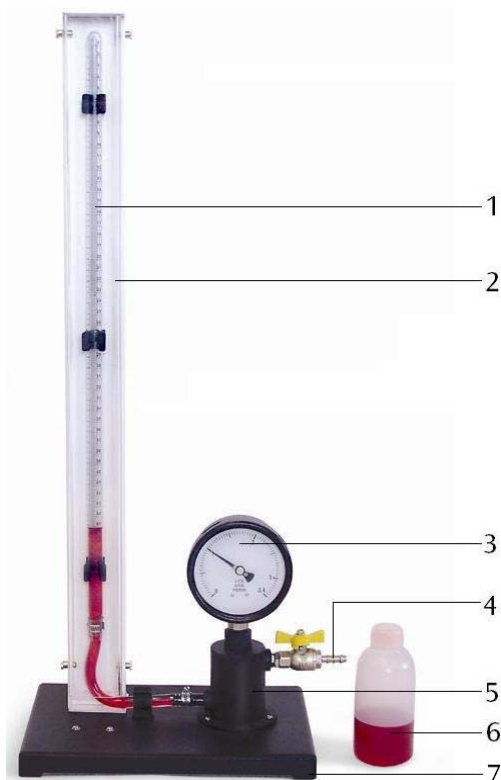


Boyle's Law Apparatus U30046

Instruction Sheet

11/08 ALF



- 1 Calibrated glass tube
- 2 Metal plate
- 3 Bourdon gauge
- 4 Hose connection
- 5 Oil reservoir
- 6 Spare oil
- 7 Base plate

1. Safety instructions

- Avoid going beyond range on pressure meter.

2. Description

Boyle's Law apparatus is used for the experiment-based determination of the relationship between the volume and the pressure of a gas (air) at constant temperature (Boyle's Law).

Boyle's law states that for a given mass of gas (air) at a constant temperature the product made up of the volume V and the pressure p is constant:

$$P \cdot V = k \Rightarrow p = k \cdot \frac{1}{V}$$

The apparatus is essentially a calibrated glass tube mounted on a white metal plate. The glass tube is extra strong and additionally protected by a plastic safety screen. It is connected to an oil reservoir on which a Bourdon gauge is fitted. By means of a hand pump coloured oil is gradually pumped from the oil reservoir into the tube creating over pressure. Whilst the volume of the trapped is read from a scale clearly visible at the tube, pressure is measured by a Bourdon gauge, which reads in $\text{Pa} \times 10^5$. (Standard pressure = $1.01325 \times 10^5 \text{ Pa}$). The Bourdon gauge is fitted with a transparent plastic back to allow students to see its working parts.

3. Technical data

Hose nipple:	10 mm dia.
Pressure max.:	3.4×10^5 Pa
Dimensions:	approx. 350 x 200 x 760 mm ³

4. Additionally required equipment

1 Vacuum hand pump	U20500
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5. Operation

5.1 Assembly and set up

- Insert the glass tube carefully into the clamps on the metal plate and mount it on to the base plate.
- Open the stop cock and fill up the oil reservoir so that at normal atmospheric pressure the oil just reaches the bottom calibration on the tube. Be careful not to fill in too much oil, because otherwise it might flow out through the hose connection into the pump.
- Screw on the Bourdon gauge carefully.
- Attach the hand pump.

5.2 Experiment procedure

- Record the reading on the tube (the volume) and the reading on the manometer in a table (refer to table 1).
- Use the pump to increase the pressure slightly, and then allow a minute for the apparatus to return to room temperature.
- Repeat the readings of pressure and volume.
- Repeat this process until you have sufficient readings.
- Plot the values in a graph of p against V and p against $1/V$ (refer to fig. 1 and 2).

Volume of air, (V/ml)	Pressure p (Pa x 10 ⁵)	$1/V$ (ml ⁻¹)

Table 1 Measuring values

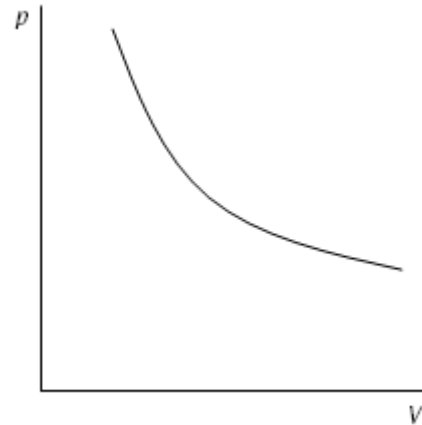


Fig. 1 Graph of pressure against volume

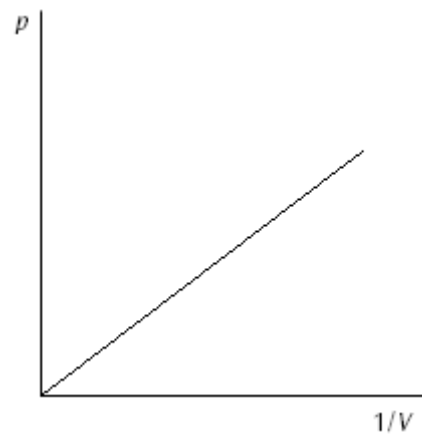


Fig. 2 Graph of pressure against $1/V$