

Lab #1

Simple Pendulum

Objectives

To apply the principles of measurements and uncertainties to study the simple pendulum and find the relationship between period, mass and length.

Material

- string and masses
- Universal stand
- Meter stick
- Plastic ruler
- Vernier caliper
- Chronometer

Necessary readings

- <http://www.remi.poirier.com/Labs.html>
- <http://www.remi.poirier.com/Labs/uncertainties.html>

Experiment

You must design your own experiment to show the dependence of the period of oscillation of a simple pendulum on its mass and length.

First keep the length constant and vary the mass. Then keep mass constant and vary length. In order to simplify the experiment choose to control the amplitude of oscillation (the initial angle) relatively small, (below 25°).

You must describe clearly in your logbook the following things:

- What is the uncertainty on the period, and how did you evaluate it?
- What are the uncertainties on length and mass.
- How did you control the amplitude of oscillation.
- Vary the length at least 10 times over a wide enough range.

Plot graphs including, error bars to show the relationships you measured. Plot a trendline only for straight line graphs.

If you find a non linear relationship, try to modify your data in order to plot a straight line. For example, if $T = C l^x$, where C is a constant and x an unknown power, an easy method to find the unknown power x , is to plot $\log(T)$ vs $\log(l)$, and since $\log(l^x) = x \log(l)$, the slope in such a graph will give you the value of the power x . The intercept of the graph will represent $\log(C)$ and the relationship can now be found quantitatively.