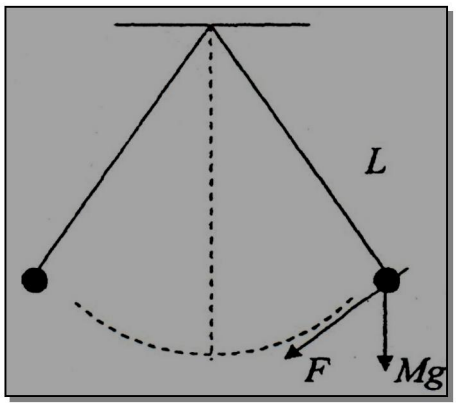
Exp. (4): The Simple Pendulum

Object:

Determine of the acceleration due gravity by using the simple pendulum method.

Theory:

Simple pendulum consists of a mass (bob) suspended by a string. When the bob of the pendulum swings, its motion describes a simple harmonic motion The periodic time [F of this motion is given by:



$$T = 2\pi\sqrt{\frac{L}{g}}$$

$$T^2 = 4\pi^2 \frac{L}{g}$$

$$g = 4\pi^2 \frac{L}{T^2}$$

Where,

L is the length of the pendulum (L is equal to the length of the string £ + the radius of the bob r).

Method:

1- Use the vernier caliper measure the diameter of the bob and then get its radius r.

2- Choose a certain length ℓ of the string and displace the bob with small displacement to make simple harmonic motion.

3- Find the time t_{20} of 20 complete oscillations, then get the time of one oscillation (periodic time) T.

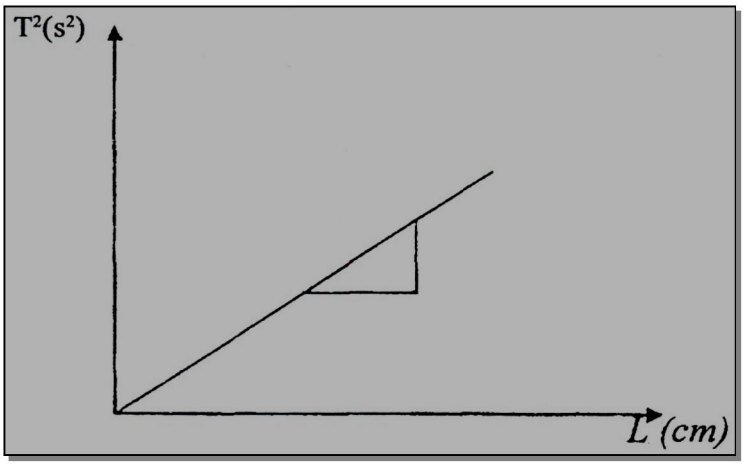
4- Respect the above steps with different string lengths and in each case find the corresponding periodic time.

5- Tabulate your results in a tb1e as shown.

$L = (\ell + r)$ (cm)	T_{20} (s)	$T = T_{20} / 20$(s)	T^2 (s^2)

6- Plot the relation between T^2 on the Y-axis and L on the X-axis to get a straight line passing through the origin whose

$$\text{Slope} = \frac{\Delta T^2}{\Delta L}$$



7- find the acceleration of gravity g from the relation:

$$g = \frac{4\pi^2}{slope} cm / s^2$$

Results:

R = (cm)

L (cm)	T20 (sec.)	$T = T_{20}/20$ (sec.)	T^2 (sec.^{2})

$$g = \frac{4\pi^2}{slope} cm / s^2$$

Good luck