Verification of Stefan's Law

OBJECT:

To verify Stefan's law of radiation.

APPARATUS USED:

Complete set-up make Raman consists of one 0- 6 V regulated power supply, Filament bulb 6V, Digital Voltmeter and Ammeter.

PRINCIPLE:

According to Stefan's law power radiated from a black body is proportional to the fourth power of its absolute temperature.

i.e. $P \mu T^4$

or $\log P \mu 4 \log T$ (1)

Resistance of the tungsten filament of the electric bulb is

$R \mu T$

Or $\log R \mu \log T$ (2)

Fron equation (1) and (2)

$\log P/\log R = 4$

PROCEDURE:

1. Connect the set-up with main's and put the power supply at anticlockwise minimum position.
2. Switch 'ON' the set-up and increase the power supply voltage till the bulb start glowing. Note the voltmeter and ammeter readings. Record these readings in table as shown below.
3. Increase the power supply voltage in steps say 1, 1.5, 2.0 …….. 5 and note the corresponding current for each setting of voltage. Record these readings in table.
4. Calculate filament resistance R = V/I and Power radiated P = VI. Record these calculations in table.
5. Calculate log R and log P .Record these readings in table as shown below.
6. Plot a graph
7. Plot graph between log P on Y-axis and log R on X-axis.

OBSERVATION AND TABULATIONS:

S. No.	Filament Voltage V_f Volt	Filament Current I_f Amp.	Filament Resistance R = V/I	Power Radiated P = VI	log R	Log P
1. **2.** **3.** **4.** **5.** **6.** **7.**						

CALCULATION:

Calculate slop from the graph as BC/AB =

RESULTS:

Slop of the graph = 4 , which verifies the Stefan's law

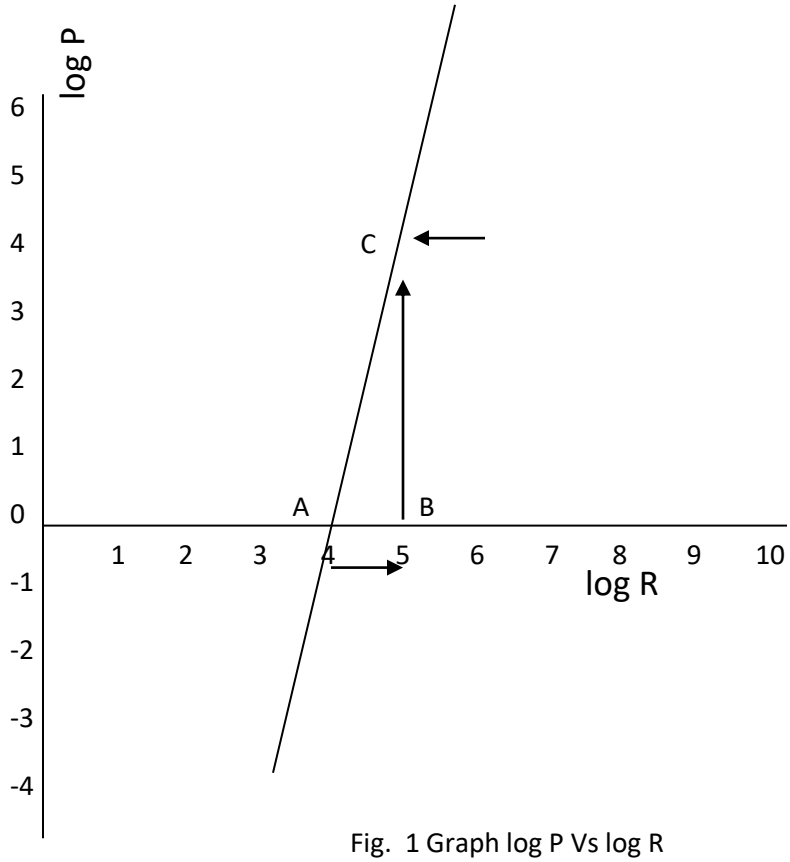

Fig. 1 Graph log P Vs log R

TESR RESULTS

OBSERVATION AND TABULATIONS:

S. No.	Filament Voltage V_f Volt	Filament Current I_f Amp.	Filament Resistance R = V/I	Power Radiated P = VI	log R	Log P
1.	1.0	0.21	4.76	0.21	0.678	-0.678
2.	1.5	0.25	6.00	0.375	0.778	-0.426
3.	2.0	0.27	7.41	0.54	0.870	-0.268
4.	2.5	0.31	8.07	0.78	0.907	-0.111
5.	3.0	0.33	9.09	0.99	0.959	-0.005
6.	3.5	0.35	10.00	1.23	1.000	+0.088
7.	4.0	0.38	10.53	1.52	1.122	+0.182
8.	4.5	0.41	10.98	1.85	1.040	+0.266
9.	5.0	0.43	11.63	2.15	1.066	+0.332
10.	5.5	0.45	12.22	2.48	1.087	+0.394
11.	6.0	0.47	12.77	2.82	1.106	+0.450

RESSULTS:

1. From Graph the slope of the curve is 3.75 close the 4. Hence, verify the Stefan's Law