

## Lista 1 - Segundo Ano

① Esta transformação é isotérmica, logo:

$$\frac{PV}{T} = \frac{PV}{T} \quad P_1 V_1 = P_2 V_2 \quad 1 \cdot 50 = P_2 \cdot 80$$

$$80 P_2 = 50 \quad P_2 = \frac{50}{80} \quad \boxed{P_2 = 0,625 \text{ atm}} \quad \textcircled{A}$$

② Anulada.

③ Esta transformação é isotérmica, logo:

$$P_1 V_1 = P_2 V_2 \quad 1 \cdot 100 = P_2 \cdot 25 \quad 25 P_2 = 100$$

$$P_2 = \frac{100}{25} \quad \boxed{P_2 = 4,0 \text{ atm}} \quad \textcircled{B}$$

④ Esta transformação é isobárica, logo:

$$\frac{PV}{T} = \frac{PV}{T} \quad \frac{V_1}{T_1} = \frac{V_2}{T_2} \quad T_1 = 47^\circ\text{C} = 47 + 273 = 320\text{K}$$

$$\frac{25}{320} = \frac{62,5}{T_2} \quad 25 T_2 = 320 \cdot 62,5 \quad 25 T_2 = 20.000$$

$$T_2 = \frac{20.000}{25} \quad \boxed{T_2 = 800\text{K}}$$

⑤ Esta transformação é isobárica, logo:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad T_1 = 25^\circ\text{C} = 25 + 273 = 298\text{K}$$
$$T_2 = -200^\circ\text{C} = -200 + 273 = 73\text{K}$$

$$298L = 2980 \text{ mL}$$

$$\frac{2980}{298} = \frac{V_2}{73}$$

$$298V_2 = 2980 \cdot 73$$

$$298V_2 = 217540$$

$$V_2 = \frac{217540}{298}$$

$$V_2 = 730 \text{ mL}$$

(D)

⑥ Esta transformação é isocórica.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$T_1 = 0^\circ\text{C} = 0 + 273 = 273 \text{ K}$$

$$T_2 = 60^\circ\text{C} = 60 + 273 = 333 \text{ K}$$

$$\frac{1}{273} = \frac{P_2}{333}$$

$$273P_2 = 333$$

$$P_2 = \frac{333}{273}$$

$$P_2 \approx 1,2 \text{ atm}$$

(C)

⑦ P, V, 300K

1,5P, 2V, T<sub>2</sub>

T<sub>2</sub> = ?

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{P_1 V_1}{300} = \frac{1,5P \cdot 2V}{T_2}$$

$$\frac{1}{300} = \frac{3}{T_2}$$

$$1 \cdot T_2 = 3 \cdot 300$$

$$T_2 = 900 \text{ K}$$

(E)

⑧ P, V, T+273

3P, 0,5V, 2T+273

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{P_1 V_1}{T+273} = \frac{3P \cdot 0,5V}{2T+273}$$

$$\frac{1}{T+273} = \frac{1,5}{2T+273}$$

$$1,5(T+273) = 2T+273$$

$$1,5T + 409,5 = 2T + 273$$

$$1,5T - 273 = 273 - 409,5$$

$$-0,5T = -136,5 \quad (-1)$$

$$0,5T = 136,5$$

$$T = \frac{136,5}{0,5}$$

$$T = 273^{\circ}\text{C}$$

$$T = 273 + 273$$

$$\boxed{T = 546\text{ K}}$$

$$\textcircled{9} \quad \frac{P_A V_A}{T_A} = \frac{P_B V_B}{T_B} \quad \frac{P_A}{T_A} = \frac{P_B}{T_B} \quad T_B = 20^{\circ}\text{C}$$

$$T_B = 20 + 273 = 293\text{ K}$$

$$\frac{2}{T_A} = \frac{4}{293}$$

$$4 T_A = 2 \cdot 293$$

$$4 T_A = 586$$

$$T_A = \frac{586}{4}$$

$$\boxed{T_A = 146,5\text{ K}}$$

(F)

