

H25298

Boyle's Law Apparatus

NFU156



Purpose

This is a demonstration apparatus for the verification of Boyle's Law, which states that the volume occupied by a fixed quantity of gas is inversely proportional to its absolute pressure.

Apparatus details

The experimental volume is contained in the wide bore glass tube, and confined by a quantity of coloured oil, which also acts as an indicator of volume changes in conjunction with the vertical scale graduated directly 0 to 65cm³. The bulk of the oil is contained in the oil reservoir chamber which may be pressurised via the inlet tubule and tap. The oil chamber also carries the bourdon-type pressure gauge, calibrated 0 to 3.4 x 10⁵Nm⁻² absolute pressure so that direct investigation of the pressure/volume relationship in the vertical tube may be carried out. The strength of the tube is such as to allow a large safety overload margin, and the Perspex shield is provided as an additional precaution.

Requirements

- Foot pump for pressurising the system
- Short length of rubber pressure tubing

Reference

- Nuffield 'O' Level Physics 'Guide to Apparatus', (Longman) Nuffield 'O' Level Physics 'Guide to Experiments, Year III' (Experiment 79), (Longman)
- Nuffield 'O' Level Physics 'Guide to Experiments, Year IV' (Experiments 76 and 83), (Longman)

Operating instructions

1. Unscrew the pressure gauge from the top of the reservoir and pour in a quantity of the red oil supplied until the liquid level reaches the side tube. More than sufficient oil is supplied with the apparatus, so that after filling, a spare amount is available for future replenishment.
2. Replace the gauge and screw down tightly with a spanner.
3. With the tap open, tilt the apparatus (reservoir uppermost) and manipulate it so as to admit some oil into the glass tube. With a little care, it can be arranged that the confined air occupies an exact number of cm³. The apparatus is now ready for use.
4. Connect the foot pump to the tap inlet by means of a short length of pressure tubing.
5. Note the volume of air in the glass tube (from the vertical scale) and the absolute pressure reading given by the bourdon gauge (this should, of course, correspond with atmospheric pressure initially).
6. Pressurise the system by operating the foot pump. Increase the pressure in stages and note the bourdon gauge reading and corresponding volume reading at each stage. The tap may be used to provide fine adjustment and to hold the pressure steady whilst readings are being taken.
7. When the pressure has reached the maximum readable on the bourdon gauge, take a series of descending pressure readings by carefully releasing the tap in stages. It is advisable always to increase or decrease the pressure slowly. When reducing the pressure, it is particularly desirable to open the tap carefully, because if the pressure is suddenly released, some oil may be expelled with the air.
8. Tabulate the readings and, if desired, plot a graph. The results should be consistent with the relationship: p i.e.
 $pV = \text{constant}$

Results

The graph of the results should be the typical parabolic curve of inverse proportionality, with both the ascending and descending readings falling on the same curve. Servicing If it is necessary on occasions to 'top up' the oil, this may be done via the tap, using a small funnel and rubber tube. Oil specifically for use with this apparatus is available, catalogue number A41750.

Safety advice

For your safety, this product should be used in accordance with these instructions; otherwise, the protection provided may be impaired.

Disclaimer

If the equipment is used in a way not specified by Philip Harris, then the protection provided may be impaired.

Warranty, repairs and spare parts

The Boyle's Law Apparatus is guaranteed for a period of one year from the date of delivery to the customer. This warranty does not apply to defects resulting from the action of a user such as misuse, improper wiring, any operations outside of its specification, improper maintenance or repair, or unauthorized modification.

Our liability is limited to repair or replacement of the product. Any failure during the warranty period should be referred to Customer Services.

Supplier details

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