

MSET – LARGE ANGLE PENDULUM



Purpose

Examine the accuracy of large angle pendulums to determine what the simple pendulum solution limits are.

Large θ Pendulum

An example of a large amplitude pendulum is the inverted pendulum called a metronome. This device is used by musicians to help keep time as they perform. The angle of sweep at slow beats can be greater than a simple pendulums.



Theory

The small angle pendulum has an period of oscillation defined as:

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

As the angle increases that solution becomes inaccurate. The following equation should be used for longer periods of oscillation:

$$T = 2\pi \sqrt{\frac{L}{g}} \left(1 + \frac{1}{16} \theta^2 + \frac{11}{3072} \theta^4 \right)$$

Setup

Results

Data of pivot point rotation will be plotted, and the measured period or frequency of oscillation determined for assigned small to large angles of rotation. Results of this will be compared to conclude if and when the small angle solution becomes inaccurate.

