

Marble Launcher #PROLCH

Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **Warning- Choking Hazard- small parts**
- **California Proposition 65 Warning: This product can expose you to chemicals including lead and nickel, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov**

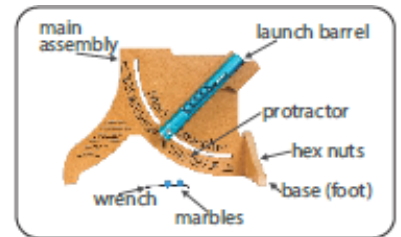


Introduction

This spring loaded marble launcher provides a fun, yet quantitative introduction to two-dimensional motion. With a maximum range of 8 meters, the launcher features five different launch speeds, repeatability to within a few percent, and a built-in-protractor for setting the launch angle. The photogate easily attaches to the launcher so the student can make precise measurements of the initial velocity of the marble.

What's Included:

- Main assembly with the launch barrel
- Base (foot)
- Plastic Marbles (x2)
- Hex nuts, t-style (2)
- Hex wrench



Not Included, but Helpful:

- Timer with photogate

How to Use

- Setting up the launcher
 - The marble launcher itself has two parts: the base and the main assembly. These two parts attach together with hex nuts. The hex nuts fit onto attachment screws that are embedded into the bottom of the main assembly. Line up the two holes in the base with the attachment screws on the main assembly.



- Attaching the Base

- The hex nuts fit onto the attachment screws through the holes in the base. Use the small hex wrench to tighten both until snug.



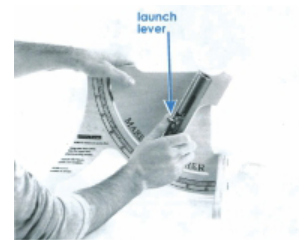
- Loading the Marble

- Set launcher to desired angle before loading the marble. To load, put the marble right into the hole at the top of the barrel. Be sure to load the marble into the barrel before pulling the launch lever back into the locked and ready to fire position.



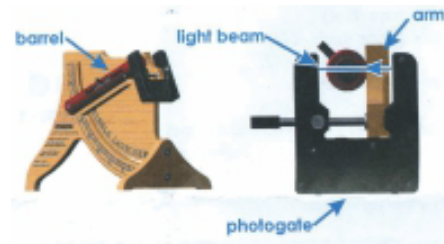
- Launching the Marble

- After loading the marble into the barrel, pull the lever back to one of the five possible notches and set into place. The marble launcher will be ready to launch. Push down on the launch level gently with your thumb to slowly slide the lever off the notch to send the marble flying.



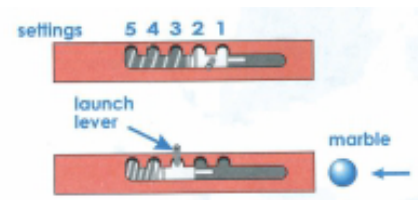
- Attaching a Photogate & Timer

- The photogate attaches to the tab on the end of the wood "arm" that supports the barrel. Be sure that the light beam crosses the center of the barrel so you get an accurate speed measurement. Next, connect one end of the timer to the photogate. Connect the other end of the photogate to the timer into the slot marked "A". If d is the diameter of the marble (0.019 m) and t_A is the time interval during which the light beam was broken (in seconds), then the initial velocity of the marble is d/t_A in m/s.



- Using Launch Settings

- Pull the lever into one of the five setting notches. Launch the marble by slowly moving the lever of the notch toward the long slot. Setting 1 is the slowest setting and 5 is the fastest.



Please follow safety guidelines printed on launcher. Wearing goggles is always recommended.