

Lab: Cons. of Momentum, Energy: The Ballistic Pendulum

Background

Conservation of momentum and conservation of energy are two fundamentally important physics laws, and many common problems require the appropriate application of both.

Objectives

To experimentally determine, in two different ways, the “muzzle velocity” of a bullet leaving a gun. The first approach will be use a classic projectile-based, kinematics approach to finding v_{bullet} . The second approach will involve using a “ballistic pendulum.”

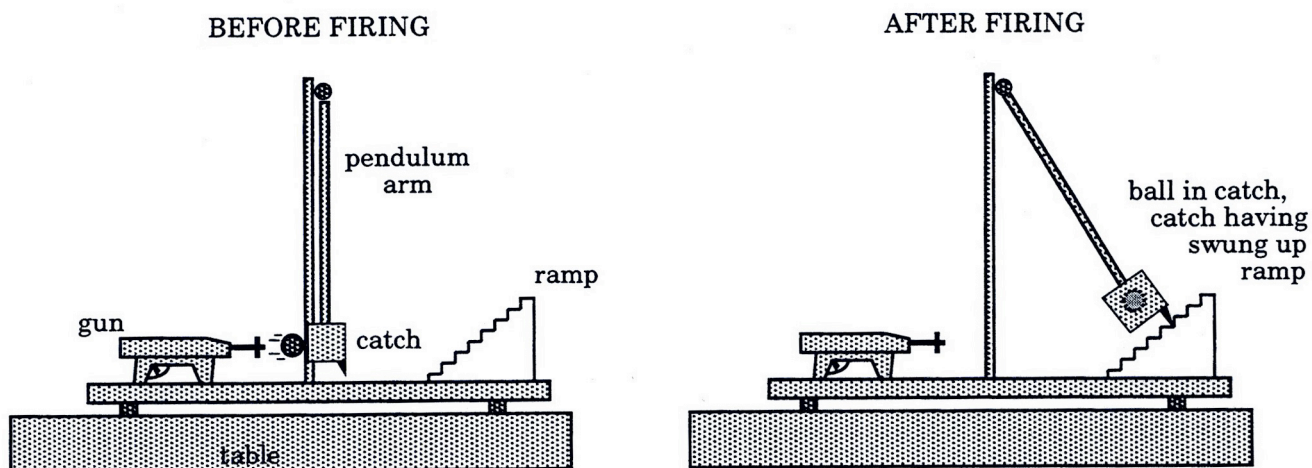
Equipment

Ballistic pendulum unit, w/ steel ball (the bullet)
Meter stick
Balance

Procedure

Part A. Muzzle Velocity of the Ball using Kinematics

1. Carefully remove the pendulum arm from the ballistic pendulum base and set it aside.
2. Place the ballistic pendulum unit on a lab table so that the gun is oriented horizontally, with at least 4 meters of clear space in front of it. **The gun should *never* be loaded and cocked if there are people in front of it.**
3. Take measurements that will allow you to calculate the ball’s velocity as it leaves the gun; these measurements will involve a projectile-style analysis. Would multiple trials be appropriate here?



Part B. Muzzle Velocity of the Ball using Conservations of Momentum & Energy

1. Carefully reattach the pendulum arm to the ballistic pendulum base. *Do not overtighten the black pivot screws!* Check to make sure that the catcher is aligned with the ball horizontally and vertically, and have the instructor confirm your setup before cocking.
2. Fire the ball into the catcher. Run three trials, in which you collect data that will allow you to determine the muzzle velocity of the ball.

Questions

No additional questions for this lab.

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Additional Notes

Make sure that you are doing Part A, Step 2b. *Sketch your set-up, identifying important variables on your sketch.* This should probably go without saying, but that step is included here in the notes as a reminder!

In Part A, Step 3, it should probably also go without saying that your collected data will be recorded in a data table, specifically designed for that purpose. Make sure your data table resembles the one shown here:

Data being recorded (unit)	Value
More data being recorded (unit)	Value
Additional data (unit), Trial 1	Value
“, Trial 2	Value
Etc. as needed	Value

In Part B, Step 2, you'll obviously need to record more data in an appropriate data table. Also, in calculating the muzzle velocity of the ball using this data, you'll need to carefully blurb your steps--otherwise, readers won't know what approaches you were using to solve different parts of the problem.