

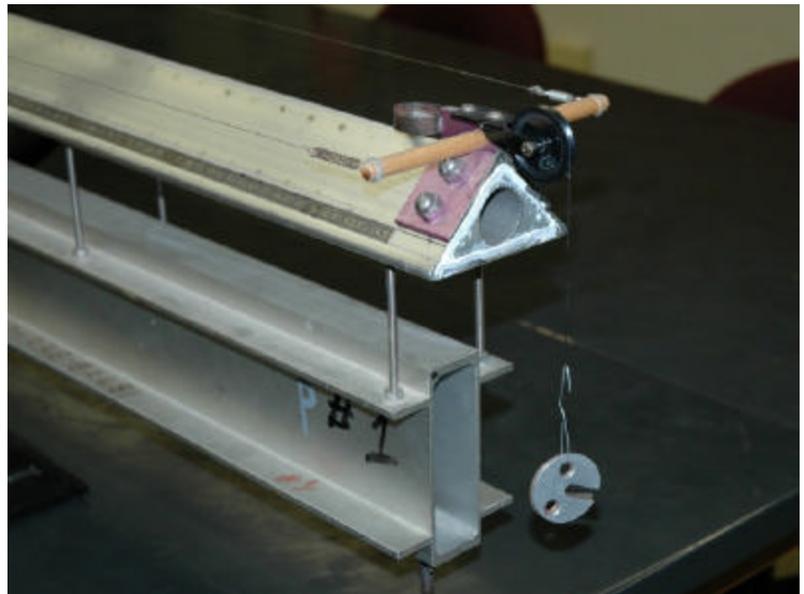
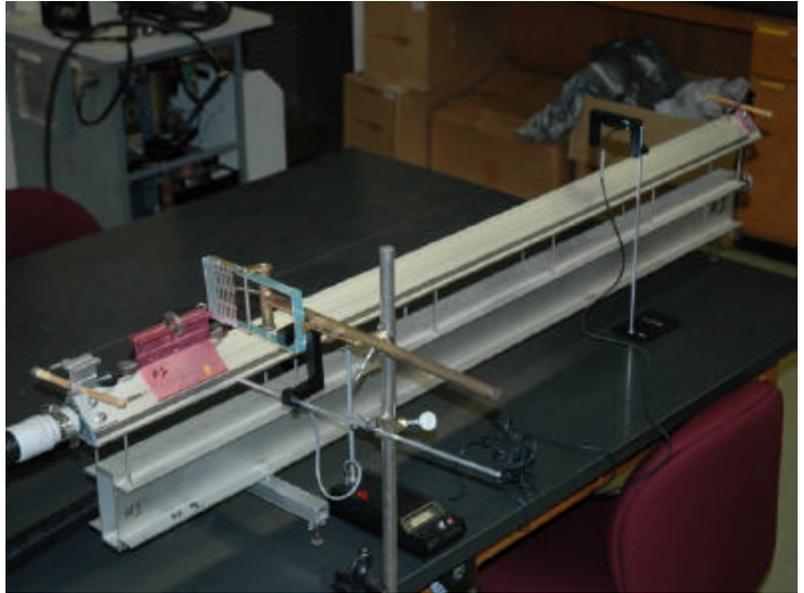
## Newton's Second Law

This lab is complicated to perform, and requires a lot of patience. The overall view of the apparatus is seen here. We're using the air tracks again, but not the spark timers. We'll use photo-gates instead.

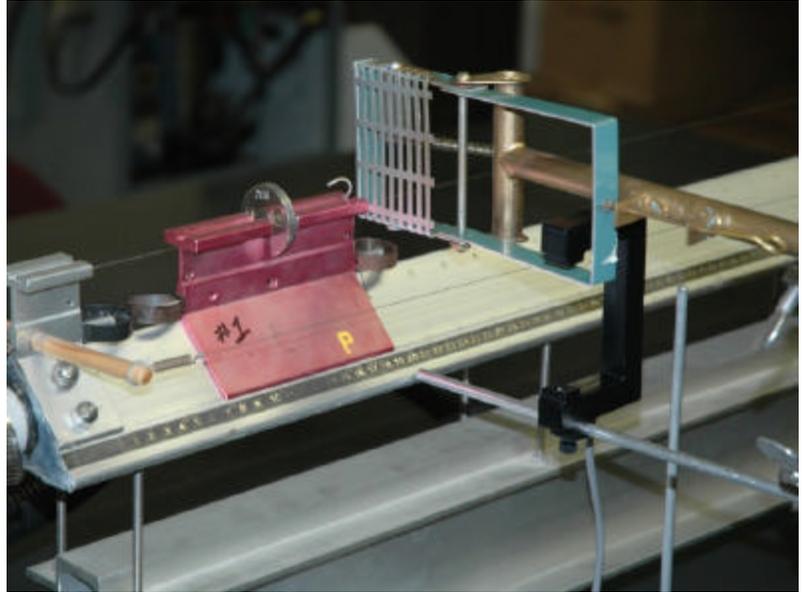
In this experiment, the track should be level. Unfortunately, every part of the experiment may move after every run, so you'll have to verify the position of each photo-gate before every run.

First, place the cart at the endpoint of the run. The cart should be pretty close to the end of the track, but not so close that the weights hanging on the end of the string can touch the floor. Then, move the free-standing photo-gate so that the front edge of the cart is as close as possible to triggering it.

Some of the photo-gates have a helpful red light to indicate when they are triggered, otherwise, you'll have to watch the timer.



Second, position the cart near the other end of the track. In this image, the front edge of the cart is exactly at the 19 cm mark (it looks like less because this picture was taken at an angle).



Then, position the trapdoor so that it holds the cart at this position. Finally, adjust the photo-gate shown here so that it will trigger when the trap-door is opened.

In the previous two pictures, you see that some of the circular free weights are on the cart, and some are hanging from the free end of the string via a paperclip. Be sure to account for the mass of the paper clip!

This picture shows one way to connect the trapdoor and the photo-gate to the table and to each other. Getting the two photo-gates to trigger at exactly the same time for each run is essential, but difficult.

