Physics 207-GH1
11/21/2016
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Title: Lab 6- Simple Harmonic Oscillators

Introduction

The purpose of this lab is to study the simple harmonic motion of a mass hanging from a spring using a motion detector. The simple harmonic motion is studied on a mass handing from a spring using a motion detector. Using a spring and a hanging mass, I was able to measure the spring constant of a system. We also looked in to different parts of harmonic motion. By collecting date from the free bouncing mass over a motion sensor and comparing the 3 graphs of period vs. time, velocity vs. time and acceleration vs. time.

Data and Calculations

Experiment 1: Spring Constant.

$F= -k\ (\ x- x_0\ )$

$x\ -x_0= 73cm-47.5cm$

$=25.5cm$

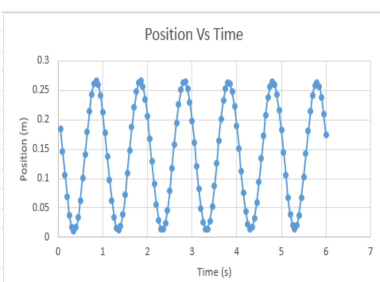
$=0.255cm$

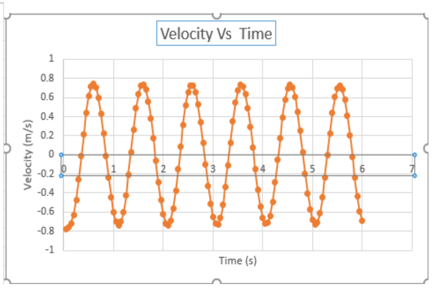
$F=-9.8\ m/s^2$

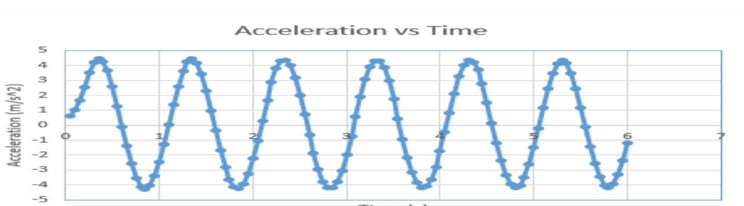
$k= 9.8/0.255$

$= 38.4\ N/m$

Experiment 2: Graph of Oscillation 1 kg.

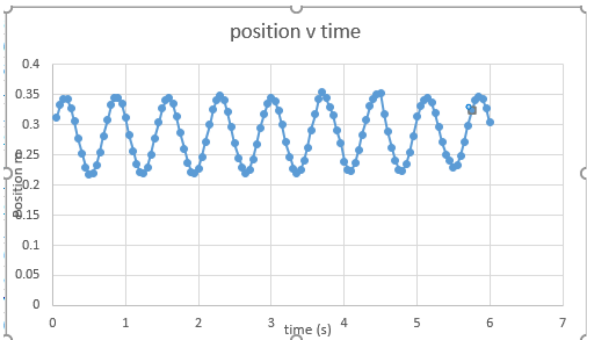


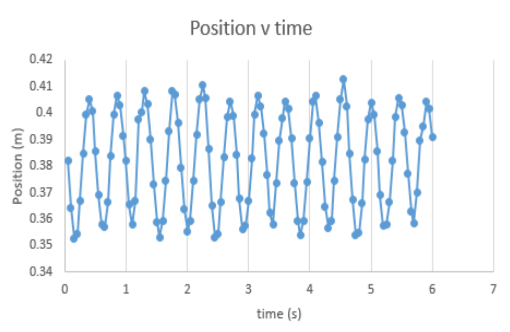


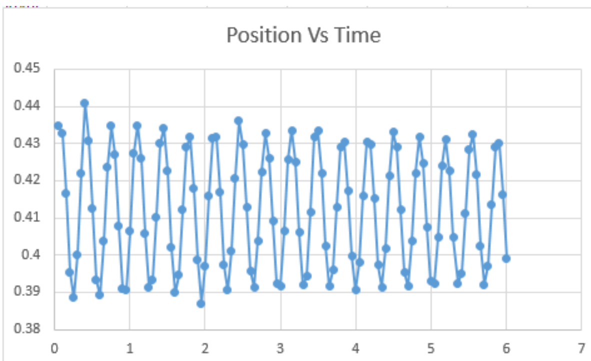


Experiment 3: Graph Data (Position v time)

