Simple harmonic motion

Introduction

In this two part lab we sought out to demonstrate simple harmonic motion by observing the behavior of a spring. For the first part we needed to observe the motion or oscillation of a spring in order to find k, the spring constant; which is commonly described as how stiff the spring is. Using the equation Fs=-kx or, Fs= mg= kx; where Fs is the force of the spring, mg represents mass times gravity, and kx is the spring constant times the distance, we can mathematically isolate for the spring constant k.

We can also graph the data collected and the slope of the line will reflect the spring constant. In the second part of the lab we used the equation T= 2? mk, where T is the period of the spring. After calculating and graphing the data the x-intercept represented k, the spring constant. The spring constant is technically the measure of elasticity of the spring.

Data: mass of weight | displacement| m (kg)| x (m)| 0. 1| 0. 12| 0. 2| 0. 24| 0. 3 | 0. 36| 0. 4| 0. 48| 0. 5| 0. 60|

We began the experiment by placing a helical spring on a clamp, creating a " spring system". We then measured the distance from the bottom of the suspended spring to the floor. Next we placed a 100g weight on the bottom of the spring and then measured the displacement of the spring due to the weight . We repeated the procedure with 200g, 300g, 400g, and 500g weights. We then placed the recorded data for each trial into the equation Fs= mg= kx. For example: 300g weight mg= kx 0. 30kg9. 8ms2= k0. 36m 0. 30kg 9. 8ms20. 36m= k 8. 17kgs= k

Here we graphed our collected data. The slope of the line verified that the spring constant is approximately 8. 17kgs. In the second part of the experiment we suspended a 100g weight from the bottom of the spring and pulled it very slightly in order to set the spring in motion. We then used a timer to time how long it took for the spring to make one complete oscillation. We repeated this for the 200g, 300g, 400g, and 500g weights. Next we divided the times by 30 in order to find the average period of oscillation. We then used the equation T2= 4? mk to mathematically isolate and find k. Lastly we graphed our data in order to find the x-intercept which should represent the value of k.

Data Collected

Derived Data: mass of weight | time of 30 osscillation | avg osscilation T| T2| | m (kg)| t (s)| t30 (s)| T2 s2| | 0. 10| 26. 35| 0. 88| 0. 77| | 0. 20| 33. 53| 1. 12| 1. 25| | 0. 30| 39. 34| 1. 31| 1. 72| | 0. 40| 44. 81| 1. 49| 2. 22| | 0. 50| 49. 78| 1. 66| 2. 76| | Going back to our equation T2= 4? 2mk .

We found the average period squared and the average mass and set the equation up as T2m= 4? 2k. Since T2 is our change in y and m is our change in x, this also helped us to find the slope of our line. We got T2m equals approximately 4. 98s2kg. We now have 4. 98s2kg= 4? 2k. Rearranging we have k= 4? 24. 98s2k= 7. 92N/m. Plotting the points and observing that the slope of our line is indeed approximately 4. 98 we see that the line does cross the x-axis at approximately 7. 92. Conclusion Prior to placing any additional weight onto our spring we measured the length of spring to be 0. 8m. So if we hooked an identical spring and an additional 200g the elongation of our total spring would be approximately 0. 8m; accounting for twice our spring and the . 24m the additional weight added. However, I believethe additional weight of the second spring would slightly elongate the initial spring; bringing it roughly over a meter. Since our spring elongation has almost tripled I believe that an effective spring constant would be triple that of what we found it to be initially, making a new spring constant of 24. 51kgs