The Simple Pendulum

The Purpose of Experiment:

To determine the acceleration of free fall by means of simple pendulum.

Apparatus used:

1. Pendulum ball (a metal sphere with a hole bored through its center).
2. Stopwatch.
3. Meter scale.
4. Metal holder.

Theory of Experiment:

The periodic time (T) is given by:

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

Where (g) is the acceleration of free fall (m/s^2).

(L) is the length of pendulum (m).

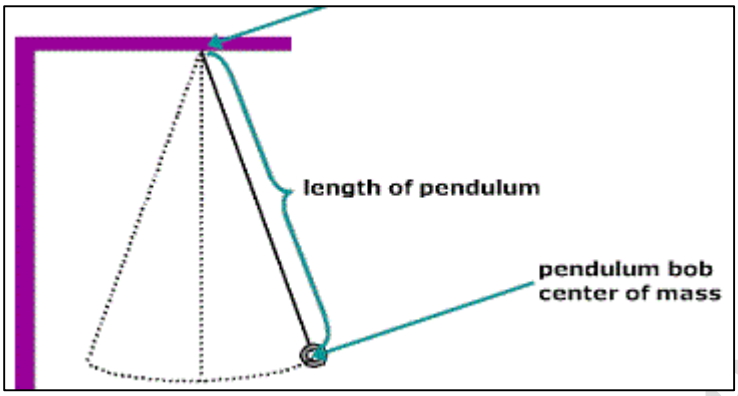
Therefore

$$g = \frac{4\pi^2 L}{T^2} \quad (m/s^2).$$

The Method of Work:

1. Tie a meter length of the thread to the pendulum ball and suspend the thread from two small plates held in a clamp.
2. Place a piece of paper with a vertical mark on it behind the pendulum, so that when the latter is at rest it hides the vertical mark.
3. Make the pendulum ball swinging through a small arc of about 10°.
4. Use the stop-watch to measure the time for (10 complete) oscillation.
5. Repeat the time.
6. Measure the length of thread (L) from the point of suspension to the middle of the ball.

7. Shorten the length of the pendulum about 5 or 6 cm by pulling the thread through the vice and take two time for 10 oscillation.



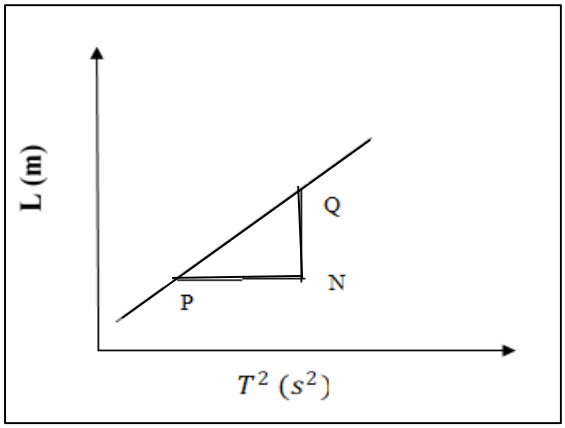
Calculations:

1. Tabulate the recorded reading as shown in the table below:

The length of the pendulum L(cm)	Time for 10 oscillations (sec)			Time for one oscillation, periodic time , $T = \frac{t_{mean}}{10}$	T^2	g
	t_1	t_2	t_{mean}			

Experiment graph:

Plot the graph of (L) against (T^2) will be a straight line whose slope ($\frac{QN}{PN}$), measured from two convenient and will-separated points P & Q on the line, is numerically equal to ($\frac{g}{4\pi^2}$),



Thus:

$$g = \frac{QN}{PN}\ 4\pi^2 \qquad (m/s^2)$$

Discussion Questions:

1. Is the acceleration depend on the weight of pendulum?
2. What is the relation between length of pendulum and time of vibration?
3. What are the medical effects of the acceleration on the body?
4. What happen without gravity of the human body?

Reference

E. Armitage, "Practical Physics in S.I. Paperback", John Murray; 2nd edition (1990).