

## Gas Laws Lab

$$1 / V \sim P$$

$$1 / V = kP$$

Number of books, $n$	Volume of gas, $V$ (mL)	$1 / V$ (mL <sup>-1</sup> )

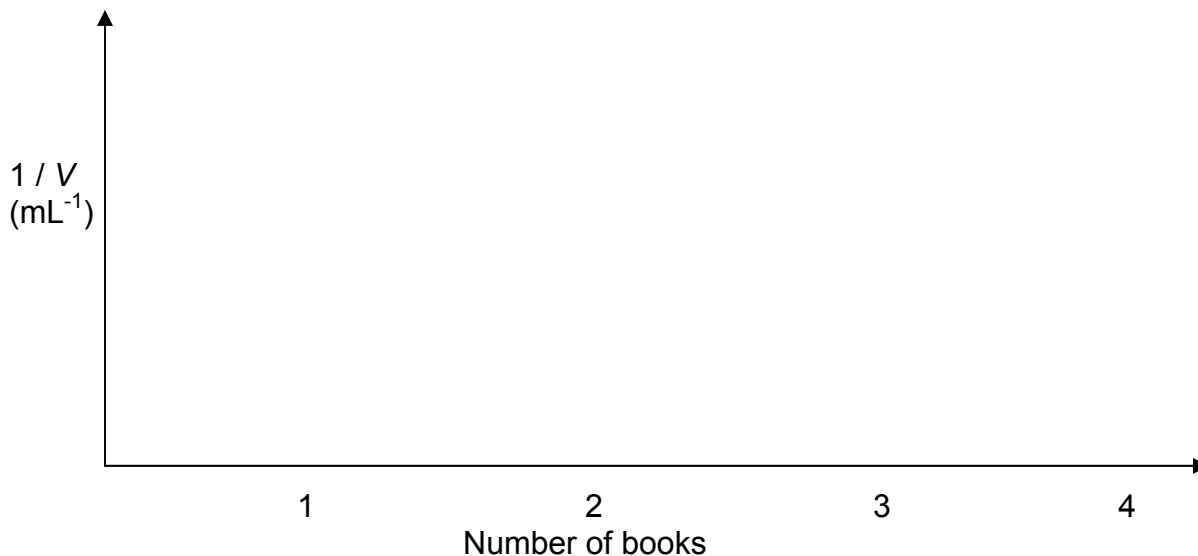
According to Boyle's law,

$$1 / V = kP$$

$$1 / V = k(P_a + nB)$$

$$1 / V = kBn + kP_a$$
$$(y = mx + b)$$

Where  $P_a$  = atmospheric pressure,  $B$  = pressure exerted by 1 book,  $k$  = constant,  $n$  = number of books).



Determine the mass of the textbook from a plot of 1/V versus n

(i) Find coefficient,  $k$ : use  $n = 0$  intercept:  $1 / V = kBn + kP_a$

$$1 / V = 0 + kP_a$$

$$1 / \text{_____ mL} = k \text{_____ mm Hg}$$

$$\text{_____ mL}^{-1} = k \text{_____ mm Hg}$$

$$k = \text{_____ mL}^{-1} / \text{_____ mm Hg}$$

$$k = \text{_____ mL}^{-1} \text{ mm Hg}^{-1}$$

(ii) Find Slope of line,  $kB$ :  $kB = \text{_____ mL}^{-1} \text{ book}^{-1}$

$$B = \frac{\text{_____ mL}^{-1} \text{ book}^{-1}}{k (\text{mL}^{-1} \text{ mm Hg}^{-1})}$$

$$B = \text{_____ mm Hg/book}$$

Each book exerts pressure of \_\_\_\_\_ mm Hg, i.e. each book exerts a pressure equivalent to a column of mercury \_\_\_\_\_ mm tall.

(iii) Find volume of Hg column:

Area of plunger: Surface area = volume of syringe / length of syringe

$$\text{Surface area cm}^2 = \text{_____ cm}^3 / \text{_____ cm} = \text{_____ cm}^2$$

Total volume of Hg column \_\_\_\_\_ mm tall, surface area \_\_\_\_\_  $\text{cm}^2$ :

$$\text{Volume of Hg column (cm}^3\text{)} = \text{height cm} \times \text{SA (cm}^2\text{)}$$

$$\text{Volume of Hg column} = \text{_____ cm} \times \text{_____ cm}^2$$

$$\text{Volume of Hg column} = \text{_____ cm}^3$$

Density Hg =  $13.6 \text{ g/cm}^3$ :

$$\text{Density} = \text{mass} / \text{volume}$$

$$13.6 \text{ g cm}^{-3} = \text{mass} / \text{volume Hg column cm}^3$$

$$\text{mass of Hg} = \text{_____ g}$$

$$\text{mass of textbook} = \text{mass of Hg} = \text{_____ g}$$