NAME: PARTNERS: DEPARTMENT: DATE:

Determination of the Initial Velocity in Projectile Motion

Purpose

This experiment is performed to determine the initial velocity of a projectile motion (horizontal throw) with kinematics and the conservation of energy.

References

1. Physics Laboratory Experiments, Yuksel Sahan, Zambak Publications.
2. Practical Physics Lab, A Resource Manual, Peter Goodwin, J. Weston Walch, Publisher.
3. http://www.physicsclassroom.com/Class/vectors/u3l2a.cfm

Equipments

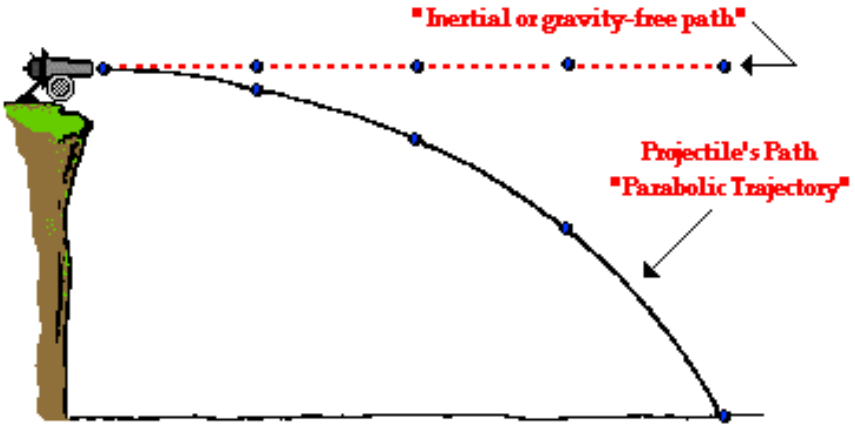
1. Curved path
2. Ruler
3. Metal ball
4. Carbon copy paper
5. Measuring tape

Pre-Lab Questions

1. What sorts of energy conservation can we observe here?
2. If we slide an ice cube instead of the metal ball, would it take shorter or longer distance?
3. When we calculate the velocity, distance and time are needed. We are able to find distance but how can we find time?

Introduction and Theory

A projectile is an object upon which the only force acting is gravity. There are a variety of examples of projectiles.



With gravity, a "projectile" will fall below its inertial path. Gravity acts downward to cause a downward acceleration. There are no horizontal forces needed to maintain the horizontal motion - consistent with the concept of inertia.

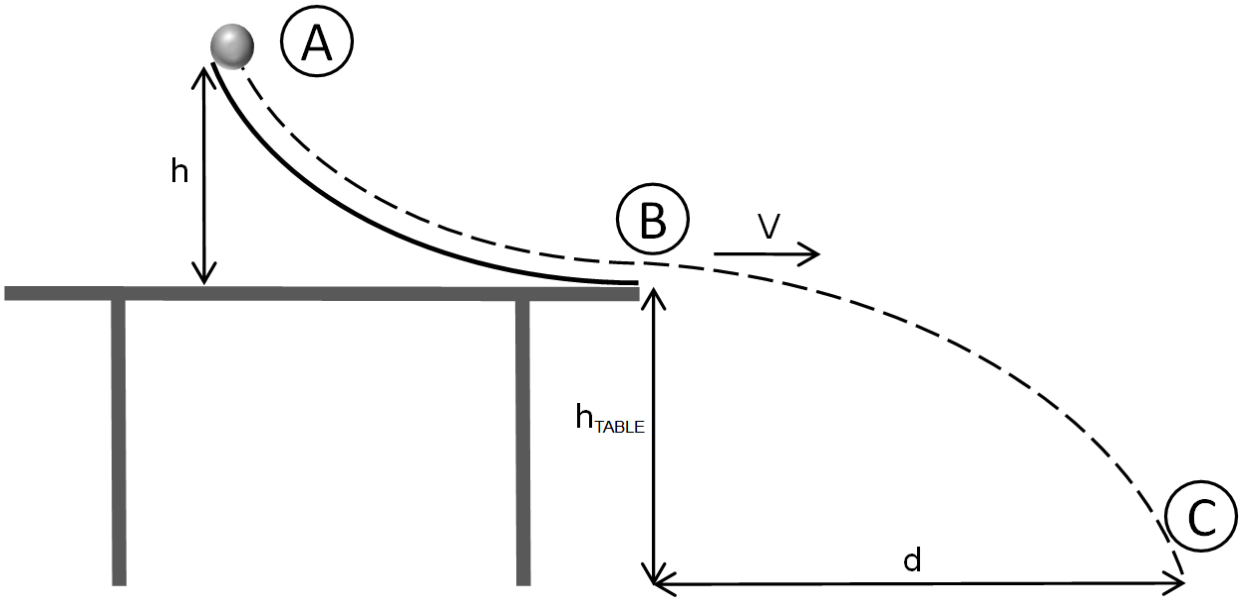
A projectile is an object upon which the only force is gravity. Gravity acts to influence the vertical motion of the projectile, thus causing a vertical acceleration. The horizontal motion of the projectile is the result of the tendency of any object in motion to remain in motion at constant velocity. Due to the absence of horizontal forces, a projectile remains in motion with a constant horizontal velocity. Horizontal forces are not required to keep a projectile moving horizontally. The only force acting upon a projectile is gravity! So the initial velocity is derived from the horizontal distance and the time of fall.

The time of fall is $t = \sqrt{\frac{2h_{TABLE}}{g}}$ like in free fall. Then the velocity (observed) is $v = \frac{d}{t}$.

Experimental Procedure

1. Measure and record the height of the table.
2. Calculate and record the time of fall.
3. Release the ball from h_1 at the point A and record h_1.
4. Measure and record the horizontal distance from the trace on the carbon copy paper left by the ball (Point C).
5. Calculate and record the velocity at the point B ($V_{OBSERVED}$).
6. Repeat the steps 3 to 5 with 2 more heights (h_2, h_3) at the point A.
7. Calculate the expected velocity ($V_{EXPECTED}$) with energy conversation for error finding

$v_{EXPECTED} = \sqrt{2gh}$ (from $\Delta E_P = \Delta E_K$, $mgh = \frac{1}{2}mv^2$ where g=9.81 m/s^2).



Data Collection and Calculations

Show the results of the experiment

h_{TABLE} (the height of the table) =……m t (the time of fall) = ……s

h (m)	d (m)	$V_{OBSERVED}$(m/s)	$V_{EXPECTED}$ (m/s)	ERROR (%)*
h_1=				
h_2=				
h_3=				

$$Error = \frac{|V_{EXPECTED} - V_{OBSERVED}|}{V_{EXPECTED}} \times 100 = \text{.....}\%$$

Your Conclusion