HEAT CAPACITY RATIO

(Last Revision: August 30, 2022)

- ABSTRACT:

  A modification of the text experiment to determine the heat capacity ratio of gases is used to find the heat capacity ratio for two gases. A differential pressure transducer is used instead of a manometer in addition to other changes.

- TEXT REFERENCE:

  "Experiments in Physical Chemistry", Garland et al., Eighth Ed., McGraw-Hill, 2009, pp. 106-118.

- OTHER REFERENCES:

  William M. Moore, J. Chem. Ed. 61, 1119-1120 (1984).

- GENERAL DESCRIPTION AND THEORY:

  The heat capacity ratio for a gas may be found by performing an adiabatic expansion of a gas. The general theory of the process is found in the text

- EQUIPMENT:

  Large Carboy, gas cylinders with regulators, differential pressure meter, laboratory barometer.

- PROGRAMS:

- CHEMICALS:

  Nitrogen, Helium, Argon, Carbon Dioxide.

- DIAGRAMS:

Figure 1

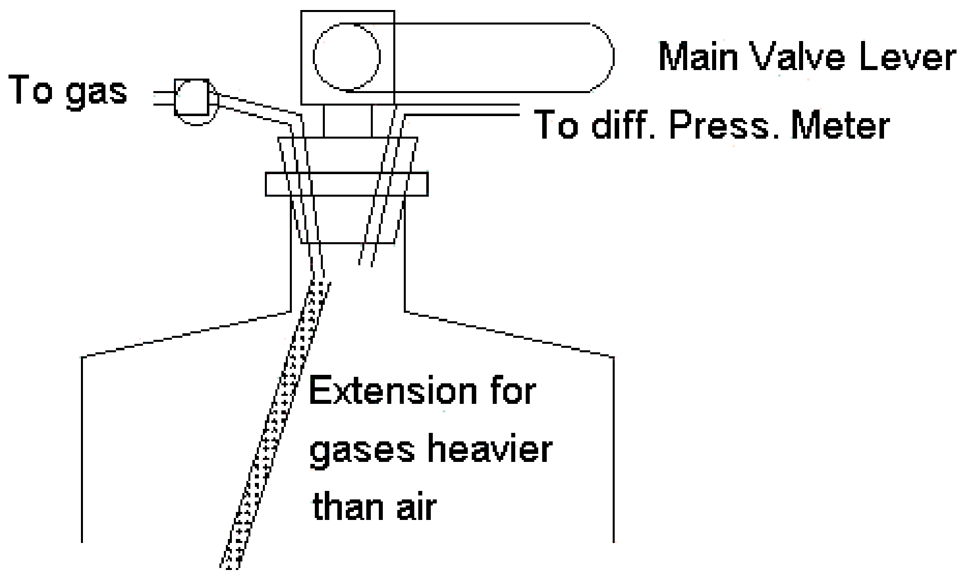
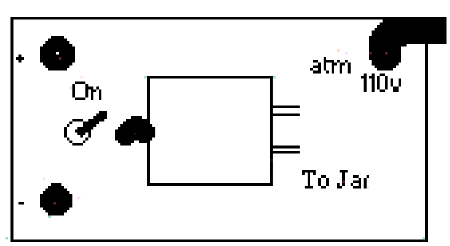


Figure 2



Differential Pressure Meter

- LABORATORY PROCEDURE:

  The laboratory procedure differs from that in the text in that a differential pressure transducer is used to measure the difference in pressure between the carboy and the room. The output of the transducer is sent to the data acquisition module and loaded into LabView. LabView will convert the measured voltage and the input room pressure to a pressure in atmospheres. The LabView output file will consist of a series of pressures (one data point per second). When adding gas to the carboy, the maximum buildup of gas pressure should be about 3 v on the differential pressure meter.

  The general procedure of the experiment is the same as that described in the text, except for the use of the differential pressure transducer.

- CALCULATIONS:

  Calculations should proceed as described in the text. Compare the ratios obtained with those found from the high-temperature and low-temperature limits derived from equipartition theorem.

- LITERATURE VALUES: