

## 4.4 Gas Laws

- A closed container containing gas has:
  - Fixed number of molecules
  - Constant mass
- The gas behaviour is dependant on three variables:
  - Pressure
  - Volume
  - Temperature

*Note:* For all gas law equations, the temperature involved must be absolute, i.e. in **Kelvin**

$$T = \theta + 273$$

where  $T$  = temperature [Kelvin]  
 $\theta$  = temperature [ $^{\circ}\text{C}$ ]

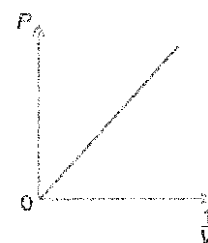
### 4.4.1 Boyle's Law

For a gas of fixed mass, the **pressure** is inversely proportional to its **volume** if the temperature is constant.

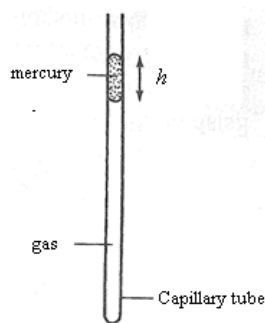
$$PV = k$$

$$P_1V_1 = P_2V_2$$

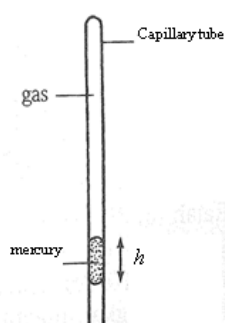
where  $P$  = pressure of the gas [Pa]  
 $V$  = volume of the gas [ $\text{m}^3$ ]



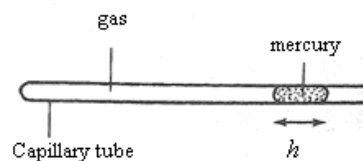
Examples of typical Boyle's Law questions: Capillary tube with a mercury column trapping some air in it. Given that the atmospheric pressure is 76 cm Hg, to calculate the pressure of the air in the tube:



Pressure of the gas =  
 $(76+h)$  cm Hg



Pressure of the gas =  
 $(76-h)$  cm Hg



Pressure of the gas = 76 cm Hg