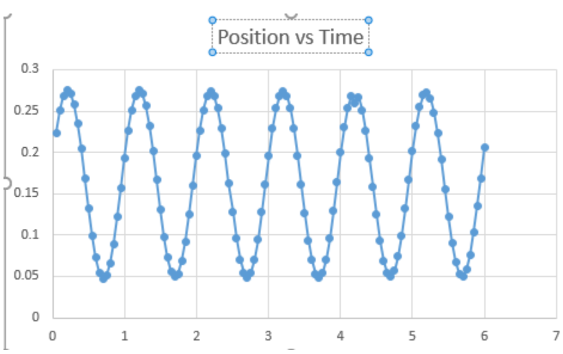
Mass .5 kg, Mass .2kg and Mass .1kg

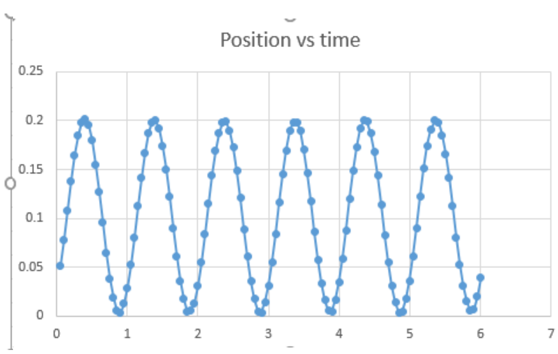






Amplitude Change: #1 and #2





Experiment 4: Conservation of Energy

$E=k((xmax+xmin)/2)^2/2$

$= ((38.4)(0.1388)^2)/2$

$= 0.370$ J (Max Point)

$E=(k(x_{equillibrium})^2)/2$

$=(38.4(0.1279)^2)/2$

$= 0.314$ J (Equilibrium)

Report Questions:

1. It always tries to move towards equilibrium.
2. Max velocity=(0.266755 m-0.01104m)/(0.85s- 0.35s)=0.51143 m/s

   Graph= 0.742366 m/s

3. When it's in equilibrium.
4. Min Velo=(0.266755 m -0.011837)/(0.85s- 1.35s)=-0.50984 m/s

   Graph= -0.77459 m/s

5. When position/displacement is at 0.
6. Max Acc=(0.742366 - -0.77459)/(0.6s -0.05s)= 2.75810 m/s^2

   Graph= 4.442556 m/s^2

7. When velocity is 0 and position is at lowest state.
8. Min Acc= (0.742366 - -0.74067)/(0.6s -1.1s)= 2.966072 m/s^2

   Graph = -4.30301

9. When velocity is at a maximum.
10. My prediction was the similar as the graph produced from the experiment.
11. As time goes on and the mass continues to oscillate, the amplitude will continue to decrease until it comes to rest.
12. τ = -1.25
13. The period does not change.
14. The energy goes into heating of the surrounding air and internal heating of the spring as its crystals slide past each other. This internal heating will not be noticed, as the heat will be quickly dissipated into the surrounding air.

Conclusion:

In these lab experiments, we proved Hook's Law and Newton's Second Law with simple harmonic oscillator. We looked at the relation between acceleration vs. time, velocity vs. time, position vs. time and observed at how they are related. Also looked at and calculated the conservation of the system and experiment with two spring and same mass. From this experiment, we know that the acceleration and displacement of a simple harmonic motion is directly proportional to each other.