⑩ A transformação de A para B é isotérmica, logo:

$$P_A V_A = P_B V_B \quad P_A = 2\text{ atm} \quad V_A = 1\text{ l} \quad P_B = 1\text{ atm}$$

$$2 \cdot 1 = 1 \cdot V_B \quad V_B = 2\text{ l}$$

A transformação de B para C é isocórica, logo:

$$\frac{P_B}{T_B} = \frac{P_C}{T_C} \quad \frac{1}{300} = \frac{2}{T_C} \quad T_C = 300 \cdot 2 \quad T_C = 600\text{ K}$$

$$T = 600 - 273 \quad \boxed{T_C = 327^{\circ}\text{C}}$$

Lista 2

$$\textcircled{1} \quad PV = nRT \quad P = 5000\text{ Pa} \quad R = 8,31\text{ atm} \cdot \text{L} / \text{mol} \cdot \text{K}$$

$$n = 1\text{ mol}$$

$$T = 50 + 273 = 323\text{ K}$$

$$V = \frac{nRT}{P} = \frac{1 \cdot 8,31 \cdot 323}{5000}$$

$$\boxed{V \approx 0,54\text{ m}^3} \quad \text{ou } 540\text{ l}$$

②  $PV = nRT$        $P = 50 \text{ Pa}$        $R = 8,31 \text{ Pa m}^3 / \text{mol} \cdot \text{K}$   
 $V = 2\rho l = 0,002 \text{ m}^3$        $T = 17 + 273 = 290 \text{ K}$

$$n = \frac{PV}{RT} = \frac{50 \cdot 0,002}{8,31 \cdot 290} = \frac{0,1}{2409,9} = \boxed{4,1 \cdot 10^{-5} \text{ mols}}$$

③  $PV = nRT$        $n = \frac{m}{M} = \frac{m = 2 \text{ g}}{M = 32}$        $n = \frac{2}{32} = 0,0625 \text{ mol}$

$$V = \frac{nRT}{P}$$

$R = 0,082 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}}$        $T = 47 + 273 = 320 \text{ K}$

$P = 20 \text{ atm}$

$$V = \frac{0,0625 \cdot 0,082 \cdot 320}{20} = \frac{1,64}{20}$$

$\boxed{V = 0,082 \text{ L}}$       (A)

④  $PV = nRT$        $P = 2,0 \cdot 10^5 \text{ Pa}$        $R = 8131 \text{ Pa} \cdot \text{atm} / \text{mol} \cdot \text{K}$   
 $n = 2 \text{ mols}$        $T = 27 + 273 = 300 \text{ K}$

$$V = \frac{nRT}{P} = \frac{2 \cdot 8131 \cdot 300}{2 \cdot 10^5} = \frac{4986}{2 \cdot 10^5} = \frac{4,986 \cdot 10^3}{2 \cdot 10^5}$$

$\boxed{V = 2,5 \cdot 10^{-2} \text{ m}^3}$       (C)

⑤  $n = \frac{m}{M}$        $M = \frac{m}{n}$        $Pv = nRT$        $n = \frac{PV}{RT}$

$1 \text{ atm} = 760 \text{ mmHg}$        $760x = 1 \cdot 765$        $x = \frac{765}{760}$        $\boxed{x = 1,0 \text{ atm}}$   
 $x = 765 \text{ mmHg}$

$T = 18 + 273 = 291 \text{ K}$        $V = 1,29 \text{ L}$        $P = 1 \text{ atm}$        $R = 0,082 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}}$   
 $m = 2,71 \text{ g}$

$$PV = nRT \quad n = \frac{PV}{RT} = \frac{1 \cdot 1,29}{0,082 \cdot 291} = \frac{1,29}{23,862}$$

$$n = 0,054 \text{ mol} \quad M = \frac{m}{n} = \frac{2,71}{0,054} \quad \boxed{M \approx 50} \quad \text{E}$$

$$\textcircled{6} \quad PV = nRT \quad P = 1 \text{ atm} \quad T = 0 + 273 = 273 \text{ K} \\ V = 112 \text{ L} \quad R = 0,082 \text{ atm} \cdot \text{L} / \text{mol} \cdot \text{K}$$

$$n = \frac{PV}{RT} = \frac{1 \cdot 112}{0,082 \cdot 273} \quad n = \frac{112}{22,386} \quad \boxed{n = 5 \text{ mols}}$$

$$\textcircled{7} \quad n = \frac{m}{M} \quad m = n \cdot M \quad n = 5,0 \text{ mols} \quad M = 40$$

$$m = 5 \cdot 40 \quad \boxed{m = 200 \text{ g}}$$

$$\textcircled{8} \quad n = \frac{PV}{RT} \quad P = 2,9 \text{ atm} \quad V = 4 \text{ L} \\ R = 0,082 \text{ atm} \cdot \text{L} / \text{mol} \cdot \text{K} \quad T = 17 + 273 = 290 \text{ K}$$

