CE 122L, Fall 2011
Lab #1 Comments

General:

- For each experiment, the Background and Objectives, Materials and Methods, Conclusions, and textbook problem sections are worth 5 points each. The Results/Analysis/Discussion section is worth 10 points.
- Scores were somewhat low this week, but don't worry. Most of the errors are things that you can easily fix for future reports.
- For future labs with multiple experiments, please keep the experiments separate. It is easier to grade one experiment at a time, and having to switch back and forth makes the report seem less unified.
- Don't feel the need to fabricate a hypothesis. You have already performed the experiment and know the results.
- Don't forget to indicate your lab group members in your title or heading.
- In your Background and Objectives section, be sure to include any and all applicable equations.
- In your Materials and Methods section, be specific about what you did. This includes describing all of the measurements you took and how you took them.
- When you list your results, make sure you either say what each measurement is (e.g. label *D* with "diameter of rod") or draw a figure with the appropriate dimensions labeled. In general, even a hand-drawn sketch of the experiment setup is better than no figure at all.
- Every plot you include should have the appropriate title and axis labels with units.
- Show your calculations for anything you calculate, and carry your units with you along the way so you can make sure your result is dimensionally correct.
- In your error analysis and/or discussion, make sure you give some meaning to your results and the errors.
- Make sure you mention any possible improvements to your experiments in the Conclusions section.
- In general, don't make things up to explain errors. You may say something that is completely incorrect. If you're unsure of something, it's ok to say so, as long as it is clear that you have made a good-faith effort.

Experiment 1

- For this experiment, it would have been better to estimate the maximum radius as $R_{max} \approx \frac{R_{float}+R_{sink}}{2}$ since you don't know where in that range the maximum radius lies.
- The error in the radius measurement is not the same as the diameter measurement. Carry out a simple sensitivity analysis to prove to yourself that $\Delta R = \frac{1}{2}\Delta D$.

Experiment 2

- Many of you started with $h = \frac{2\sigma\cos\theta}{\gamma R}$ in your mathematical proof of why the meniscus follows a hyperbolic curve. The idea was for you to start with a force balance using the appropriate simplification of Laplace's equation ($\Delta p = \frac{\sigma}{R_1}$) and the weight of the water ($\Delta p = \gamma h$). Then use the geometrical description of the distance between the plates as a function of *x* ($d(x) = \frac{D}{a}x$) to get an expression for *h* as a function of *x*, namely $h(x) = \frac{2\sigma a}{\gamma D} * \frac{1}{x}$. The form of a constant

multiplied by the inverse of *x* shows that the curve is hyperbolic. The constant, call it *A*, is equal to the slope of your *y* vs. *1/x* curve, so you can calculate the surface tension as $\sigma = \frac{A\gamma D}{2a}$.

- Most of you did not perform a sensitivity analysis for this experiment. Your expression for the surface tension has errors in the slope *A*, the diameter *D*, and the length *a*. Since the slope is from experimental values, you may estimate the error using an appropriate measure such as the root mean square error of your individual points from your best-fit line.
- Some of your plots of *y* vs. *1/x* are not anywhere close to linear. If this applies to you, I suggest you find a classmate who does have a linear plot and compare results.