1ª QUESTÃO:

$$3\,H_2 + N_2 \rightarrow 2\,NH_3$$

| | INÍCIO | VARIAÇÃO | FINAL |
|---|---|---|---|
| $H_2$ | 2,0 | −2,0 | 0 |
| $N_2$ | 1,0 | −2/3 | 1/3 |
| $NH_3$ | 0 | +4/3 | 4/3 |

$$\begin{array}{l} 3H_2 - 1N_2 \\ 2H_2 - x \end{array} \therefore x = \frac{2}{3} \qquad \begin{array}{l} 3H_2 - 2NH_3 \\ 2H_2 - y \end{array} \therefore y = \frac{4}{3}$$

$$P_{TOTAL} V_{TOTAL} = n_{TOTAL} RT$$

$$P_{TOTAL} = \frac{n_{TOTAL} RT}{V_{TOTAL}} = \frac{(1/3 + 4/3)\,\cancel{mol} \cdot 0{,}0821\ atm \cdot \cancel{L}/\cancel{mol} \cdot \cancel{K} \cdot 273{,}15\ \cancel{K}}{22{,}4\ \cancel{L}}$$

$$\therefore P_{TOTAL} = 1{,}67\ atm \ //$$

$$x_i = \frac{n_i}{n_{TOTAL}} \rightarrow x_{H_2} = 0 \ ; \quad x_{N_2} = \frac{1/3}{5/3} = 0{,}2$$

$$x_{NH_3} = \frac{4/3}{5/3} = 0{,}8$$

$$P_i = x_i P_{TOTAL}$$

$$P_{H_2} = 0 \ //$$

$$P_{N_2} = 0{,}2 \cdot 1{,}67 = 0{,}33\ atm \ //$$

$$P_{NH_3} = 0{,}8 \cdot 1{,}67 = 1{,}34\ atm \ //$$

2ª QUESTÃO:

$$m_{ar} = m_{ampola + ar} - m_{ampola} = 28,0529 - 27,9214 = 0,1315\ g$$

$$n_{ar} = \frac{m_{ar}}{P.M._{ar}} = \frac{0,1315\ g}{28,9\ g/mol} = 4,55 \times 10^{-3}\ mol$$

$$n_{ar} = n_{mistura}$$ (Princípio de Avogadro: vols. iguais de 2 gases nas mesmas T e P têm mesmo nº moles)

$$m_{mistura} = m_{amp. + mist.} - m_{amp.} = 28,0140 - 27,9214 = 0,0926\ g$$

$$m_{metano} + m_{etano} = m_{mistura} \therefore n_{met} \cdot P.M._{met} + n_{et} \cdot P.M._{et} = m_{mist.}$$

$$(P.M._{met} \cdot x_{met} \cdot n_{mist}) + (P.M._{et} \cdot x_{et} \cdot n_{mist}) = m_{mist}$$

$$16 \cdot x_{met} \cdot 4,55 \times 10^{-3} + 30 \cdot x_{et} \cdot 4,55 \times 10^{-3} = 0,0926$$

$$\begin{cases} 16\, x_{met} + 30\, x_{et} = 20,35 \rightarrow \text{P.M. mistura} \\ x_{met} + x_{et} = 1 \therefore x_{et} = 1 - x_{met} \end{cases}$$

$$16\, x_{met} + 30(-x_{met} + 1) = 20,35$$

$$16\, x_{met} - 30\, x_{met} = 20,35 - 30$$

$$14\, x_{met} = 9,64$$

$$x_{met} = 0,69$$ //

3.ª QUESTÃO:

$$Z = \frac{PV_m}{RT}$$

$$P(V - nb) = nRT \quad \therefore \quad PV - Pnb = nRT$$

$$(\div n) \rightarrow PV_m - Pb = RT \quad \therefore \quad PV_m = Pb + RT$$

$$(\div RT) \rightarrow \frac{PV_m}{RT} = \frac{Pb}{RT} + 1 = Z \quad //$$

$$\left.\begin{array}{l} V_m = 10b \\ b = \dfrac{V_m}{10} \end{array}\right\} \Rightarrow Z = \frac{Pb}{RT} + 1 = \underbrace{\frac{P}{RT} \cdot V_m}_{=Z} \cdot \frac{1}{10} + 1 = \frac{Z}{10} + 1$$

$$10Z = Z + 10$$

$$9Z = 10$$

$$Z = \frac{10}{9} \quad \therefore \quad Z = 1,11 \quad //$$

$Z > 1$, logo $V_m$ será maior que no caso do gás ideal nas mesmas condições de P e T. Logo, o gás real é menos compressível, o que ocorre quando predominam as forças repulsivas.

4ª QUESTÃO:

$n = 10{,}0\ mol\ ;\ V = 4{,}860\ dm^3\ ;\ T = 27°C = 300\ K$

(a) $$P = \frac{nRT}{V} = \frac{10{,}0\ \cancel{mol} \times 0{,}0821\ atm.\cancel{L}.\cancel{mol^{-1}}.\cancel{K^{-1}} \times 300\ \cancel{K}}{4{,}860\ \cancel{L}}$$

$P = 50{,}7\ atm$ //

(b) $$P = \frac{nRT}{V - nb} - a\left(\frac{n}{V}\right)^2 \ ;$$ $a = 5{,}507\ dm^6.atm.mol^{-2}$; $b = 0{,}0651\ dm^3.mol^{-1}$

$$P = \frac{10{,}0\ \cancel{mol} \times 0{,}0821\ atm.\cancel{L}.\cancel{mol^{-1}}.\cancel{K^{-1}} \times 300\ \cancel{K}}{4{,}860\ dm^3 - 10{,}0\ \cancel{mol}.0{,}0651\ \frac{dm^3}{\cancel{mol}}} - 5{,}507\ \frac{\cancel{dm^6}\ atm}{\cancel{mol^{-2}}}.\left(\frac{10{,}0\ \cancel{mol}}{4{,}860\ \cancel{dm^3}}\right)^2$$

$P = 35{,}2\ atm$ //

$$Z = \frac{PV_m}{RT} = \frac{PV}{nRT}$$

$$Z = \frac{35{,}2\ atm.4{,}860\ dm^3}{10{,}0\ mol.0{,}0821\ \frac{atm.L}{mol.K}.300\ K} = 0{,}695$$ //