Physics 118 - Studio 11 Discussion

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February 25, 2015

Discussion

Our results support our hypothesis that the height after one full uninterrupted swing would be only slightly smaller than the release height of the pendulum. Our release height was $15 \pm .2$cm and the corresponding catch height was $14 \pm .5$ cm. We observe this small decrease in energy due to friction with the surrounding air. Our uncertainty in these and the subsequent measurements were due to uncertainties in our measurement devices, and an inability to catch the pendulum at exactly its point of rest. A possible improvement would be to use logging software to measure the exact height at which the pendulum was stationary rather than relying on catching it. Our results also indicated that, even when the swing of the pendulum was interrupted, the height achieved was still only slightly smaller (again because of energy loss due to friction with the air). We also found the height in the string at which the pendulum was interrupted did not affect the re-achieved height of the pendulum (for the distances of 35.5cm, 41.5cm, and 24.5cm between the interrupting rod and the swing fulcrum, we achieved no significant difference in release and catch heights). This is because gravity is a conservative force, and thus the pendulum was able to re-achieve approximately the same potential energy independent of the path that it took to reach that height. When releasing the pendulum from a horizontal position of 90^o, with the distance between the swing fulcrum and interrupting rod set to the following fractions of the length of the pendulum (L represents pendulum length): $.5L, .6L, .75L, .59L$, we found that only the lengths $.6L, .59L, .75L$ were able to produce a full rotation around the interrupting peg. From our trials, we estimated the minimum distance between the swing fulcrum and interrupting peg to be $(.59 \pm .01)L$. We found that the pendulum was not able to complete a full rotation when the distance between the swing fulcrum and interrupting peg was $.5L$. Such a result was expected, as we had estimated earlier that the minimum required distance for a full rotation was $(.59 \pm .01)L$.