ANNUAL EXAMINATION – 2012-2013

Class – X I

SUBJECT – Physics (Practical)

Time – 3 Hrs.

M.M. – 20

Candidates are allowed additional 15 minutes for only reading the paper.
They must not start writing during this time.
All answers must be written in the answer booklet provided separately.
If squared paper is used it must be attached to the answer booklet. Marks are given for a clear record of observations actually made for their suitability and accuracy, and for the use made of them.
A brief statement of the method may be given if necessary. The theory of experiment is not required unless specifically asked for.
Candidates are advised to record observations as soon as they have been made. All working including rough work should be done on the same sheet as, and adjacent to the rest of the answer.
Mathematical tables and squared paper are provided.
The intended Marks for question or parts of questions are given in the brackets [ ].

Answer all questions
You should not spend more than one and a half hours on Question 1

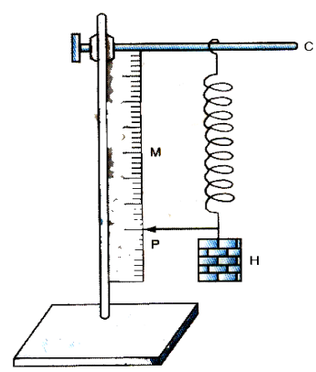
Question 1 [10]

Aim of the experiment. To find the force constant of a spring and to study the variation in time period of oscillations of a body suspended by the spring. To find the acceleration due to gravity by plotting the graph of T against $\sqrt{m}$.

Requirements: A spring, stop watch, hanger, slotted weights, clamp and stand.

Procedure:

1- Suspended the spring in vertical position using clamp and stand arrangement along the scale.
2- Suspend the hanger along with 50 g on it from its lower end. Spring will get extended. Note the reading of the pointer on the scale.
3- Pull the weight downwards a little distance from its equilibrium position and release it. The spring will start oscillating vertically.
4- As soon as the pointer crosses the equilibrium position, start the stop watch. Find the time for 10 vibrations.
5- Repeat the above reading twice for same load on the spring. Find the mean of these two. Calculate the time period.
6- Increase the load by 50 g and again find the time period. Take five such observations.
7- Note the equilibrium position for each observation.
8- Plot the graph between extension *l* and mass m suspended. It is a straight line. Select mass 'm' corresponding to centre of graph.
9- Plot the graph between T and $\sqrt{m}$ also. Which is a straight line.



Measurement of extension

Calculate: i) $K = \frac{4\pi^2 m}{T^2}$ (from 3 set of readings)

ii) $g = K\frac{l}{m}$ (from 3 set of readings)

Question 2 [5]

To find the spring constant of the given spring by plotting load – extension graph.

A rigid support, helical spring with a pointer attached at the lower end and a hook to support a hanger, five slotted weights of 20 g each, and a metre scale. (Range of the weights may be changed according to the stiffness of the spring)

Hook's law for a linear spring is ' If a spring is stretched (or compressed) the restoring force (F) applied by the spring to oppose the change in its length is directly proportional to the change in its length (x) i.e.

$F \propto -x$

i.e. $F = -Kx$

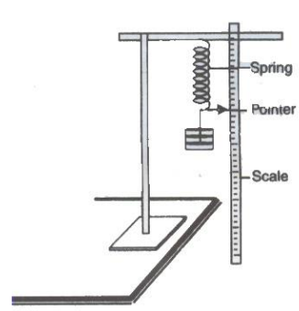
K is defined as the spring constant. If m_0 is the mass of the hanger and m is the mass kept on the hanger then

in equilibrium $F = -(m_0 + m)g = -Kx$

Which gives $m = \frac{K}{g}x - m_0$

Thus if a graph of m is plotted against x it with be a straight line with slope S = $\frac{K}{g}$. $i.e. K = Sg.$

1- Place the stand on the table top firmly near the edge so that arm of the clamp may be extended out of the table boundary as shown in the figure.
2- Clamp a half meter scale with the clamp so that it remains vertical with the zero of the scale on top.
3- Tie one end of the helical spring firmly with the arm of the clamp and let the other end hanging freely.
4- Attach a hook to carry weights and a pointer with the free end of the spring so that the pointer may move along the scale when the spring extends on loading to it.
5- Add a weight 20 gm. On the hook attached with the spring and wait for the mass spring system to come to a rest.

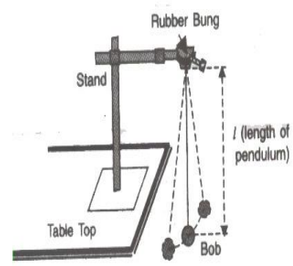


6- Read and record the position of the pointer on the scale (say l) against the weight (m) on the hook.
7- Repeat this experiment for four more weights on the hook increasing 20 gm. every time.
8- Read and record the corresponding values of 'l' and 'm' in the table.
9- Now remove the weights one by one in the same order. Read the position of the pointer on the scale (say l') for the same masses on the hook and record it against corresponding masses.
10- Calculate the average of l and l' ($x = \frac{l + l'}{2}$).
11- Plot a graph of 'm' against 'x' and determine the slope of the graph S.
12- Calculate spring constant K = Sg.

Question 3 [5]

To find the acceleration due to gravity with the help of a simple pendulum.

Brass bob, rubber bung, clamp with retort stand, thread, a stop clock or stop watch a Vernier callipers and a metre scale.



The formula for the time period of a simple pendulum is T = $2\pi\sqrt{\frac{l}{g}}$ where l is the length of the pendulum (from point of suspension to the centre of pendulum)

Squaring the formula on both sides and making l as the subject it gives $l = \frac{g}{4\pi^2}T^2$.

Thus if a graph of l (the length of pendulum) is plotted against T2 (the squire of the time period of the simple pendulum) it will be a straight line with slope $S = \frac{g}{4\pi^2}$. Therefore g = $4\pi^2$S.

1- Measure the diameter of the bob with the help of a Vernier callipers correctly and calculate its radius and record.
2- Tie the bob with one end of a silk thread about 120 cm in length. Clamp the thread between two flat pieces of rubber bung clamed with the clamp of the stand as shown in the fig.
3- Adjust the length of the thread (from rubber bung to the base of the hook of the bob) equal to 60 cm.
4- Calculate the length of the pendulum l = length of the thread + radius of the bob.
5- Keep the base of the stand near the edge of the table top and let the bob be hung from the side freely.
6- Pull the bob a little aside keeping the string taugh and release. The bob will start oscillating about its mean position.
7- By the help of a stop watch or clock measure and record the time of 20 oscillations.
8- Calculate the time period T and T^2 up to 3 significant figures and record in your table.
9- Repeat this experiment for four more lengths of the thread. Calculate T and T^2 and record in the table.
10- Plot a graph of l against T^2.
11- Determine the slope of the line and therefore calculate the value of g = $4\pi^2$S.