PHYSICS SL
Barton's Pendulum

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1 Research Question

What is the relationship between the amplitude of the forced pendulum /rad and the length of the driver pendulum /m in a Barton's pendulum.

2 Introduction

Pendulums undergo a repeating cycle of energy transfer from only potential energy to only kinetic energy back to only potential energy. This process causes a pendulum system to undergo simple harmonic motion, therefore pendulums have properties such as period and frequency of oscillation defined that are dependent on the length of the pendulum.

What this also means is that any periodic external force will or will not resonate with the pendulum. This applies to various real-life scenarios and problems, from something as little as the frequency that a parent should push their child on a swing to whether gusts of wind are capable of driving an idle wrecking ball to dangerous.

Intuitively, if an external periodic force is resonant with the pendulum, then the extent that the pendulum's amplitude will reach will be at its maximum. However, one should question exactly how this maximum amplitude grows as the frequency of the external force approaches the resonant frequency of the pendulum.

This could easily be investigated by suspending a driving pendulum and a forced pendulum on the same string. This allows for an easy way to provide an external periodic force through the driver pendulum, allowing for the frequency of the external force to be manipulated through changing the length of the driver pendulum and removing the necessity of a motorized instrument.

3 Background information

4 Hypothesis

When the length of the driver pendulum equals to the length of the forced pendulum, then the amplitude of the forced pendulum will be at its maximum as the two pendulums are in resonance.

As the length of the driver pendulum approaches the length of the forced pendulum, then the amplitude of the forced pendulum will approach that maximum from lower values.

5 Materials

6 Experimental Protocol

7 Variables

8 Raw Data

9 Processed Data

10 Analysis

11 Evaluation

References

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