

Name: _____

Phys 12

Projectile Motion Lab

Write the lab on a separate sheet of paper and staple it to this page before handing it in.

Purpose:

- 1) Exercise your understanding of projectile motion (this page)
- 2) Choose and evaluate a video analysis app used in physics experiment (next page)

Group requirement: one person in your group MUST have an Android cell phone AND have access to the internet (OR an Apple user with internet access AND is willing to spare a few bucks)

Part 1

Objective:

- 1) Measure and compare time of fall to predicted values using uncertainties
- 2) Measure and compare horizontal velocity to predicted values using uncertainties

Procedure

- 1) Set up your apparatus by the edge of your table. You can get a partner to hold it down while a ball is dropped or you can fasten it down with tape.
- 2) Measure the drop height and the height of the ramp. Make sure to include units, sig figs, and uncertainty.
- 3) Predict the time of fall and the horizontal velocity of the ball by doing some calculations with your preliminary data.
- 4) Take a white sheet of paper, place it below the table near where the ball will drop and tape it down. Have a friend focus on where the ball hits this paper so he/she can make a mark on this sheet. (If you have a better way to do this, you can design and record your own procedure)
- 5) Drop the ball at the top of the ramp and record the time it takes the ball to leave the ramp and hit the floor.
- 6) Have your friend mark the white paper where the ball landed. Measure this horizontal distance from the edge of your ramp.
- 7) Make sure to record units, sig figs, and uncertainties of ALL measurements.
- 8) Repeats steps 5-7 for 3 more trials.
- 9) Calculate the averages and uncertainties of your time and distance measurements.

Data Analysis

Compare your measured results with your predicted values. Make sure to include a percent difference calculation.

Discussion

Key questions to answer in your discussion:

- 1) What did we find out in our lab? Include specific measurements and values calculated from your data analysis.
- 2) What do our results imply? Do our results comply with the laws of physics within uncertainty? Why or why not?
- 3) What were some of the sources of errors in our lab? How did these sources of errors impact our results? Be specific about the impact (increase/decrease? More/less deviation from true value?).
- 4) How could you improve the procedures of this lab? What extensions would you suggest and why?

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Part 2

Objective:

1) Have your group try a video analysis app, play around with the functions, and write up a brief report (max 200 words) evaluating the usefulness of this app to perform future experiments

Apps to try:

Android app: VidAnalysis Free

Apple app: Vernier Video Physics (not free ☹)

Procedure

- 1) Go online and download the free app on Android.
- 2) Have a friend line a meter stick vertically beside the ramp apparatus.
- 3) Take a video (without moving your phone) of the ball moving down the ramp and falling to the floor. To capture the whole thing on your camera, you might need to step back a little.
- 4) Analyze your video by calibrating your video screen with an appropriate length using the meter stick in the video.
- 5) Next step is to track your moving object frame by frame. Do this by selecting your object on your phone screen on every frame.
- 6) Save this and export to your e-mail. You can also view the graphs on your app.

In your report, you want to evaluate this app to perform future experiments. Keep in mind that this may be something you can use in the projects you will do in this course.

When you're evaluating anything (product, methodology, idea, etc), keep in mind you want to at least:

- 1) Discuss the pros and cons of this app using specific examples to support your claims
- 2) Decide whether this app is useful for you in future physics projects based on 1). To what degree is this app useful?

Attach your own report to your lab and hand this in together.

Your report will be assessed on accuracy of analysis and depth of discussion + evaluation.

Lab due: Thurs Nov 3rd, 2016