(HT1-12) Boyle's Law of Gases

Aim of experiment

Determination of the atmospheric pressure.

Apparatus

Boyle's law apparatus – ruler – two stands.

Theory of experiment

Boyle's law states that for a given mass of gas maintained at constant temperature, the volume *(V)* is inversely proportional to the pressure *(P)*, or *PV = constant.* A plot of *1/V* against P will thus yield a straight line graph passing through the origin, *figure 1.*

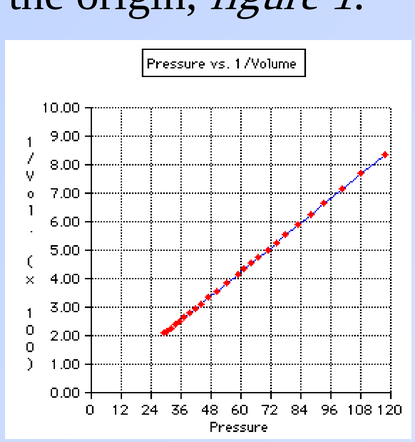
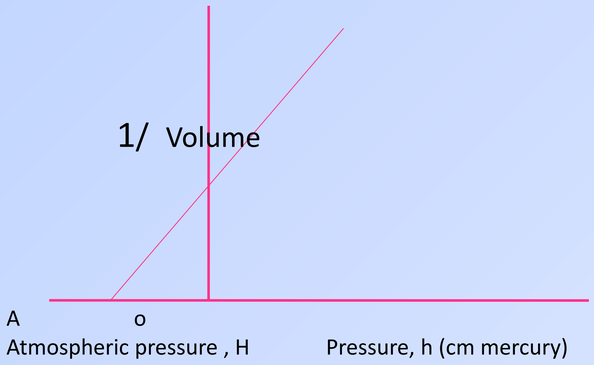


Figure 1. The plot of *1/V* against P

Now if *H* is the atmospheric pressure in cm of mercury, and *h* the difference in the mercury levels in tubes T_2 and T_1, then the pressure in cm mercury is $P = H \pm h$. thus the plot of *1/V* against *h* when extrapolated to cut the *h* - axis will locate the common zero, and the intercept, oA, is evidently the atmospheric pressure *H, figure 2.*



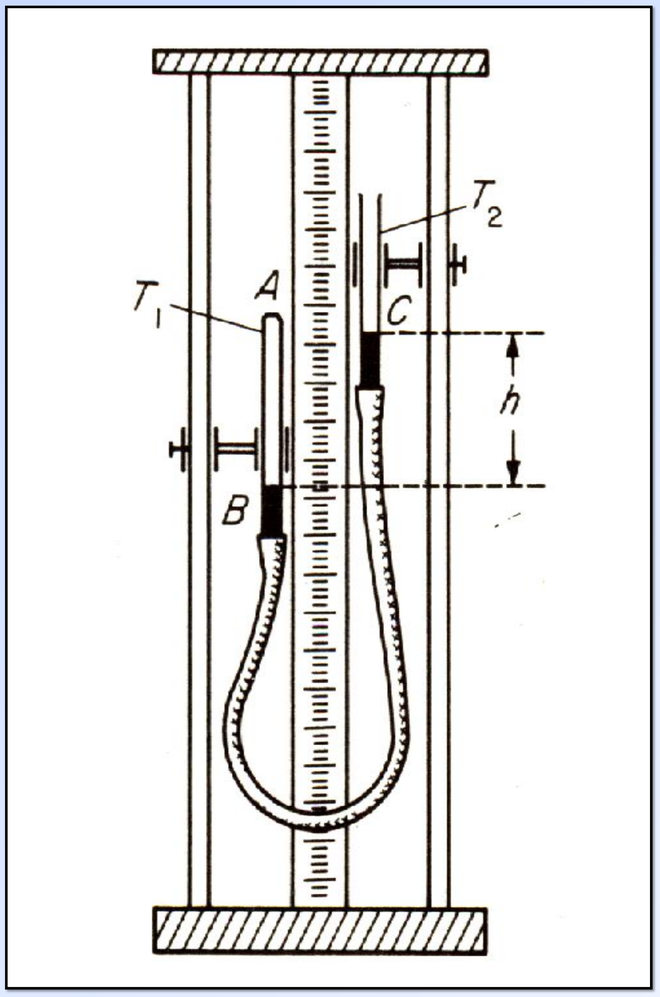


Figure 1. A schematic diagram of Boyle's law apparatus

Procedures

1. Start from the point at which the mercury level in the open end tube, T_2, equal that of the closed end tube, T_1 and measure air volume contained in the graduated tube A, *figure 1.*
3. Move up the open end tube T_2 each 1 cm from the mercury level in the tube T_1, which represents the height difference $h = C-B$ and record the corresponding volume.

Repeat the above steps two more times.

4. Record the results in table and find the average volume.
5. Draw a graph between $1/V_{av}$ on y-axis and *h* on the x-axis, a straight line is obtained, its intercept with –ve x-axis represents the atmospheric pressure *H.*

Results

h (cm_{Hg})	V_1 (cm^3)	V_2 (cm^3)	V_3 (cm^3)	V_{av} (cm^3)	$1/V_{av}$ (cm^{-3})

Density of mercury *(ρ)* = 1.335 x 10^3 Kg m^{-3}

Acceleration of gravity *(g)* = 9.81 N Kg^{-1}

Atmospheric pressure in Pascal = ρ g *H* =

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