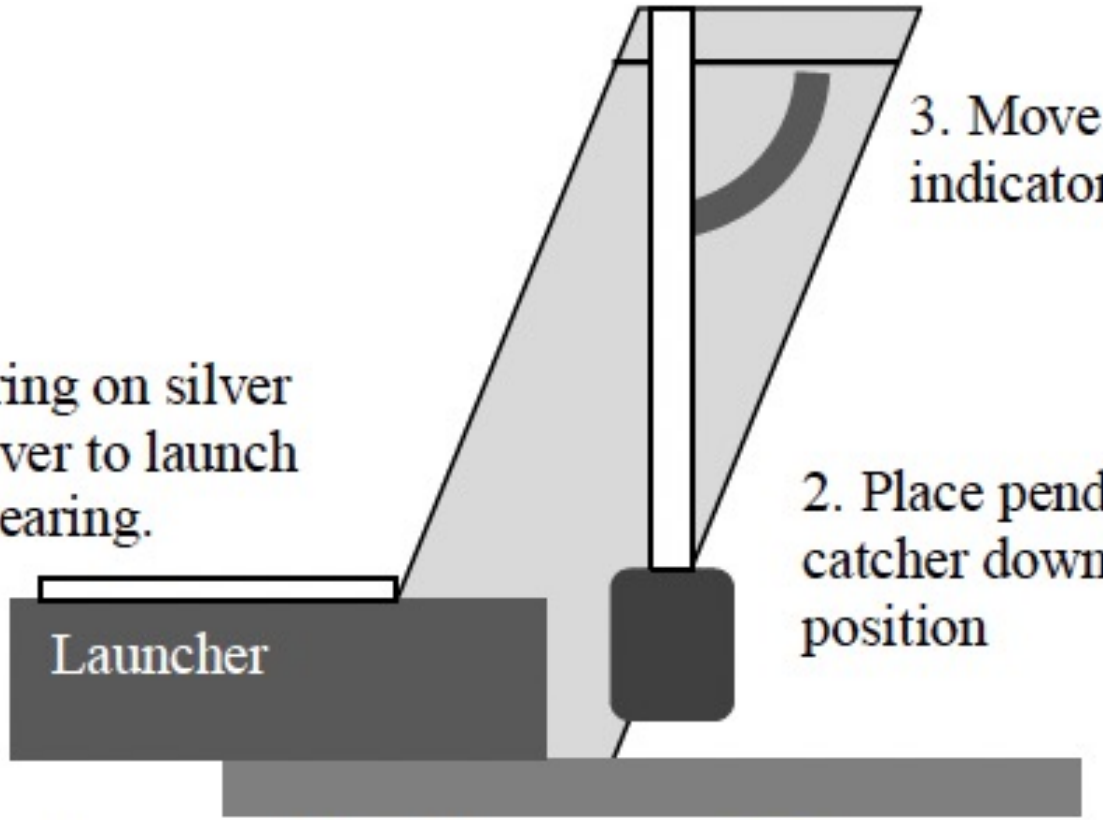
Test Summary Emailed to You

Test info

- Multiple choice as usual
- Be able to define (equation and units) and apply concepts of impulse and momentum
- Be able to use impulse/change in momentum and conservation of momentum to solve problems or answer conceptual questions (including 2D)
- Be able to identify when momentum, KE, mechanical E are conserved, and how to use those principles to solve problems like the ones from this unit (both from class and from HW/XtraWrk)
  - You will need to use BOTH conservation of momentum AND conservation of energy at some point, as we've done in many problems
- Know the different types of collisions and how to distinguish them (elastic, inelastic, perfectly inelastic)

