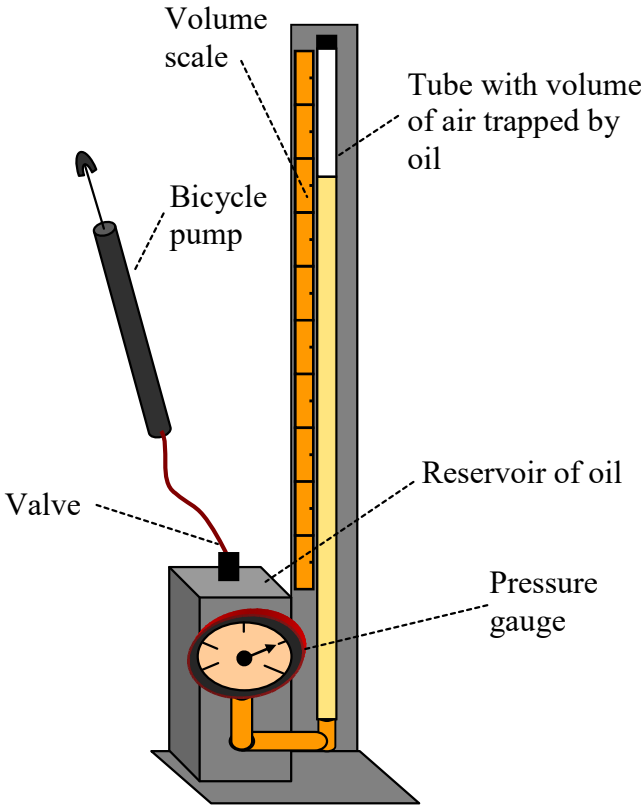
VERIFICATION OF BOYLE'S LAW

Apparatus

One type of Boyle's law apparatus (shown here) consists of a thick walled glass tube that is closed at one end. It contains a volume of air trapped by a column of oil. A pressure gauge attached to the oil pipe is used in measuring the pressure of this volume of air.



Procedure

1. Using the pump, increase the pressure on the air in the tube. Make sure not to exceed the safety limit indicated on the pressure gauge. Close the valve and wait 20 s to allow the temperature of the enclosed air to reach equilibrium. Read the volume V of the air column from the scale.
2. Take the corresponding pressure reading from the gauge and record the pressure P of the trapped air.
3. Reduce the pressure by opening the valve slightly – this causes an increase the volume of the trapped air column. Again let the temperature of the enclosed air reach equilibrium.
4. Record the corresponding values for the volume V and pressure P .
5. Repeat steps two to five to get at least six pairs of readings.

Results

P/Pa	V /cm^3	$\frac{1}{V}$ /cm^{-3}

Plot a graph of P against $\frac{1}{V}$.

A straight-line graph through the origin will verify that, for a fixed mass of gas at constant temperature, the pressure is inversely proportional to the volume, i.e. Boyle's law.

Note

Before starting the experiment, the pressure gauge reading must be checked.
Open the valve fully. If the pressure gauge reads 0, then the value of atmospheric pressure (1×10^5 Pa) must be added to the pressure reading on the gauge to get the pressure of the air in the tube.
If the gauge reads atmospheric pressure (1×10^5 Pa) with the valve opened, then the pressure of the air in the tube is obtained directly from the gauge.