Corrigé de la série N°1

Exercice 1: La valeur de la pression : $P = 2$ atm.

* Bar.

$1\ atm = 1{,}013\ Bar \Rightarrow 2\ atm = 2 \times 1{,}013 = 2{,}026\ Bar$

$$\boxed{P = 2{,}026\ Bar}$$

* Pascal.

$1\ atm = 1{,}013 \times 10^5\ Pa \Rightarrow 2\ atm = 2 \times 1{,}013 \times 10^5 = 2{,}026 \times 10^5$

$$\boxed{P = 2{,}026 \times 10^5\ Pa}$$

* mmHg et torr

$760\ mmHg = 1\ atm = 760\ torr$

$2\ atm = 760 \times 2 = 1520\ mmHg = 1520\ torr$

* N/m^2.

$1\ Pascal = 1\ N/m^2 \Rightarrow \boxed{P = 2{,}026 \times 10^5\ N/m^2}$

Exercice 2: equation des gaz parfait $PV = nRT$.

$m = 0,90g$ $\quad P = 752 \text{ mmHg} = \frac{752}{760} = 0,989 \text{ atm}$

$V = 0,67 \ell$

$T = 15,2 = 288,2 \text{ k}$.

calcul de R:

R: $J \text{ mol}^{-1} k^{-1}$

$n = \frac{0,9}{32} = 0,028 \text{ mol}$.

$PV = nRT \Rightarrow R = \frac{RV}{nT} = \frac{0,989 \times 0,67}{0,028 \times 288,2} = 0,082$

$R = 0,082 \ \ell . \text{atm} . k^{-1} \text{mol}^{-1}$

* $J . \text{mol}^{-1} k^{-1}$

$R = \frac{1,002 \times 10^5 \times 0,67 \times 10^{-3}}{0,028 \times 288,2} = 8,319 \ J . k^{-1} \text{mol}^{-1}$

$\boxed{R = 8,319 \ J \ k^{-1} \text{mol}^{-1}}$

* $\text{cal} . \text{mol}^{-1} k^{-1}$

$R = \frac{8,319}{4,18} = 1,99 \text{ cal } k^{-1} \text{mol}^{-1}$

$\boxed{R = 1,99 \text{ cal } k^{-1} \text{mol}^{-1}}$

Exercice 3 :

calcul des Pressions Partielles.

$m_{He} = 0,401\ g.$

$m_{N_2} = 3\ g.$

$m_{Ar} = 3\ g.$

$\Big\}$ $P_{tot} = 5$ atm.

$$P_i = x_i P_{tot}.$$

$$x_i = \frac{n_i}{\sum n_i} = \frac{n_i}{n_{tot}}$$

$n_{He} = \frac{0,401}{4} = 0,100$ mol. $\Rightarrow x_{He} = \frac{0,100}{0,282} = 0,354$

$n_{N_2} = \frac{3}{28} = 0,107$ mol. $\Rightarrow x_{N_2} = \frac{0,107}{0,282} = 0,380$

$n_{Ar} = \frac{3}{40} = 0,075$ mol. $\Rightarrow x_{Ar} = \frac{0,075}{0,282} = 0,266$

$n_{tot} = 0,100 + 0,107 + 0,075 = 0,282$ mol.

$\Rightarrow P_{He} = x_{He} \times P_{tot} = 0,354 \times 5 = 1,77$ atm

$\boxed{P_{He} = 1,77 \text{ atm}}$

$P_{N_2} = x_{N_2} \times P_{tot} = 0,380 \times 5 = 1,9$ atm

$\boxed{P_{N_2} = 1,9 \text{ atm}}$

$P_{Ar} = x_{Ar} \times P_{tot} = 0,266 \times 5 = 1,33$ atm

$\boxed{P_{Ar} = 1,33 \text{ atm}}$

Exercice 4 :

calcul de la masse m_A et m_B dans chaque compartiment

$P_A = 4$ atm, $T_A = 300$k, $V_A = 30$L.

$P_B = 14$ atm, $T_B = 300$k, $V_B = 50$L.

* m_{He} :

$P_A V_A = n_A R T_A \Rightarrow n_A = \frac{P_A V_A}{R T_A} = \frac{4 \times 30}{0,082 \times 300} = 4,87$ mol.

$n = \frac{m}{M} \Rightarrow m_A = n_A \times M = 4,87 \times 4 = 19,4$ g.

$$\boxed{m_{He} = 19,4 \text{ g}}$$

* m_{O_2} : $n_B = \frac{P_B V_B}{R T_B} = \frac{14 \times 50}{0,082 \times 300} = 28,45$ mol.

$m_B = 28,45 \times 32 = 910,4$ g.

$$\boxed{m_{O_2} = 910,4 \text{ g}}$$

2) calcul des nouvelles pression P_A et P_A lorsque T = 5

* $P_{He} = P_A = \frac{n_A R T_A}{V_A} = \frac{4,87 \times 0,082 \times 530}{300} = 7,05$ atm

$$\boxed{P_{He} = 7,05 \text{ atm}}$$

* $P_{O_2} = \frac{n_B R T_B}{V_B} = \frac{28,45 \times 0,082 \times 530}{50} = 24,72$ atm

$$\boxed{P_{O_2} = 24,72 \text{ atm}}$$

3) Lorsqu'on soulève la cloison séparant les deux récip

les deux gaz vont se mélanger et occupent le volum

total $\boxed{V_{tot} = V_A + V_B = V_{He} + V_{O_2} = 30 + 50 = 80\,L.}$

* La pression partielle de chaque gaz :

$$P_{He} = x_{He} \times P_{tot} = \frac{n_{He}}{n_{tot}} \times P_{tot}$$

$$P_{tot}\, V_{tot} = n_{tot}\, RT$$

$$n_{tot} = 4,87 + 28,45$$

$$\boxed{n_{tot} = 33,32 \text{ mol}}$$

$$\Rightarrow P_{tot} = \frac{n_{tot}\, RT}{V_{tot}} = \frac{33,32 \times 0,082 \times 530}{80}$$

$$\boxed{P_{tot} = 18,10 \text{ atm}}$$

$$P_{He} = \frac{4,87}{33,32} \times 18,10 = 2,64 \text{ atm}.$$

$$\boxed{P_{He} = 2,64 \text{ atm}}$$

* P_{O_2} :

$$P_{O_2} = x_{O_2} \times P_{tot} = \frac{n_{O_2}}{n_{tot}} \times P_{tot} = \frac{28,45}{33,32} \times 18,10 = 15,45 \text{ atm}$$

$$\boxed{P_{O_2} = 15,45 \text{ atm}}$$