VALENCIA COLLEGE

Chemistry

Appendix 9: How to Write a Conclusion

The reason to write a conclusion is because your lab report might be long and the reader may not remember all the important points. Also, it gives you a chance to explain anything that might have gone wrong or could be improved.

A useful way to get started is to write an outline like you did for your English composition classes. Then turn the outline into full sentences, with proper punctuation and grammar. Summarize your major findings. This section should be complete so that the reader has a clear understanding of the goals, results, and conclusions without being redundant to the previous sections. Show that you really understood what you did in the lab, instead of simply filling in numbers.

Keep in mind that you are writing about what you did, so write in past tense. Traditionally, first person is avoided in order to appear less biased, so write in third-person, passive voice (English composition professors, eat your heart out!). For example, instead of 'We mixed two solutions of different densities,' write 'Two solutions of different densities were mixed.'

Avoid unsubstantial and subjective comments. Instead of 'I had a lot of fun', describe what you learned. Instead of 'a lot of crystals were obtained,' be very specific: 0.876 g of white, needle-like crystals were obtained.

Try the following structure.

- First paragraph:
  - Re-state your purpose or hypothesis.
  - What concept were you investigating? Describe how it related to the experimental procedure.
  - How did you go about your work and why? This is not the details of your procedure repeated, but discussion of the processes. For example, describe the methods that you chose for finding volume of specific shapes of unknown objects.
- Second paragraph:
  - Summarize your final results (not any intermediate results). Then answer: was the purpose met? What evidence proves it? What is your conclusion for each part? Use the values you obtain as evidence in your reasoning. Statements like, "see data table for values" are not acceptable!
  - Discuss the validity and reliability of your data in answering the question. Are the results reasonable? How do you know? For example, if you obtained a density of 4 g/mL for a plastic, that would not be reasonable since typical plastics vary from 0.7 – 2.2 g/mL per the data table in the experiment. If you obtained unreasonable results, what were the expected results? Explain based upon what you know from lecture and the lab manual.
  - If you calculated a standard deviation, report it right after the mean it is associated to with $\pm$ in between. If a relative percent error was calculated, follow the above with it. Example: The density of unknown 4 was 1.8 g/mL $\pm$ 0.3 g/mL. The relative percent error of this density was 2.5 %.
- Third paragraph:
  - Discuss any problems during the experiment and any errors. These should be more than errors within your control such as 'the glassware must have been dirty.'

- Describe how the errors might have affected the results. Include standard deviation and relative percent error discussions if relevant.

Example of a Conclusion for Experiment 1, Parts A and B

The purpose of Part A was to read measurements on graduated cylinders and a buret to be able to make accurate volume readings. Key considerations included reading the meniscus from the correct angle and recording significant figures to reflect the accuracy of the tools. The procedures were completed successfully since the unknown volume readings were accurate according to the expected values. This skill will be useful for making measurements in the class in the future.

The purpose of part B was to practice volume measurement techniques and to compare the accuracy and precision of a graduated cylinder versus a volumetric pipet. The same volume of water was measured five times with 10.00 mL volumetric pipet, taking the mass each time. The procedure was repeated with a graduated cylinder. By graphing the volume versus the mass measurements, the slope of the line gave the density of water (Fig. 1): 0.9982 ±0.0011 g/mL for the volumetric pipet and 0.915 ±0.003 g/mL for the graduated cylinder. By comparing the density of water to the known value (corrected for temperature and pressure), the measurements using the two instruments can be compared. The measurements made with the volumetric pipet were more accurate than those of the graduated cylinder since the relative percent errors were 0.12% and 8%, respectively (see calculations below Data Table 5). The measurements made with the volumetric pipet were also more precise since the standard deviation was 0.0011 g/ml compared to 0.003 g/ml for the graduated cylinder. These data confirm the usefulness of the graduated cylinder for speed and the volumetric pipet for more careful work.

