FÍSICO-QUÍMICA I – EC1

(1) $\Delta V = V_f - V_i = -2{,}20\ dm^3$; $P_f = 5{,}04\ bar$; $V_f = 4{,}65\ dm^3$; $P_i = ?$

Gás ideal, $T = cte$ $\Rightarrow$ $PV = nRT = cte$ $\Rightarrow$ $P_i V_i = P_f V_f$ $\Rightarrow$ $P_i = \frac{P_f V_f}{V_i}$

$\Delta V = 4{,}65 - V_i = -2{,}20\ dm^3 \therefore V_i = 6{,}85\ dm^3$

(a) $P_i = \frac{5{,}04\ bar \cdot 4{,}65\ dm^3}{6{,}85\ dm^3} = 3{,}42\ bar$ //

(b) $P_i = 3{,}42\ bar \times \frac{10^5\ Pa}{1\ bar} \times \left[\frac{101325\ Pa}{1\ atm}\right]^{-1} = 3{,}38\ atm$ //

(2) Considerando que o ar comprimido se comporte idealmente:

$PV = nRT$; n e $V = cte$ $\Rightarrow$ $\frac{P}{T} = \frac{nR}{V} = cte$

$\frac{P_i}{T_i} = \frac{P_f}{T_f}$; $T_i = -5 + 273 = 268\ K$; $T_f = 35 + 273 = 308\ K$

$P_f = P_i \frac{T_f}{T_i} = 24\ psi \cdot \frac{308\ K}{268\ K} = 27{,}6\ psi$ //

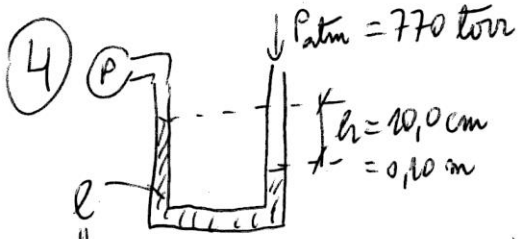
(3) $CH_4 \rightarrow V = 4{,}00 \times 10^3\ m^3$; $P.M.(CH_4) = 16{,}0\ g \cdot mol^{-1}$

$PV = nRT \therefore n = \frac{PV}{RT} = \frac{m}{(P.M.)} \therefore m = \frac{PV}{RT}(P.M.)$

$m = \frac{1{,}00\ atm \cdot 4{,}00 \times 10^3\ m^3 \times (10^3\ L \cdot m^{-3})}{0{,}0821\ atm \cdot L \cdot mol^{-1} \cdot K^{-1} \cdot (20 + 273)\ K} \cdot 16{,}0\ g \cdot mol^{-1}$

$m = 2{,}66 \times 10^6\ g = 2660\ kg$ //

(4)



$P + \ell g h = P_{atm}$

$P = P_{atm} - \ell g h$

$0,997\ g \cdot cm^{-3}$

$0,997 \cdot 10^3\ kg \cdot (10^{-2}\ m)^{-3}$

$0,997 \times 10^3\ kg \cdot m^{-3}$

$P = 770\ \text{torr} \cdot \frac{101325\ Pa}{760\ \text{torr}} - 0,997 \times 10^3\ kg \cdot m^{-3} \times 9,8\ m \cdot s^{-2} \cdot 10^{-1}\ m$

$(kg \cdot m^{-1} \cdot s^{-2} \equiv Pa$

$Pa \equiv \frac{N}{m^2} = kg \frac{m}{s^2} \frac{1}{m^2} = \frac{kg}{m \cdot s^2}$

$P = 101681\ Pa$ //

(5) Considerando o comportamento do gás como ideal:

$PV = nRT = \frac{m}{M} RT$; $M \rightarrow$ peso molecular (massa molar)

$P = \frac{m}{V} \cdot \frac{RT}{M} = \frac{\rho RT}{M}$ $\therefore$ $M = \frac{\rho RT}{P}$

$M = \frac{1,23\ kg \cdot m^{-3} \times 8,314\ Pa \cdot m^3 \cdot mol^{-1} \cdot K^{-1} \times 330\ K}{20 \times 10^3\ Pa}$

$M = 0,1687\ kg \cdot mol^{-1} = 168,7\ g \cdot mol^{-1}$ //