Name_____
Class_____Date_____

HOOKE's LAW

Purpose

To measure time with a stopwatch and to calculate the spring constant of a spring.

Apparatus

Stand, clamp, spring, stopwatch, mass, mass hanger

Theory

The period of oscillation of a system obeying hooke's law is given by the relation

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

where
T: is the period in seconds
m: is the mass in kilograms
k: is the spring constant.
If the value of T is measured for a particular spring system of mass m , an experimental value for k may be determined by rewriting the above equation to give

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

PART I : Procedure

1. Set up the stand and clamp and spring and place the mass hanger at the end of the spring.
2. Place 50 g of mass to the mass hanger.
3. Displace the 50 g mass between 5 and 10 cm vertically and time 50 complete oscillations of the mass with the stopwatch. Read the time to the nearest 0.01s.
4. Repeat procedure (2) with the length of the pendulum 100, 150, 200, 250, and 300 g and enter the data in the table.

Calculations

1. Calculate the period of oscillation for each length of the mass to 3 decimal places by dividing the times by 50.
2. Calculate the values of the spring constant to 3 significant figures using the equation above.
3. Determine the average value of the spring constant and its percent error from the standard value.

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Data

Mass in grams	Time for 50 oscillations in seconds	Time for 1 oscillation in seconds	Spring constant k in N/m
50			
100			
150			
200			
250			
300			

Average value of the spring constant = _____ N/m

Percent error = _____

PART II

Now placed 200 g of mass to the mass hanger and measure the displacement, x. Since the system is in balance :**k x = m g** and spring constant k can be calculated from this formula. Compare this spring constant with the one that you have found at part I

Questions

1- What is the advantage of measuring the time for 50 oscillations in order to find the period, compared with measuring one oscillation directly?
2- Do you need to correct your time measurement for your reaction time? If not, why not?.