

4.3.1: Introduction

The simple harmonic motion is examined in this exercise through the observation of a simple pendulum and a mass-loaded spring. A pendulum is an example of simple harmonic motion. For small displacements of the mass relative to the length of the pendulum, and assuming that the weight of the suspending rod or wire is negligible, the frequency of oscillation is

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

where f is the frequency in Hertz, g is the gravitational attraction (9.8 m/s^2 on Earth) and l is the length of the pendulum in meters. Note that longer pendulums produce a lower frequency of oscillation and that mass does not affect the frequency.

For the mass-loaded spring, the frequency of oscillation is

$$f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$$

where f is the frequency in hertz, k is the spring constant in kilograms per second squared (higher values indicate a stiffer spring) and m is the suspended mass in kilograms. Note that a stiffer spring produces a higher frequency of oscillation and that a larger mass produces a lower frequency.

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