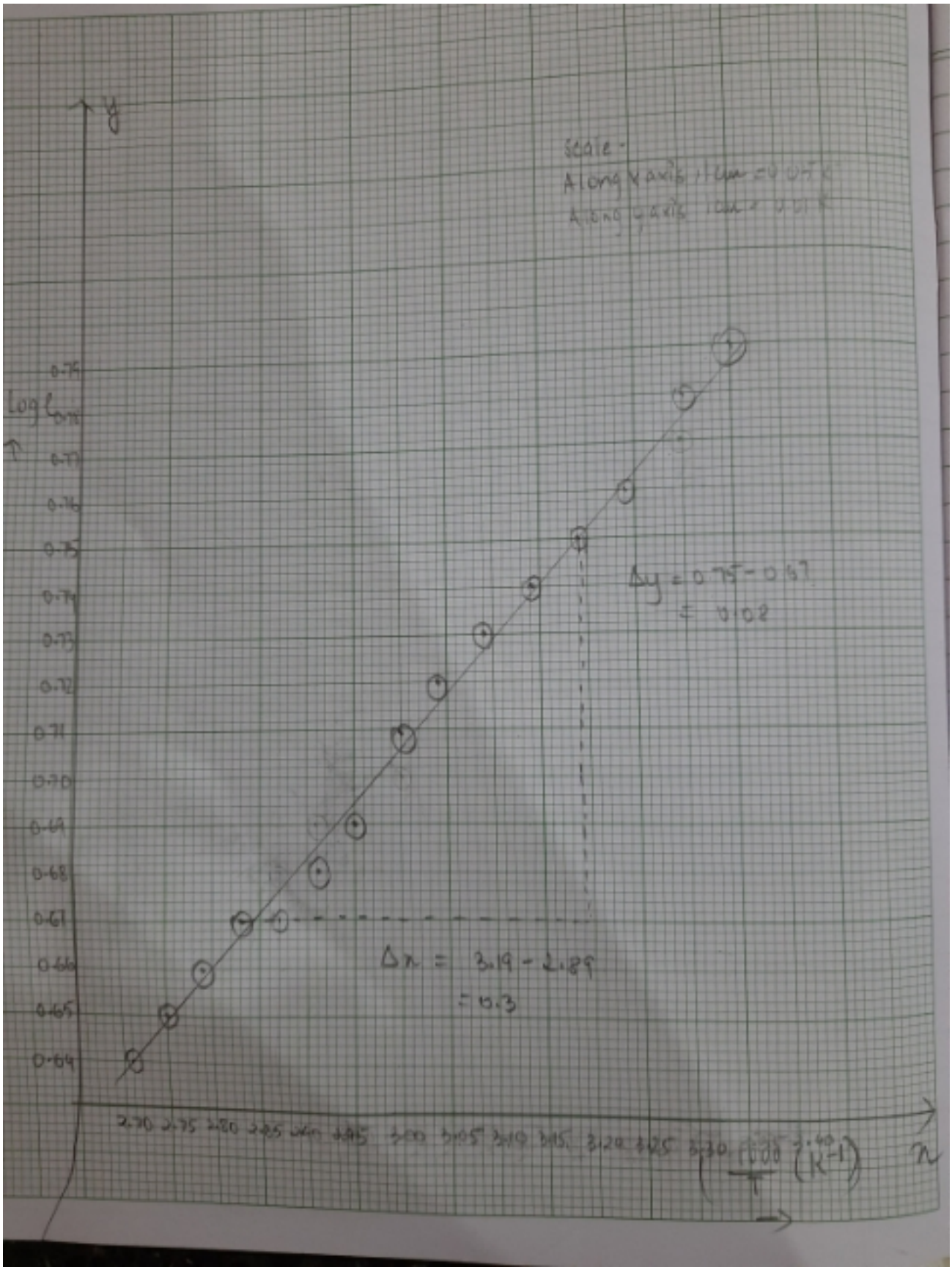
(Distance between probe $= 0.200\ cm$ (S)

Distance
Thickness of crystal $= 0.05\ cm$ (W))

Now substituting the proper value :- $\rho_0 = \frac{V}{I} \times 2 \times 3.14 \times 0.200$

$\rho_0 = \frac{V}{I} \times 1.256$

$\rho = \frac{\rho_0}{5.89} = \frac{V}{I} \times \left(\frac{1.256}{5.89}\right) = \frac{V}{I} \times 0.213$


y
scale -
Along Y axis 1 cm = 0.01 K
Along X axis 1 cm = 0.01 K
Log I_{out}
0.75
0.74
0.73
0.72
0.71
0.70
0.69
0.68
0.67
0.66
0.65
0.64
$\Delta y = 0.75 - 0.67$
$= 0.08$
$\Delta x = 3.19 - 2.89$
$= 0.3$
2.70 2.75 2.80 2.85 2.90 2.95 3.00 3.05 3.10 3.15 3.20 3.25 3.30 3.35 3.40
$\frac{1000}{T}$ (K^{-1})
x