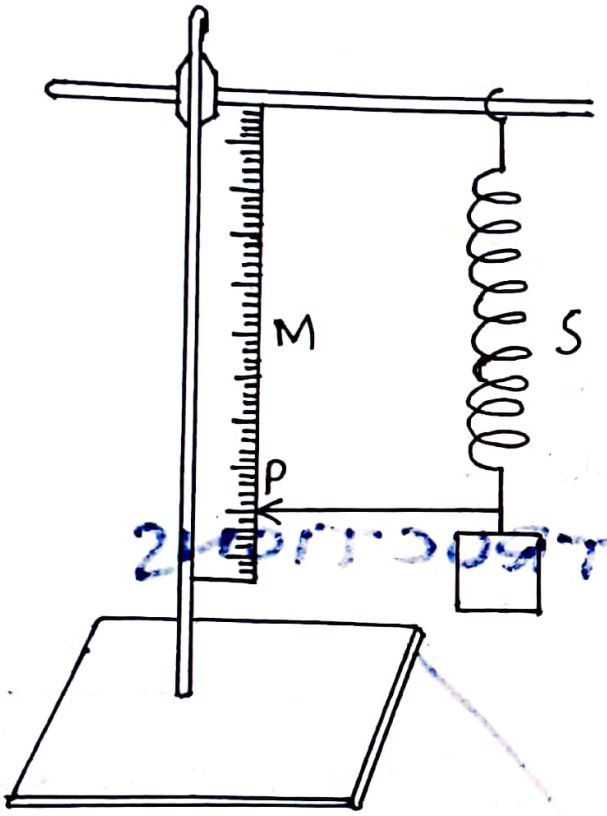

Measurement of extension in a spring

Date
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EXPERIMENT 1

AIM To determine the spring constant of a spring by measuring the time period of vertical oscillation of known loads.

APPARATUS

A spring vertical clamp and stand, metre scale, a light pointer, stop watch, hanger and slotted weights.

THEORY

Time period 'T' of vertical oscillations of a mass-less loaded spring is given by

$$T = 2\pi\sqrt{\frac{m}{k}}$$

Squaring $T^2 = \frac{4\pi^2 m}{k}$; $k = \frac{4\pi^2 m}{T^2}$

Knowing 'm' and 'T', value of k can be calculated.

Procedure

1) **Setting**

i) Attatch the light pointer P with one end of the spring S and suspend it from the clamp C by the other end in such a way that the spring hangs freely.

2) Adjust the metre scale vertically so that the tip of the pointer just touches the scale. Note the reading

3) Suspend the hanger along with some weight (say 100g) on it

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RECORD

Serial no	Mass loaded 'm' (g)	Time for 10 vibrations			Time Period $T = \frac{t}{10}$ (sec)	$\frac{m}{T^2}$ ($g\ sec^{-2}$)
		(i) (sec)	(ii) (sec)	Mean 't' (sec)		
1	50	3.6	3.5	3.55	0.35	408.16
2.	100	4.3	4.3	4.3	0.43	540.83
3.	150	5.1	5.8	5.45	0.54.	2027.02

from its lower end. The spring will get extended in length and will achieve equilibrium. Note the reading of the pointer on the scale

2) Working

i) Pull the weight downward a little distance from its equilibrium position and release it. The spring will start oscillating vertically.

ii) As soon as the pointer crosses a fixed mark on the scale, start the stop watch and count zero. Next time when the pointer, again, crosses the same mark in same direction, count one. This way go on counting up to 10. When you say 'ten', stop the watch. Note the time recorded by the watch. This is the time taken by the spring to complete 10 vibrations

iii) Repeat the above process twice for same load on the spring. Find the mean of these two observation

iv) Divide the time (10 vibrations) by 10 to get the time period of vibrations of springs.

v) Increase the load by 50g and again find the Time Period as explained above. Repeat with three different weights. Everytime read the pointer

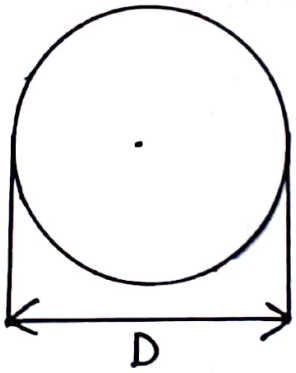
Mean $\frac{m}{T^2} = \frac{408.16 + 1540.83 + 2027.02}{2} = 1488.005$

Spring constant $K = 4\pi^2 \cdot \frac{m}{T^2} = 4 \times \frac{22}{7} \times \frac{22}{7} \times 1488.005$

$= 58791.38$ dyne cm^{-1}

Bharati

Teacher's Signature.....



$\frac{1}{2}D = R$