

Verification of Boyle's Law

Introduction

In this practical the pressure of a sample of gas trapped in a syringe will be measured with a pressure sensor.

Theory

Boyle's law states that for a fixed mass of gas at constant temperature the pressure will be inversely proportional to the volume. This can be expressed as:

$$PV = nRT$$

Where n = the number of moles

R = molar gas constant ($8.31 \text{ m}^2\text{kgs}^{-2}\text{K}^{-1}\text{mol}^{-1}$)



General Method

- Connect the pressure sensor to the interface and set up the software to measure pressure.
- Connect the syringe to the pressure sensor making sure that it is full of air.
- Make sure that everything is working by pressing the piston to see if the pressure increases.
- Measure the pressure of air as the volume is reduced in steps. To do this you can either read the values of pressure directly off the digital display or record values on a graph/table.
- Estimate the uncertainties in your measurements.
- Make a non-linear graph.
- Linearize the data and then create a linear graph.
- Be sure you are handling the uncertainties correctly.

Conclusion and evaluation

- Did the linear graph support Boyle's law?
- Was the intercept (0,0), if not can you think of a reason why it wasn't?
- Use the gradient of your graph to estimate the number of moles of air in the syringe. Does your value seem reasonable?
- Do you think that the temperature of the gas was constant throughout the experiment? Do you have any evidence to suggest that it wasn't?
- What effect would the gas in the tube have on your result?