

## **Results and Discussion**

The heart of a laboratory report is the presentation of the results and the discussion of those results. In some formats, "Results" and "Discussion" appear as separate sections. However, P.B. Medawar [1979] makes a strong case that the two should appear together, particularly when you have many results to present (otherwise, the audience is faced with a "dump" of information that is impossible to synthesize).

Much here depends upon your experiment and the purpose of your laboratory report. Therefore, pay attention to what your laboratory instructor requests. Also, use your judgment. For instance, combine these sections when the discussion of your first result is needed to understand your second result, but separate these sections when it is useful to discuss the results as a whole after all results are reported.

In discussing the results, you should not only analyze the results, but also discuss the implications of those results. Moreover, pay attention to the errors that existed in the experiment, both where they originated and what their significance is for interpreting the reliability of conclusions. One important way to present numerical results is to show them in graphs.

### **Sample Results and Discussion**

This section analyses the results of the experiment. The experiment went as expected with no unusual events that would have introduced error. The voltages as measured for the pressure and temperature transducers appear in Table A-1 of the Appendix. Also included in the Appendix are the equations used for calibrating those voltages with the actual pressures and temperatures. These equations led to the values of pressure and temperature that are shown in the third and fourth columns of Table A-1. From these values, a graph between temperature (K) and pressure (kPa) was created (Figure A-1). As can be seen from the graph, the relationship of temperature versus pressure is roughly linear.

As part of this experiment, the theoretical values of temperature were calculated for each measured pressure value. In this calculation, which used the ideal gas equation, the volume and mass were assumed to be constant. These theoretical values of temperature are shown in the final column of Table A-1. From this final column arose Figure A-2, a graph of ideal temperature (K) versus pressure (kPa). As shown in this graph, the relationship between temperature and pressure is exactly linear.

A comparison between the graph showing measured data (Figure A-1) and the graph showing theoretical data (Figure A-2) reveals differences. In general, the measured values of temperature are lower than the ideal values, and the measured values are not exactly linear. Several errors could explain the differences: precision errors in the pressure transducer and the thermocouple; bias errors in the calibration curve for the pressure transducer and the thermocouple; and imprecision in the atmospheric pressure assumed for the locale. The bias errors might arise from the large temperature range considered. Given that the temperature and pressure ranges are large, the calibration

equations between the voltage signals and the actual temperatures and pressures might not be precise for that entire range.

The last type of error mentioned, the error in the atmospheric error for the locale where the experiment occurred is a bias error that could be quite significant, depending on the difference in conditions between the time of the experiment and the time that the reference measurement was made.

<http://www.writing.eng.vt.edu/workbooks/labreport2.html#results>.