HONORS PHYSICS

Projectile Motion Lab

Introduction
Remember that when analyzing two-dimensional motion, the horizontal and vertical motions are independent of one another. Horizontally, projectiles in free fall travel at constant velocity, while, vertically, they experience uniform acceleration resulting in a classic parabolic trajectory.

For this experiment, you have two tasks:
1. Determine the initial velocity of the Atomic Power Popper
2. Calculate the angle of inclination needed to launch the Atomic Power Popper from the top of 1026 to the top of 1027.

Safety
You will need to wear safety glasses for this experiment.

Materials
Atomic Power Popper
Stopwatch

Procedure: Part 1
The goal of this part of the lab is to determine the launch velocity of the Atomic Power Popper.

1. Aim the Atomic Power Popper horizontally and shoot the nerf ball onto the floor.
2. Use the stopwatch on your phone to measure how long the nerf ball is in the air.
3. Mark the location on the floor where the nerf ball lands. Record the horizontal distance traveled by the nerf ball.
4. Repeat this two times and record your data in the data table.
5. Record the height of the table.

Procedure: Part 2
The goal of this part of the lab is to use the concept of the general launch angle to measure an average value for the muzzle velocity.

1. Use an angle of 30 degrees.
2. Aim the Atomic Power Popper at an angle of inclination of 30 degrees and shoot the nerf ball.
3. Record the range of the nerf ball.
4. Use the range equation, given in class, to calculate the muzzle velocity of the Atomic Power Popper.

5. Repeat this two times and record your data in the data table.

Procedure: Part 3
You may only do this part after you have done your calculations for parts 1 and 2.
1. Use the dimensions of the courtyard and the height of 1026 and 1027 to calculate the angle of inclination required to launch the nerf ball across the courtyard so that it lands safely on the top of 1027. Use your average muzzle velocity of the Atomic Power Popper.
2. Have your value

Data Table: Part 1

Height of the table: _____ m

Trial	Time to hit floor (sec)	Horizontal distance (m)	Muzzle velocity (m/sec)
1			
2			
3			
Average			

Data Table: Part 2

Trial	Range (m)	Muzzle Velocity (m/sec)
1		
2		
3		
Average		

Analysis Questions: Part 1

1. For each trial, calculate the muzzle velocity of the Atomic Power Popper.

2. Calculate the average muzzle velocity of the Atomic Power Popper.

3. Is the muzzle velocity generally consistent? Determine your variation in your trial data.

Analysis Questions: Part 2

1. For each trial, calculate the muzzle velocity of the Atomic Power Popper.

2. Calculate the average muzzle velocity of the Atomic Power Popper.

3. Is the muzzle velocity generally consistent? Determine your variation in your trial data.

Analysis Questions: Part 3

1. State the muzzle velocity and angle you need to project the nerf ball across the courtyard.

2. State whether your nerf ball made it across or not.

3. If your nerf ball does not make it across, select one variable you would change or one variable you did not consider that might have influenced your result. How would you change that variable so that the nerf ball was successful?