

**Colorado State University**  
**CHEM 477**  
**Physical Chemistry Laboratory - 2**

**Notes for**  
**Heat-Capacity Ratio of Gases**

The following is a set of short notes to outline the experiment in question and to provide helpful guidance to those executing the experiment.

- A. The thermodynamic property of a gas consisting of the ratio of its heat capacity at constant pressure to its heat capacity at constant volume can be readily and accurately measured by the speed of acoustic waves, that is, sound in that gas. This measurement will be performed on several different gases.**
- B. For an ideal gas the heat capacity ratio is understood by thermodynamic analysis of the configuration, that is, the number of motional degrees of freedom, of the gas.**
- C. This is a straight-forward measurement but requires control over a number of experimental variables and a good understanding of related thermodynamics.**
- D. Spend sufficient time learning how to use the apparatus in order to make high-quality measurements of the speed of sound using AIR only.**
- E. Demonstrate to the teaching staff the quality of your measurements BEFORE attempting to use any other gas.**
- F. Determine the relevance of the temperature and the pressure of the gas to the speed of sound within it. There is ample literature available to answer these two separate questions definitively, not trivially.**
- G. Do not confuse heat capacity with heat capacity ratio. These are separate yet related. Your focus ought to be primarily and deeply on the heat capacity ratio.**
- H. Review the reference by Garland *et. al.* and follow its Results and Discussion topics in your written laboratory report. This is an instruction not a suggestion.**