Lab 3 – projectile motion

Purpose – to determine the speed of a projectile and to predict the range of a projectile

dart gun

*h*

*R*

**Set-up 1 – object projected horizontally**

An object projected horizontally will

follow a path that is half a parabola

with a horizontal acceleration of zero

and a vertical acceleration of ***g*** downward.

From values for vertical distance and

horizontal distance the projectile moves,

the flight time and the launch speed of the object can be calculated.

Method: Measure and record the distance from the table top to the floor. Place the loaded and cocked dart gun flat on the table. Fire the gun and mark the spot where the dart hits the floor. Measure and record the horizontal distant from the table edge to the impact point of the dart.

Data table height \_\_\_\_\_\_\_\_\_\_ m horizontal distance for dart \_\_\_\_\_\_\_\_\_\_\_ m

Calculate the time of flight and the launch speed of the dart.

*R*

37o

**Set-up 2 – object projected with a launch angle**

 **between 0o and 90o**

An object projected upward at an angle across a level surface will follow a symmetrical, parabolic path. From the launch speed and the launch angle, the flight time and the horizontal distance can be calculated.

Method: Load and cock the dart gun. Incline the gun at an angle of 37o with the table top using the protractor and plumb line. Fire the gun and mark the spot where the dart lands. Measure the horizontal distance the dart went.

Data: launch speed \_\_\_\_\_\_\_\_\_\_ m/s ***Use the launch speed for the dart you determined in set-up 1.***

measured horizontal distance \_\_\_\_\_\_\_\_\_\_\_ m

launch angle 37o

Calculations:

Calculate the following: *X* – component of the launch velocity

 *Y* – component of the launch velocity

 vertical displace – launch point to impact point

 time of flight – launch to impact

 predicted horizontal distance – launch to impact