

VARIFICATION OF STEFAN'S CONSTANT.

The setup consists of a power supply, connected to a Stefan-Boltzmann lamp, with a mili-voltmeter and an mili-ammeter attached. An electrical schematic of the experimental setup is shown in figure 1: The electrical schematic of the setup. The voltmeter measures the potential difference across the Stefan-Boltzmann bulb.

THEORY:- according to Stefan law if a blackbody at absolute temperature T is surrounded by another blackbody at temperature T_0 , the amount of heat radiated per unit area per unit second is $P = \sigma(T^4 - T_0^4)$,

where $\sigma = \text{stefan's constant}$.

In case of torch bulb filament $T \gg T_0$, and it is not a perfectly blackbody then for torch bulb filament we can approximately write $P = AT^n$, where A is some constant which depends on area and the material of the filament.

Then $\log_{10} P = \log_{10} A + n \log_{10} T$. Or, $(\log_{10} P) = n (\log_{10} T) + C$,

where C is some constant and n is expected to slightly from 4

EXPERIMENTAL DATA:

Bulb specification:

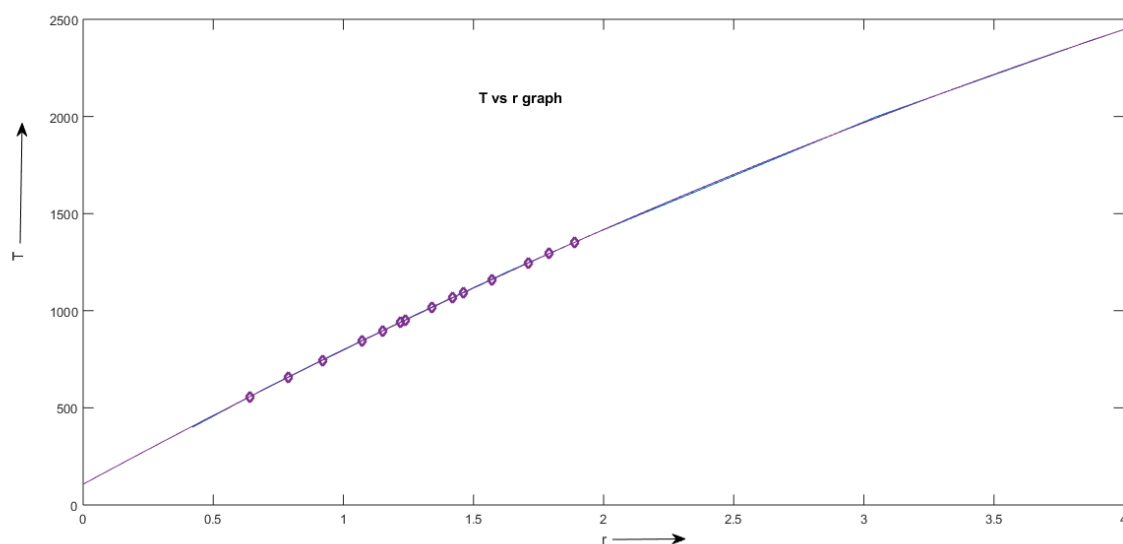
To draw the calibration curve of the filament:

$\alpha = 5.21 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$, $\beta = 7.2 \times 10^{-7} \text{ } ^\circ\text{C}^{-2}$, $t_d = \text{draper point temp} = 527^\circ\text{C}$

then $1 + \alpha t_d + \beta t_d^2 = 3.9456$

TABLE-1

SL NO	R_t/R_d	TEMPERATURE
1	0.42	400
2	0.70	600
3	1.00	800
4	1.31	1000
5	1.63	1200
6	1.97	1400
7	2.33	1600
8	2.69	1800
9	3.05	2000
10	3.47	2200
11	3.89	2400



LAB MANUAL
DEPARTMENT OF PHYSICS, PRTGC
Experimental data:

$$V_D = 0.66 \text{ volt} \quad I_D = 65 \text{ mA} \quad R_D = 10.15 \text{ ohm}$$

Table -2

V(volts)	I (mA)	$R_T = V/I$ (ohm)	$r = R_T/R_D$	T(K)	P=V*I(mW)	ln P	lnT
0.2	31	6.45	0.64	557	6.2	0.79	2.75
0.4	50	8.00	0.79	658	20	1.3	2.82
0.6	64	9.38	0.92	745	38.4	1.58	2.87
0.8	74	10.81	1.07	843	59.2	1.77	2.93
1.0	86	11.63	1.15	895	86	1.93	2.95
1.2	97	12.37	1.22	940	116.4	2.07	2.97
1.4	111	12.61	1.24	953	155.4	2.19	2.98
1.6	118	13.56	1.34	1020	188.8	2.28	3.01
1.8	125	14.40	1.42	1070	225	2.35	3.03
2.0	135	14.81	1.46	1090	270	2.43	3.04
2.5	157	15.92	1.57	1160	392.5	2.59	3.06
3.0	173	17.34	1.71	1250	519	2.72	3.1
3.5	193	18.13	1.79	1290	675.5	2.83	3.11
4.0	209	19.14	1.89	1350	836	2.92	3.13

CALCULATION OF SLOPE:

