Bharati

Practical PHYSICS

Note Book

MJC-3.

Certificate

Name : ..... Class : .....

Roll No. : .....Exam. No. : .....

Institution : .....

This is certified to be bonafide work of the student in the ..... Laboratory during the academic year 20 .

No. of practicals certified ..... out of .....in the subject of .....

..... Teacher in-charge

....

Examiner's Signature Principal Signature

Date : ..... Institution Rubber Stamp

(N.B. : The candidate is expected to retain his/her journal till he/she passes in the subject.)

Expt — 1.

* **Objectives :-**

The main objective of this lab is to determine the value of the mechanical equivalent of heat by electrical method.

* **Apparatus :-**

Joules calorimeter with heating coil, thermometer, rheostat switch, stop watch, a liquid of known specific heat, voltmeter, ammeter, weight box, balance, connecting wires.

* **Formula :-**

$$J = \frac{Vit}{(m_1 s_1 + m_2 s_2 + m_2 s_3)\Delta\theta}$$

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Where,

m_1 = mass of the calorimeter

m_2 = mass of the stirrer

m_3 = mass of the contents in the calorimeter

S_1 = Specific heat of calorimeter

S_2 = Specific heat of stirrer

S_3 = Specific heat of the contents in the calorimeter

$\Delta\theta = (\theta_2 - \theta_1)$

~~From equation (1) and (2) we get~~

* Observations :-

- Mass of the calorimeter, $m_1 = 60$ gm
- Mass of the stirrer, $m_2 = 10$ gm
- Mass of the calorimeter and water, $m_2 = 220$ gm
- Mass of water, $m_3 = m - m_1 = 160$ gm

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- Specific heat of calorimeter, $S_1 = 0.09$ cal $gm^{-1} °C^{-1}$
- Specific heat of stirrer, $S_2 = 0.09$ cal $gm^{-1} °C^{-1}$
- Specific heat of the contents in the calorimeter, $S_3 = 1.00$ cal $gm^{-1} °C^{-1}$

No of Observations	Time (m)	Current, i (amp)	Voltage, V (volts)	Temperature °C)
1.	0	2.0	6.0	25.0
2.	1	2.0	6.0	25.8
3.	2	2.0	6.0	26.6
4.	3	2.0	6.0	27.4
5.	4	2.0	6.0	28.2
6.	5.	2.0	6.0	29.0
7	6	2.0	6.0	29.9
8.	7	2.0	6.0	30.8
9.	8.	2.0	6.0	31.8
10.	9	2.0	6.0	33.0
11.	10	2.0	6.0	34.2

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* Calculation :-

$$J = \frac{V \cdot I \cdot t}{(m_1 S_1 + m_2 S_2 + m_3 S_3)\,\Delta\theta}$$

(2) $W = V \cdot I \cdot t$

$\Rightarrow W = 6.0 \times 2.0 \times 600 = 7200$ Joules.

(2) $H = (m_1 S_1 + m_2 S_2 + m_3 S_3) \cdot \Delta\theta$

$\Rightarrow H = (60 \times 0.09 + 10 \times 0.09 + 160 \times 1.0)\, 9.5$

$\Rightarrow H = (5.4 + 0.9 + 160.0)\, 9.5$

$\Rightarrow H = 166.3 \times 9.5 = 1579.85$ Calories.

$$J = \frac{W}{H} = \frac{7200}{1579.85}$$

$$\boxed{J \approx 4.557 \text{ J/cal}}$$

Ans

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Expt-2.

* **Aim :-**

To determine the Thermal Conductivity of Copper using Serale's Apparatus.

* **Apparatus Used :-**

1) Searle's Thermal Conductivity apparatus,
2) 4 Thermometers,
3) Steam Boiler,
4) Measuring Cylinder,
5) Constant water level Tank,
6) Pinch Cork
7) Stop watch
8) Rubber Tube and
9) Hot Plate.

