General Feedback on SCM reports
Jeanne Wilson, December 2011

I summarise here some of the common mistakes I have seen in the reports for experiment 4. However, a lot are just not following instructions of what is expected. I encourage you to read:

- This note
- THE INSTRUCTIONs on page 4-4 of the lab manual that tell you what a formal report should include
- The report by Rees and Viney which is a good example of the format and kind of language expected in scientific writing
- The marking scheme posted on the course website that has a list of common mistakes and an idea of what is expected to gain top marks: http://ph.qmul.ac.uk/course/phy-103 (marking scheme tab)

Common mistakes and suggestions:

- Think of a sensible title of your own – it doesn't have to be the one in the lab manual but should be applicable. For example, don't mention tea in the title if you only measured coffee and water!
- Include author and affiliation (QMUL and address) under the title
- The abstract should be a few precise sentences summarizing what you did and the key numerical results, which should be quoted with units and uncertainties, and the main conclusion.
- Make sure you have the theory right – some people got the equation for Newton's law of cooling wrong. The ΔT_0 deals with initial difference from ambient temperature – the exponential depends on t/τ. This means if you compare time constants, τ, you should be comparing the rate of cooling independently of starting temperature.
- You should include the circuit diagram for the thermometer – if it was scanned from the lab manual, that should be properly referenced. Copying diagrams etc from others without reference is a form of plagiarism.
- The accuracy of the thermometer should come from the calibration – when you compared the digital and mercury measurements at various temperatures. You should be able to do better than ±0.5°C (which can be obtained with the mercury) as once calibrated once, you can quickly read off the digital scale without the worry of parallax error reading the mercury.
- To verify this relationship applies to your data I expect to see log plots of ΔT versus time with a linear fit. You need to include error bars on the points and then the linear fit should have a meaningful χ^2/NDF value and errors on the fit parameters. You need to discuss the quality of fit using the χ^2/NDF.
- Given the relationship is $e^{-t/\tau}$ it makes sense to use natural logs (ln) rather than $\log_{10}$.
- You should use the gradients to calculate the time constants, and propagate the error on the gradient to an error on the time constant.

- A smaller time constant means quicker cooling.
- You should compare the time constants you have derived for ALL FOUR liquids quantatively. This means taking the difference, comparing it to the size of the error and doing a 3 sigma test. Eg. If τ_w = 30±2 minutes and τ_B = 40± 2 minutes, the difference is 10±3 minutes (40-30 $\pm\sqrt{(2^2+2^2)}$), which is more than 3σ from zero (10/3>3) so this is a significant difference. You can say with >99% confidence that white coffee cools faster than black coffee.
- You should do a similar comparison to the values presented by Rees and Viney – are they numerically consistent?
- Many people didn't discuss the purpose of the control samples (boiled water and coffee + water) at all.
- The conclusions should be drawn from YOUR results, not what you expect. Many people gave very inconsistent conclusions