# Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_

*Bubble in a Tube* Lab *(20 points total)*

**Purpose:**

1. Observe the relationship between angle of inclination and speed of a bubble in a tube containing an unknown fluid.
2. Demonstrate mastery of the concept and calculation of constant velocity.
3. Become familiar with LoggerPro and iSENSE to visualize and compare data sets and draw conclusions.

**Materials:**

1. Lab Stand, dynamics track and clamps, support hardware
2. Bubble Tube
3. Stopwatch / timer

**Background:**

From the class so far, we know that:

**V = d / t**

Where:

**v** = speed (or velocity)

**d** = distance

**t** = time

***GOAL: Develop a graph that relates angle of inclination to speed of a bubble.***

1. Talk over with your group how you will calculate the speed of the bubble in the tube. Be sure that everyone in the group is comfortable with the process and who will be responsible for which specifics. You do not need to use any software (LoggerPro or iSENSE) for your data collection!

2. Formally define your experimental variables here: *(3 points)*

**DEPENDANT:**

**INDEPENDENT:**

**CONSTANTS (at least three):**

**1.**

**2.**

**3.**

1. **Write a hypothesis for this experiment.**  *(2 points)**(For only this lab I will remind you that a correctly written hypothesis directly relates the independent and dependent variables in a cause and effect statement. For example, if I were examining the relationship between the mass of a rock (independent) and how much time (dependent) it takes to fall a given distance (constant), the hypothesis “more massive rocks take different times to fall” is not correct (it fails to directly correlate the relationship between mass and time – it uses the unspecific word “different”). A correct hypothesis would be “more massive rocks take less time to fall a given distance” or “more massive rocks take more time to fall a given distance”. In either case the scientist has directly predicated the testable outcome of adjusting the independent variable on the dependent variable. Is the hypothesis “more massive rocks fall faster” correctly stated? Why or why not? You can check your answer at the top of the next page!)*

1. Explain how your group will calculate the speed of the bubble in the tube. Be specific! *(2 points)*
2. In order to calculate speed in step #4 above, what assumptions have you made about the motion of the bubble? *(2 points)*
3. Create a neat data table that organizes your results (always use a straight edge!) *(2 points)*

**Keep in mind that you’ll be using LoggerPro throughout the course!**

*Answer to hypothesis question*: NO! It does not include a reference to the dependent variable – time. Technically it says that more massive rocks (independent) fall *faster*: velocity or acceleration is not clear here – either way we do not know how that will affect time, which is the variable being tested)

1. Now use LoggerPro to organize and graph your data.
   1. Open LoggerPro.
   2. Click on the “X” and “Y” table headers on the left side of your screen and rename them to something more appropriate for this experiment.
   3. Click on each cell underneath (in the table) and enter your data. You will see the graph begin to generate on the right as you enter in the data.

Screen shot 2011-08-02 at 12

* 1. Once you are finished you can autoscale the axis by clicking on   
       
     or selecting analyze > autoscale or alternatively use **⌘+j**

1. Copy and past your graph below*. Be sure to select the graph first and then copy and paste! Size it so that it fits in the space below that you’ve been given. (2 points)*
2. Now export the data from LoggerPro and upload it into iSENSE for comparative analysis.
   1. File > Export As > InspireData (CSV)
   2. Name it appropriately and save it somewhere that you can find it!
   3. Go to iSENSE ([www.isenseproject.org](http://www.isenseproject.org))
   4. Login using: username: windham password: jaguars
   5. Find “Bubble in a Tube” Experiment
   6. Click on the “contribute” button
      1. Your group name should be your first name and the first letter of your last names. For example, “John S. and Kelly G. and Rebecca L.”
      2. Under procedure simply identify which tube number you had.
      3. Under street put “64 London Bridge Rd.”
      4. Under city, state put “Windham, NH”
      5. Under Session type choose “data file”
      6. Click create session (you may need to again click “Complete Session”)
   7. Examine your data
      1. Click on examine your data
      2. Choose the scatter chart tab
      3. Select “Angle of Inclination” for your X-axis and then click “Reload”
   8. Simultaneously compare your data to that collected from other groups
      1. Go to the main “Experiment” page (click “experiment” at the top of any page)
      2. Find the “Bubble in a Tube” Lab
      3. Select at least five different groups from any class or level by checking the box next to the group name. You do not have to select your own group (but you can if you want).
      4. Click the “visualize” button
      5. Choose the scatter chart tab
      6. Select “Angle of Inclination” for your X-axis and then click “Reload”
3. Copy and paste this comparative graph in the space below (size it appropriately so that it fits!).

*(2 points)*

1. What does the data tell you? Use your data (visualized both in LoggerPro and iSENSE) to write a concluding paragraph about your results. Try to answer the question as to why your data looks this way. Be sure to reflect on your original hypothesis.  *(5 points)*