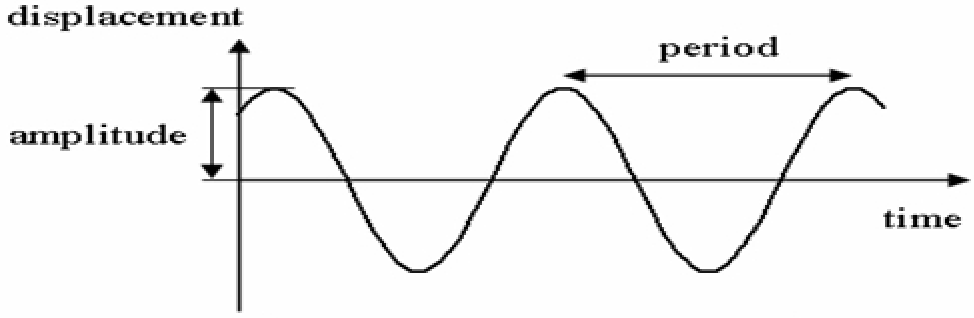
EXPERIMENT 1: SIMPLE HARMONIC MOTION

THEORY

Simple Pendulum

Any motion which repeats itself in equal intervals of time is called periodic motion.



Basic Illustration of Simple Harmonic Motion

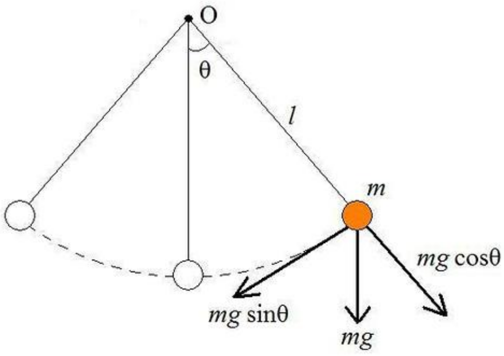
Simple harmonic motion is the motion of a simple harmonic oscillator. The motion is periodic, as it repeats itself at standart intervals in a specific manner, with constant amplitude.

It is characterised by its amplitude which is always positive and depends on how motion starts initially, its period which is the time for a single oscillation and its phase which depends on displacement as well as velocity of the moving object.

$$x = A\ \cos(wt + \ \varphi)$$

$x = displacement$ $\quad$ $A = amplitude$ $\quad$ $w = angular\ velocity$

$t = elapsed\ time$ $\quad$ $\varphi = phase$



For small angle

$$\sin\theta = \frac{x}{l}$$

$$T = 2\pi\sqrt{\frac{l}{g}} \qquad f = \frac{1}{T} \qquad f = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$$

- The period of pendulum is independent of its own mass and amplitude of the oscillation.
- The period of the pendulum is depends on its length.

PROCEDURE AND CALCULATIONS

For m_1=50g mass

1. Adjust the string length.
2. Initiate oscillations by displacing the mass with a small angle.
3. Determine the period by timing oscillations.(For 10 oscillations) Each oscillation involves a complete swing back to the starting position. The period T is determined by counting the number N of complete oscillations in a time t:

$$T = \frac{t}{N} \quad ; \quad N = 10$$

4. Calculate the period by using length of the string.
5. Compare these two values of the period and calculate percentage difference.
6. Calculate the acceleration of gravity by using the T value found in “3” and the string length.
7. Plot the graph T^2 vs L.

- Change the mass and repeat the steps 1-7.
- Change the length of string and repeat the steps 1-7 for two different masses.

m_1=	l_1=	l_2=	l_3=	l_4=
t(s)				
T_{exp}				
T_{theo}				
PE				
g(m/s^2)				

m_2=	l_1=	l_2=	l_3=	l_4=
t(s)				
T_{exp}				
T_{theo}				
PE				
g(m/s^2)				