Bishop Heber High School
Advanced Level Preparation
March 2013

Physics PHY6T/PREP/task

Unit 6 Investigative and Practical Skills in A2 Physics
ISA (P) Pressure–volume relationship for gases

Stage 1: Task Sheet

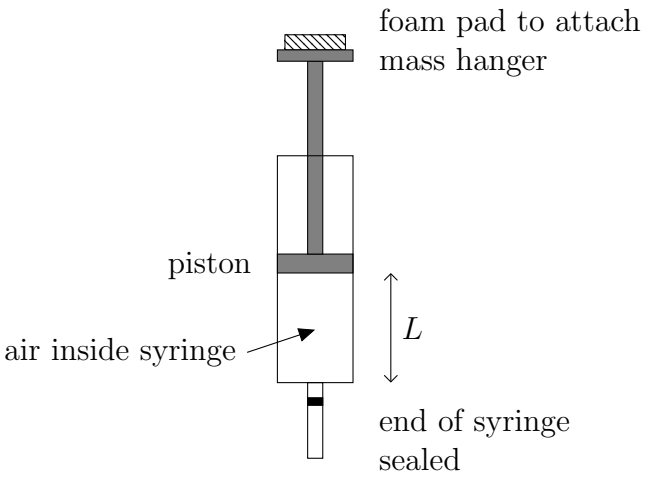
This task is worth 7 marks

You are advised to read through these instructions before beginning your work.

You are going to investigate how the volume of a fixed mass of gas changes when the pressure is changed.

- The syringe has a fixed mass of air inside it. A mark on the syringe indicates the initial position of the piston. The syringe has been clamped as shown in **Figure 1**.
- Measure the length L from the piston to the closed end of the syringe.
- Gently move the piston up and down a few mm to ensure it does not stick.
  Return it to the original mark on the syringe.
- Carefully peel off the backing paper from the foam pad on top of the syringe piston.
- Position the 100 g slotted mass holder centrally on the piston and attach it to the piston by pressing it firmly together.
- Measure the new length L.
- Add further 100 g masses, each time recording the total mass M in kg, and the corresponding value of L.
- Take sufficient readings to reduce the uncertainty of your results. Before each new set of readings gently move the position back to its original unloaded position.
- Calculate F where $F = (p_0 \times A) + Mg$ and $p_0 = 1.01 \times 10^5\,\text{Pa}$, $g = 9.81\,\text{N kg}^{-1}$ and A = cross-sectional area of syringe in m^2 provided by your teacher.
- Record your results in a table which should include measurements of L, M, F, $\log_{10}(F/\text{N})$ and $\log_{10}(L/\text{m})$.
- Plot a graph of $\log_{10}(F/\text{N})$ on the y-axis against $\log_{10}(L/\text{m})$. Draw a straight line of best fit.

Figure 1



After the investigation

At the end of the investigation, hand in all your written work, including the graph.

This documentation will be required for Stage 2 of the practice/preparation work for your ISA.