Tuesday

Date 08/06/21

Expt. No. 05

Page No.

Experiment No :→ 05

1) Aim:→ To determine mechanical equivalent of Heat

2) Apparatus Required:

→ A tube, A measuring scale, An electronic balance, an infrared thermometer, Metal (Cu, Al, Pb)

3) Formula Used:

→ Gravitational Potential Energy (E) = mgh

where,

m = mass of metal, g = acc^n due to gravity

h = height of shot / fall

Amount of Heat generated = $mc\Delta T$.

where,

c = specific heat capacity,

g = acc^n due to gravity,

$\Delta T = T_2 - T_1$

So,

Joule's Equivalent of Heat = $J = E/Q$

Teacher's Signature

OBSERVATION TABLE

	ALUMINIUM	COPPER	LEAD
Specific Heat (c) (J/kg°C)	887	385	130
Length of Tube (l) (metre)	1.8	1.8	1.8
Mass of Metal (m) (kg)	0.5508	0.5761	0.5464
Initial Temperature (°C) (T_1)	21.1	21.4	21.4
No of times flipped (n)	31	35	38
Final Temperature (T_2)°C	21.7	22.9	26.3
Height Calculated (h=2nl) (°C)	55.8	63.0	68.4
Gravitational Potential (E=mgh) J	0.6	1.5	4.9
Heat Energy $Q=\frac{mc\Delta T}{4.18}$	301.199472	355.68414	366.9332
Joule's Equivalent $J=E/Q$	70.128172	79.5928	83.4196
	4.29286	4.46424	4.389

$$J(\text{average}) = \frac{4.29286 + 4.46424 + 4.389}{3}$$

$$= 4.382064 \text{ J/cal Ans}$$

$$\text{Error} = \left| \frac{4.382064 - 4.18}{4.18} \right| \times 100\%$$

$$= 4.83\% \text{ Ans}$$

Result ⇒ J = 4.382064 J/cal, % error = 4.83% Ans

Date _____

Expt. No. 05 Page No. _____

4.) Theory: According to Law of conservation of Energy mechanical work done on a system is proportional to heat produced i.e.

$W \propto Q \Rightarrow W = JQ$ where

W = work done
Q = Quantity of heat
J = Joule's Equivalent of heat.
= Amount of work that needs to be performed to produced unit quantity of heat.

5.) Procedure:

1.) Use choose a metal menu to select a metal.

2.) One of the measurement i.e. distance of shortfall is measured by dragging the ruler next to the tube using mouse & measure the length of tube.

3.) To measure mass of shot, click open tube then drag the shot to balance the & measure weight.

4.) Also, shot's initial temperature is needed so drag the shot onto red laser front of infrared thermometer & take it's reading.

5.) Click "Close tube" to put shot back & click "flip tube".

Teacher's Signature _____

as many times you need to flip. Click open Tube & drag shot to thermometer to get final temperature. Do the above steps for other metals.

6) Result:

Experimental value of Joule's Equivalent of heat [J] = 4.382064 J/cal with % error = 4.83%

Ans.

Precautions & Sources of Error:

- ☆ Measure Length of tube carefully
- ☆ Convert all quantities to SI units before calculations
- ☆ Temperature should be measured carefully