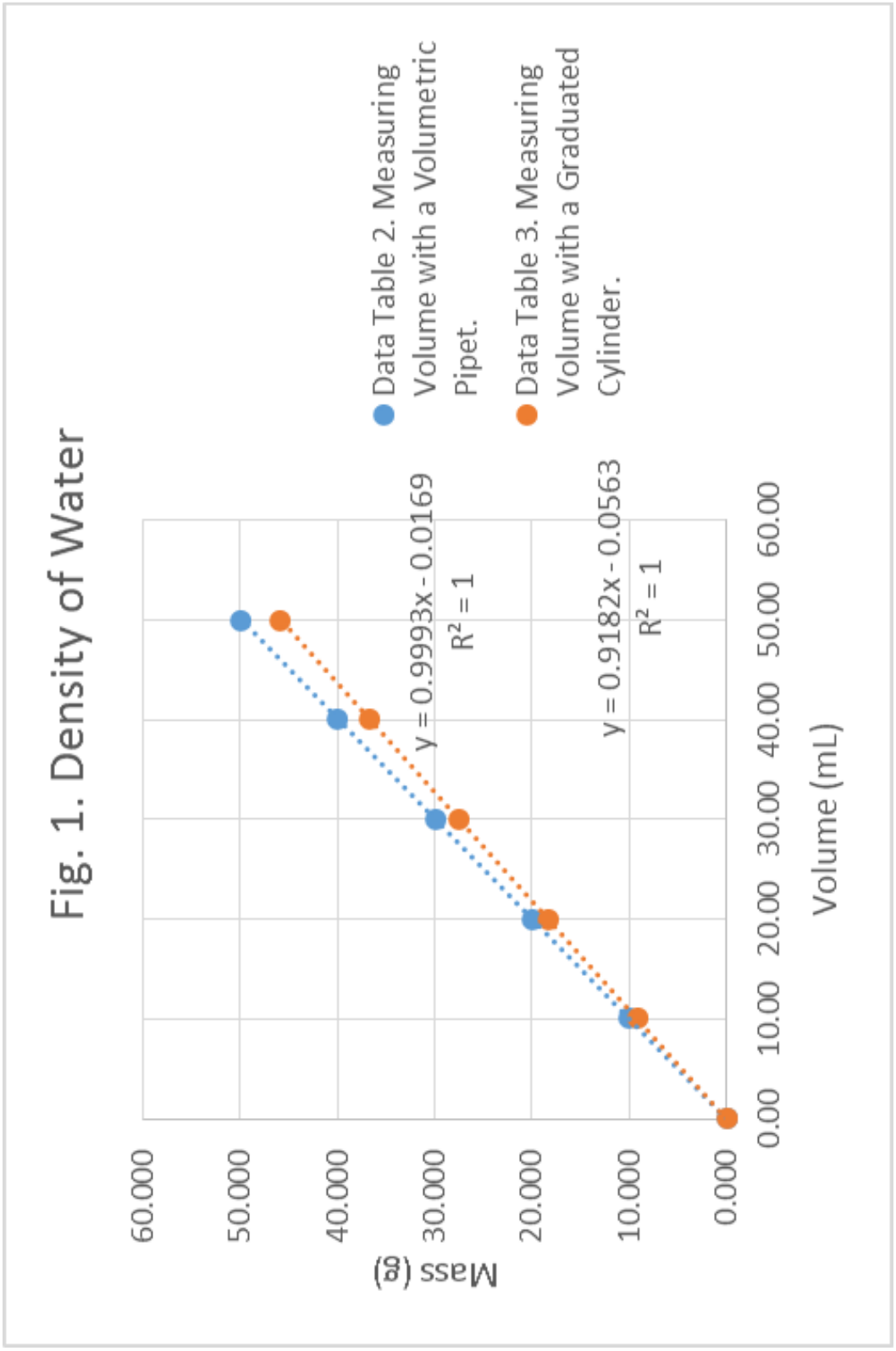
Fig. 1. Density of Water
Data Table 2. Measuring Volume with a Volumetric Pipet.
Data Table 3. Measuring Volume with a Graduated Cylinder.
y = 0.9993x - 0.0169
R² = 1
y = 0.9182x - 0.0563
R² = 1
Mass (g)
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
Volume (mL)