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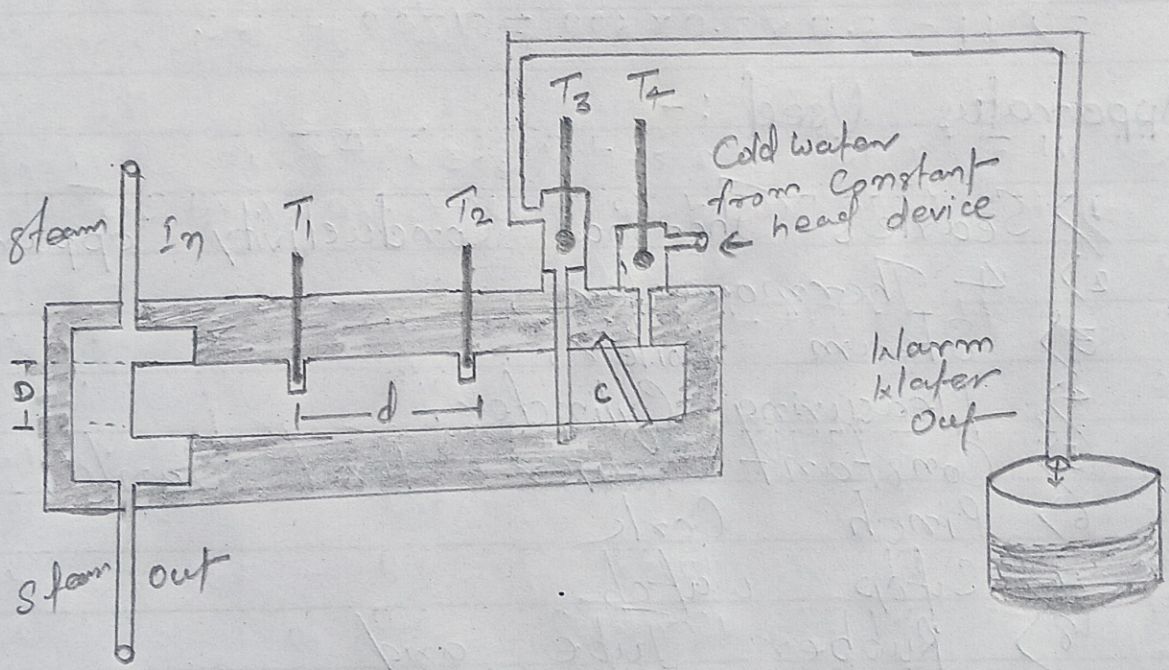
T_3
T_4
Cold water from Constant head device
Steam In
T_1
T_2
D
d
c
Warm water out
Steam out

* Formula Used :-

Coefficient of thermal conductivity -

$$K = \frac{m \times S \times (\theta_4 - \theta_3) \times d}{A(\theta_2 - \theta_1) \times t}$$

Where,

m = Mass of Water flowing out in t sec.

A = Face area of rod (πr^2, r is radius).

d = Length of the rod between thermometers.

S = Specific Heat of Water

θ_3 and θ_4 = Initial and final temperature of Water.

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θ_1 and θ_2 = Steady temperatures shown by thermometers T_1 and T_2

* Observations :-

1. Vernier Constant = 0.01 cm
2. Diameter of rod = 2.49 cm
3. Radius = 1.285 cm
4. Area of the cross section = 4.867 cm^2
5. Distance between thermometer T_1 and T_2, d = 10.90 cm
6. Steady state Temperature, $\theta_2 = 82°C$, $\theta_2 = 63°C$
7. Density of water = 0.99 gm/cm^3
8. Specific heat of Water = 1 cal/g°C

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S. No.	θ_3 (°C)	θ_4 (°C)	$\theta_4 - \theta_3$ (°C)
1.	36.0	47.0	11.0
2.	37.5	51.0	13.5
3.	31.0	42.0	11.0

Volume of Water	Mass of Water	Time (sec)	K
210	205	300.12	~~0.741~~ 0.88
100	98	210.44	~~0.741~~
269	254.8	240.15	1.375

* Results :-

1. The Thermal conductivity K of Copper obtained experiment = 0.398 cal/gm/°c/sec

2. The standar value of Thermal conductivity K of copper = 0.99 cal/gm/°C/sec

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