3rd Laboratory exercise

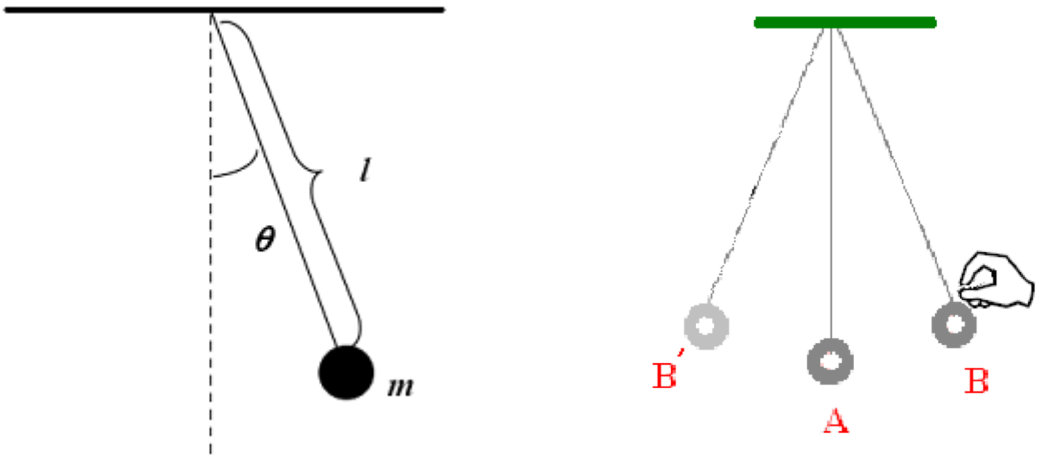
Periodic movements-oscillations

Theoretical part

Simple pendulum

When a move is repeated at equal intervals it is called periodic. In the event that a periodic movement becomes reciprocated around a position of equilibrium then it is called oscillation.

The simple pendulum consists of a small-sized heavy body, usually a pellet, that hangs with a thin thread from a fixed point and can move freely around it, making oscillations on a vertical plane. If the pellet is removed at a small angle θ (fig. 1a) from its equilibrium position, it is left free and ignored frictions and resistances, then due to its weight and the tension of the yarn will make free oscillation between points B and B΄ that are equal Distance from A (Fig. 1b).



(a) **(b)**

Pict. 1 (a): Simple Pendulum, **b** Simple pendulum oscillation around position A.

The pendulum makes a oscillation, if the pellet moves from the B to the B΄ and back to B. The time of an oscillation is the period T of the pendulum. The distance from the dependency point to the center of the pellet is the length l of the pendulum. Considering that such a pendulum makes oscillations of a very small deflection angle θ ($\theta < 5^o$), the period T of the pendulum is given by the relationship:

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

Where: π= 3.14 and g= Acceleration of gravity

Experimental part

Instruments, apparatus and materials:

1. Timer
2. Ruler
3. Iron Hook
4. Iron Base
5. Iron rod
6. String
7. Beads (pellets)
8. Magnet

Figure 1 *Experimental Apparatus*

Experimental procedure:

A. Effect of length in the pendulum period

1. Use the ruler and measure the length of the thread at 1 m.
2. Remove the pellet from the balance position and measure the time of five oscillations. The time measurement starts from the moment you leave it. You say "zero" and you Count "one", "two" etc. when the pellet goes again from the point where you leave it in the "ten" stop the timer. Repeat two or three times. Change the length of the string reducing it each time by 10 cm and fill the following Table 1

Table 1

	l (m)	*10T (s)*	*T (s)*
1			
2			
3			

B. Effect of mass in the pendulum period

1. Keeping the length of the yarn fixed (l = *1 m*) mount 3 different weights.
2. For each weight, measure the time of 10 oscillations and fill in Table 2.

Table 2

	m (g)	*10T (s)*	*T (s)*
1			
2			
3			

C. Effect of acceleration of gravity in the pendulum period

1. Mount the iron ball into the yarn. Place the magnet directly below the balance position of the pendulum For length l = *1 m* divert it by small angle, measure the time of 10 oscillations and calculate the period *T* of the pendulum. Repeat this procedure for 3 different string lengths and fill the Table 3.

Table 3

Without Magnet			**With Magnet**		
10 T (s)	*T (s)*	*l (cm)*	*10 T(s)*	*T(s)*	*l (cm)*