

AP Physics C: Summer Assignment

*Note 1: if you haven't taken AS Physics here at M-A (there are a few of you) please also do the **AS** Physics Summer Homework as the skills of that work will be needed from day 1.

*Note 2: if you will have no calculus experience by the start of school in August, (e.g., if you will not have completed AB Calc) please contact me before June 30th at jdecurti@seq.org.

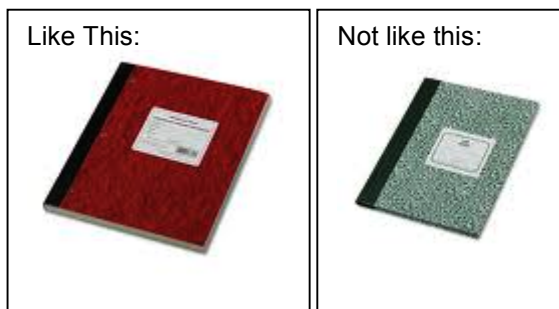
Part 1: Stuff you need to get

A lab notebook: this needs to be bound (not "spiral") with "quadrille" (i.e. graph) paper pages that are at least 8½ by 11. It should be soft cover, not hard cover. The little English "composition" books will not do.

We will use these during labs. Please see:

<http://www.swarthmore.edu/NatSci/cpurrin1/notebookadvice.htm>

but don't read the whole article. This web page has a set of links to places that sell these notebooks. I followed the first link (BookFactory) and looked at the "Student Economy Laboratory Notebooks". They are charging about \$11.50 for these and that's a very good price. Another source would be the Stanford Bookstore.



Part 2: Learn to PRINT

Sounds crazy, but you'll have to show work on tests and in your lab notebook... You'll need to label hand-drawn sketches with something a lot better than scribble. I will not spend ANY time trying to decipher your handwriting. You can find hints and guides on-line with keywords such as drafting, lettering, etc.

ABCDEFGHIJKLMNOPQRSTUVWXYZ
TUVWXYZ 12345678910
abcdefghijklmnopqrstuvwxyz

CLEAR LETTERING CAN BE PRODUCED AS EASILY
AND AS SWIFTLY AS SCRATCHY LETTERS BY
USING THE CORRECT TECHNIQUES.

A DRAFTSMAN WILL
NEVER LETTER
WITHOUT GUIDELINES

Part 3: The First Lab**Why do water streams get thinner as they fall?***(This should be entered as the first lab in your lab notebook)*

When a stream of water comes out of a faucet it grows thinner as it gets farther down from the faucet. Why is this?

In particular, can you find an equation that will give you the radius r of the stream at any distance y below the rim of the faucet?

Before you panic, here's a thought: except for the area of a circle and the volume of a cylinder, the only equations you'll need are:

$$y = y_0 + v_0 t + \frac{1}{2} a t^2 \quad \text{and} \quad v = v_0 + at$$

Step 1: deriving a mathematical model

Assume that the water faucet has a radius of r_0 and the water *exits* the faucet with velocity v_0 as shown in the diagram at right.

(This diagram – your rendition of it – should appear in your lab notebook.) We suspect that the initial velocity v_0 of the water coming out of the faucet and the acceleration g due to gravity has something to do with this, so that the resulting math model will show the following dependence:

$$r = f(r_0, v_0, g, y)$$

Do this *symbolically*, i.e., don't plug in numbers from your faucet just yet.

Hint: If the water exits the faucet with a velocity v_0 , how much water (volume) comes out in 1 second? How much water passes through an imaginary plane at distance y below the faucet in 1 second?

Step 2: measuring v_0 and r_0 and r and y

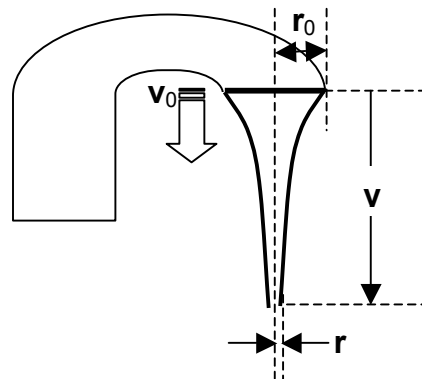
If you've come this far, might as well check out your results.

Can you actually measure v_0 ? (I'll assume you can measure r_0).

Hint: look at the first question in the first hint... you'll need to measure v_0 to predict r and then test it.

Measure the radius of the stream at, say, 2 distances below the faucet and check them against the predictions of your equation. You might also speculate on why water does this. What substance would not?

Good luck! ... you know my email... jdecurti@seq.org
(but it doesn't mean I'm just sitting at home waiting for your message)

**General Format for Lab Notebooks:***Pullleeeeeeze: Do NOT be afraid to use paper! Don't Cram.*

Start at the top of a right-hand page. Print a title for the lab. Underneath, print a brief (one short sentence) statement of the purpose of the lab. Under that, print a brief (bulleted, no more than 5 lines) summary of your intended procedure.

Use the remainder of the page for background theory. This would be Step 1 of the water faucet lab.

Use at least the next whole page for data taken during the lab, e.g., data tables (titled, labeled columns!), rough but annotated sketches of setups (showing meaning of measured variables), notes on problems encountered or adjustments to techniques, etc.

Use a new page (not the space left over on a previous page) to jot down your analysis and conclusions.