Physics 203/241
Laboratory Project - Motion on an Incline

The Problem:

Part 1: "Creating A Simple Theory of Motion"

At what rate will an object accelerate down an inclined plane? Show using a simple Free-Body-Analysis that the acceleration is given by the expression:

$$a = g\sin(q)$$

where θ is the angle of inclination for the plane.

Part 2: Putting Your Theory to the Test

There are 3 different sets of apparatus for you to use so that you can test your theory. It is crucial that in each case you work as precisely and accurately as possible.

1. The Air-Table

- Set-up the air table so that it is initially level and the pucks move freely. Check all air lines for leaks or kinks and seal as needed. Make sure that the carbon paper is clean (wipe with a DRY cloth or paper to remove any grit).
- When ready, raise the back end of the table by propping on a book. **Make any measurements that will allow you to determine the angle (θ).**
- Run a spark path and inspect it. Suggested spark rate is 20 Hz.
- Determine the acceleration of the puck down the incline. The manufacturer of the timer rates the spark-time to a precision of 5%.

2. Incline and Sphere

- An inclined plane is set-up for you. **Be sure to make any measurements needed to determine the angle of inclination for the incline.** Make sure to inspect the incline for any sag that will distort your findings. Remove sag by placing the small wooden blocks under the incline at specific points along the incline.
- Roll the sphere down the incline and use the stop-watch provided to determine the time of descent. Repeat this enough times to permit a **standard error analysis of the time**.
- Determine the acceleration of the sphere down the incline.

3. Incline and Cylinder

- Repeat the steps listed in 2 (above), this time using a cylinder.

What to Hand-In

Your final submission does not need to be in a paper format but it should include the following:

i. title page identify what lab it is and who you are!
ii. FBD and analysis of the problem (including the theory used to determine acceleration)
iii. a table showing your measured accelerations and their errors.
iv. conclusion (less than 1 page) in which you discuss whether or not your experiments support the simple theory. NOTE: marks will be deducted for sloppy work. Accuracy counts!

Date Due: One Week from Today