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Lab 5 Conclusion

The object of the experiment is to determine the spring constant for a hard and soft spring by using weights to increase the length of the spring, giving us the ability to calculate the force with which we can calculate the spring constant. We are also looking for the instances of error that are produced within the experiment.

The apparatus consisted of a plumb bob apparatus, hard and soft springs, string, pulley, meter stick, and weights.

The theory used in this lab consisted of the force (Fs) exerted by a spring is equal to the force constant (k) times the displacement (x). The provides the equation:

Fs = -kx

This equation is Hooke’s law. The reason k is negative is that the force exerted by the spring is opposite of the displacement from the equilibrium position.

The steps we followed during the lab were:

1. Attach a soft spring to the hook on the pole of the apparatus. Attach a piece of thread to the other end of the soft spring, and connect it to a weight pan. Hang the pan over the side of the pulley.
2. Record the equilibrium length of the soft spring. Place a mass on the pan so that a total mass of 0.100 kg is hanging from the thread. Record the total length of the distended spring.
3. Repeat step two with the following masses: 0.150 kg, 0.250 kg, 0.350 kg, and 0.450 kg.
4. Repeat steps 1, 2, and 3 for the hard spring.

Our results were:

Table 1: Soft Spring

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mass, kg | Equilibrium Length,m | Distended length, m | Fs, N | x,m | k, N/m |
| 0.100 | 0.044 | 0.062 | .98 | 0.018 | 54.44 |
| 0.150 | 0.044 | 0.095 | 1.47 | 0.041 | 35.85 |
| 0.250 | 0.044 | 0.109 | 2.45 | 0.065 | 37.69 |
| 0.350 | 0.044 | 0.144 | 3.43 | 0.1 | 34.43 |
| 0.450 | 0.044 | 0.171 | 4.41 | 0.127 | 34.72 |

Average = 35.65

Table 2: Hard Spring

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mass, kg | Equilibrium Length,m | Distended length, m | Fs, N | x,m | k, N/m |
| 0.100 | 0.047 | 0.051 | .98 | 0.004 | 245 |
| 0.150 | 0.047 | 0.062 | 1.47 | 0.015 | 98 |
| 0.250 | 0.047 | 0.075 | 2.45 | 0.028 | 87.5 |
| 0.350 | 0.047 | 0.088 | 3.43 | 0.041 | 83.66 |
| 0.450 | 0.047 | 0.96 | 4.41 | 0.049 | 90 |

Average = 89.788

The weight 0.100 for both the soft and hard spring produced a bad point of measurement because the weight was not enough to provide a good distance from the point of equilibrium, giving you an inaccurate reading.

Our results backed up what we expected to get from the experiment.

Sources of Error:

1. Human: inability to take exact measures causing imprecise calculations, incorrect amount of weight being put on the pulley causing a bad reading, steps were not followed exactly.
2. Equipment: weights did not weigh their exact measurements causing a misreading, weights were not heavy enough to provide an accurate reading, tension in the spring varied from their original tension, plumb bob weighed more than specified adding too much weight to the spring.
3. Environmental: conditions in the room caused the springs to be too elastic or not elastic enough for the experiment to be exact.