### Dalton's Law of Partial Pressures

The total pressure in a mixture of non-reacting gases is equal to the sum of the partial pressures of the individual gases.

$P_T$ = $P_1 + P_2 + \ldots$

Pressure is caused by parts hitting the sides of the container

So if there were 2 or more different gases in a mixture each gas would be hitting the sides of the container and contributing to the total pressure

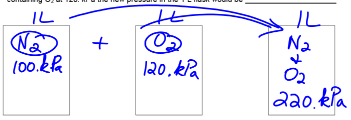
Dalton's Law summarizes the behavior of a system consisting of a mixture of gases.

The molecules (or atoms e.g. Inert) exert the same pressure they would exert if they were alone in the container.

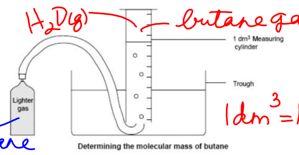
Thus the total P is the sum of all the "partial pressure"

exerted by the gases of the mixture.

For example, if the $N_2$ contained in a 1 L flask at 100. kPa were transferred to another 1 L flask containing $O_2$ at 120. kPa the new pressure in the 1 L flask would be __________




Where have you used this law already?



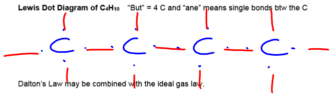
Determining the molecular mass of butane

$1 dm^3 = 1 L$

Any time you collect a gas over water you must account for the water vapour pressure.

Gases not appreciably soluble in water can be bubbled through.

**Lewis Dot Diagram of $C_4H_{10}$** "But" = 4 C and "ane" means single bonds btw the C



Dalton's Law may be combined with the ideal gas law.

$P_1 + P_2 + P_3 = P_T$

$P_T V = n R T$

1 n = # of parts.

In such a case, n represents the total number of moles of all gases present in the mixture.

$P_T V = n_T R T$

$n_1 + n_2 + n_3 = n_T$

**e.x.** A gaseous mixture consists of 11.0 g of $CO_2$ and 16.0 g of $O_2$. The volume of the container is 5.00 $dm^3$ and the temperature is 27.0 °C.

a) Find the partial pressure of each gas.

b) Find the total pressure of the mixture.

$11.0 g\ CO_2 \times \frac{1 mol\ CO_2}{44 g} = 0.25 mol\ CO_2$

$16.0 g\ O_2 \times \frac{1 mol\ O_2}{32 g} = 0.5 mol\ O_2$

$0.25 mol + 0.5 mol = 0.75 mol$

$P_T V = n_T R T$

$P_T = \frac{n_T R T}{V}$

$= \frac{(0.75 mol)(8.314)(300. K)}{5.00 L}$

$P_T = 374 kPa$ units!

Since each gas in a mixture contributes to the total pressure depending on the number of moles of each gas we can write:

$P_{gas} = \frac{\text{moles of the gas}}{\text{total moles of gas}} \times P_t$

mole fraction = % of the # parts.