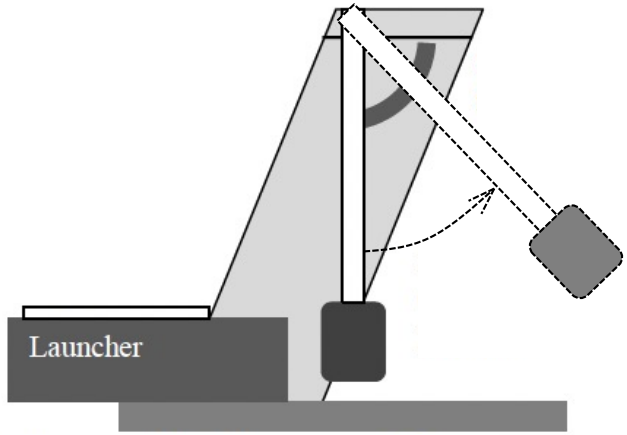
Ballistic Pendulum Lab

Part A. Muzzle Velocity of the Ball using momentum/energy



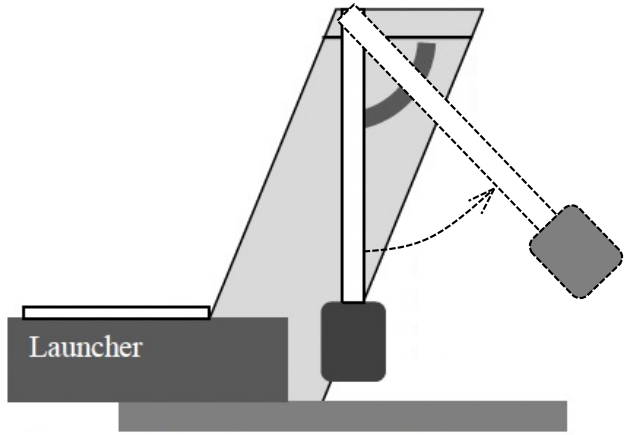
(Note: if ball rolls outward, use something to elevate barrel slightly)

1.) When during the experiment is the mechanical energy in the system conserved? When is it NOT conserved?

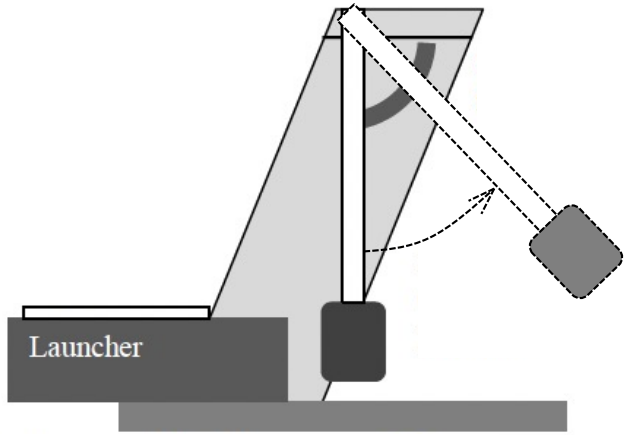


2.) When during the experiment is momentum in the system conserved? When is it NOT conserved?

3.) Use conservation of energy and conservation of momentum (appropriately) to derive a general algebraic expression for the muzzle velocity of the launcher.

