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Physics

Lab 4 Conclusion

The object of the experiment is to determine the velocity of a projectile by means of a ballistic pendulum apparatus and to discover the sources of error in the apparatus and through the calculations being used.

The apparatus of the experiment consisted of a ballistic pendulum apparatus, steel ball, balance, and measuring tape.

The theory used in this lab consisted of

1. A bullet of mass m traveling with a velocity V in the x-direction strikes the ground at some distance x.
2. Assuming that the initial acceleration of the ball is instantaneous, the only acceleration will be in the y-direction due to gravity.
3. Therefore, Vxf will equal Vxi, and Vyf = Vyi + gt, h = vyit + 1/2gt2.
4. The velocity of the bullet Vx is given by Vx = x/t, because ax = 0.

The steps we followed during the lab were:

1. Locate four heights from which the apparatus will fire from.
2. Measure the height from the ground to the middle of the steel ball.
3. Fire the projectile and observe where it strikes the ground, measuring the distance from the original point to the point of impact.
4. Repeat steps 1 to 3 twice more at each location.
5. Calculate the time, initial velocity, and final velocity for each height.

Our results were

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Trial # | Height h  m | X  m | Time  T | Initial  Vxi | Final  Vyf |
| 1. | 0.46m | 1.67m | 0.31s | 5.448m/s | 3.00m/s |
| 2. | 1.53m | 3.06m | 0.559s | 5.456m/s | 5.48m/s |
| 3. | 0.66m | 1.84m | 0.367s | 5.022m/s | 3.60m/s |
| 4. | 0.09m | 0.83m | 0.136s | 6.125m/s | 1.33m/s |

Our results were synonymous with what we expected.

Sources of Error

Human: Inability for a human to take precise measurements; one group member could have removed the measuring devices too early, causing the measurement to be guessed at; inability of someone to recognize a measurement or incorrectly compute.

Apparatus: measuring devices were not accurate; measuring devices were broken/missing parts; stress on string decreased optimized velocity.

Environmental: The ground was not completely level, causing an inaccurate reading; firing the ball into the grass would provide a false reading.