Adiabatic compression pre-laboratory questions

1. The cylinder used for the adiabatic compression has no insulation. How can the process be adiabatic?

2. Assuming that the volume decrease is approximately a factor of three in the experiment, why is the temperature of an ideal diatomic gas in the cylinder when the compression is complete? You may assume that the starting temperature is 298 K.

3. Why can't one use an isothermal expansion to measure the heat capacity of gas?

4. Which thermodynamic path could be used, in theory to measure the heat capacity of gas?

5. What is a common method for measuring heat capacities of liquids and polymers? Hint: there is an instrument of this type in the Physical Chemistry laboratory, but we are not using it for the main classroom experiments.

6. Show the propagation of error for a van der Waal's gas written as a function of pressure.

$$P = \frac{RT}{V-b} - \frac{a}{V^2}$$

where V represents the molar volume. You may assume that you have a way to measure the 95% confidence limit of the volume and temperature, called $\sigma(V)$ and $\sigma(T)$, respectively. Show how to obtain the 95% confidence limit of the pressure, $\sigma(P)$.