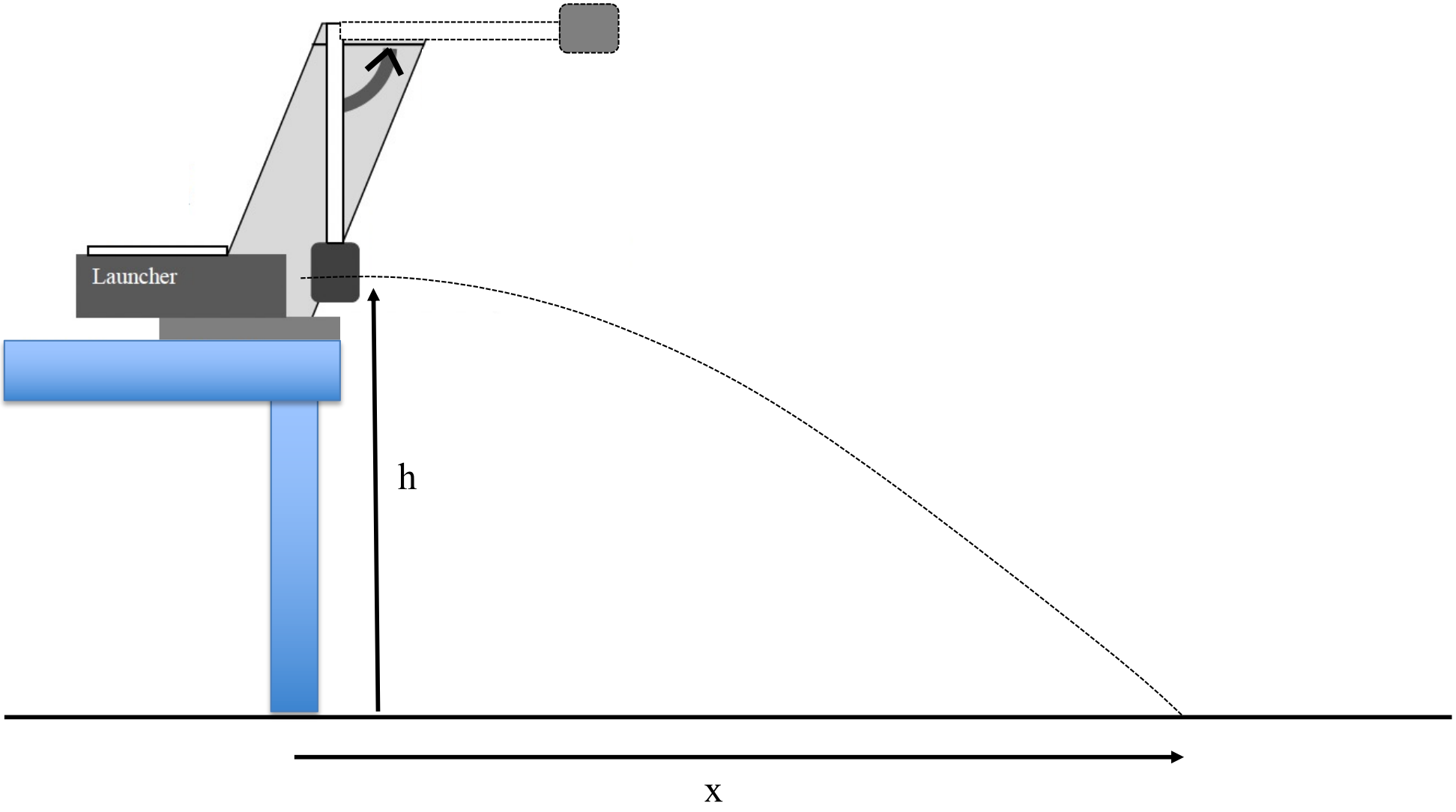


4.) Use the data to determine the actual muzzle velocity for your launcher.



Part B. Muzzle Velocity of the Ball using Kinematics

With the catch rotated up and out of the way, fire your ball into the room. Measure the distance it dropped during the flight and the horizontal distance it traveled during the flight.



5.) Noting that the initial velocity in the “x” direction is the launcher’s muzzle velocity, and that the initial velocity in the “y” direction is zero, use kinematics to derive a general algebraic expression for the muzzle velocity of the launcher

5.) Use your data to come up with a numerical value for the muzzle velocity of your launcher.

6.) Do a % comparison between the two muzzle velocities you have calculated in this lab (they should be approximately the same . . . !).

Questions:

1.) In a real CSI lab, which approach would be the most reasonable to use in determine the muzzle velocity of a bullet coming out of a gun? Briefly explain.

2.) Calculate the amount of mechanical energy that was lost due to the collision of the ball and the catch. That is, calculate how much kinetic energy the ball had before the collision, and how much kinetic energy the ball and catch had just after the collision (or how much potential energy the ball and catch had at the top of their swing). WHAT % OF ENERGY WAS LOST DUE TO THE COLLISION (you should find this to be around 80%!). What does this tell you about energy loss in collision like this?