$$n = \frac{2,9 \cdot 4}{0,082 \cdot 290} = \frac{11,89}{23,78} = 5,0 \text{ mols}$$

$$\text{Número de moléculas: } n \cdot N_A = 5,0 \cdot 6,023 \cdot 10^{23} = 30,115 \cdot 10^{23}$$

$$\boxed{N_m = 3,0 \cdot 10^{24}}$$

⑨ A temperatura e o volume são constantes. sendo a pressão proporcional ao número de mols, tem-se:

$$\begin{array}{l} 3 \text{ — } n \\ 1 \text{ — } n-4 \end{array}$$

$$3 \cdot (n-4) = n \quad 3n - 12 = n$$

$$3n - n = 12 \quad 2n = 12 \quad n = \frac{12}{2}$$

$$\boxed{n = 6 \text{ mols}} \quad \text{A}$$

$$n = \frac{PV}{RT}$$

$$P = 1 \text{ atm}$$
$$V = 11,2 \text{ l}$$

$$R = 0,082 \text{ atm} \cdot \text{L} / \text{mol} \cdot \text{K}$$
$$T = 273 \text{ K}$$

$$n = \frac{1 \cdot 11,2}{0,082 \cdot 273} = \frac{11,2}{22,386} = 0,5 \text{ mol}$$

$$M_{\text{CO}_2} \Rightarrow M_c = 12 \quad M_o = 16$$

$$M_{\text{CO}_2} = 1 \cdot 12 + 2 \cdot 16 = 12 + 32 = 44 \text{ g/mol}$$

$$n = \frac{m}{M} \quad m = n \cdot M \quad m = 0,5 \cdot 44 \quad \boxed{m = 22 \text{ g}}$$

$$\textcircled{11} \quad n = \frac{PV}{RT} \quad P = 3 \text{ atm} \quad R = 0,082 \text{ atm} \cdot \text{L} / \text{mol} \cdot \text{K}$$
$$V = 12,3 \text{ l} \quad T = 327 + 273 = 600 \text{ K}$$

$$n = \frac{3 \cdot 12,3}{0,082 \cdot 600} = \frac{36,9}{49,2} \Rightarrow n = 0,75 \text{ mol} \quad m = 30 \text{ g}$$

$$n = \frac{m}{M} \quad M = \frac{m}{n} \quad M = \frac{30}{0,75} \quad \boxed{M = 40 \text{ g} \cdot \text{mol}^{-1}}$$

$$\textcircled{12} \quad M_c = 12 \quad M_o = 16 \quad M_{\text{CO}_2} = 44 \text{ g/mol}$$

$$m = 4,4 \text{ Kg} = 4400 \text{ g} \quad n = \frac{m}{M} \quad n = \frac{4400}{44} \quad \boxed{n = 100 \text{ mol}}$$

$$PV = nRT \quad P = 1 \text{ atm} \quad n = 100 \quad R = 0,082 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}} \quad T = 27 + 273 = 300 \text{ K}$$

$$V = \frac{nRT}{P} = \frac{100 \cdot 0,082 \cdot 300}{1} \quad \boxed{V = 2460 \text{ l}}$$

$$\textcircled{13} \quad PV = nRT \quad P = 5 \text{ atm} \quad R = 0,082 \text{ atm} \cdot \text{L/mol} \cdot \text{K}$$

$$V = 9,84 \text{ L}$$

$$T = 27 + 273 = 300 \text{ K}$$

$$n = \frac{PV}{RT} = \frac{5 \cdot 9,84}{0,082 \cdot 300} = \frac{49,2}{24,6}$$

$$n = 2 \text{ mols}$$

$$m = n \cdot M$$

$$m = 2,0 \text{ mols}$$

$$M = 40 \text{ g} \cdot \text{mol}^{-1}$$

$$m = 2,0 \cdot 40 \quad \boxed{m = 80 \text{ g}}$$

$$\textcircled{14} \quad \begin{array}{l} 1 \text{ atm} - 760 \text{ mm Hg} \\ x \quad \quad \quad 900 \text{ mm Hg} \end{array}$$

$$760x = 900 \quad x = \frac{900}{760}$$

$$P = 1,18 \text{ atm}$$

$$V = 24,92 \text{ L} \quad T = 27^\circ\text{C} = 300 \text{ K}$$

$$n = \frac{PV}{RT}$$

$$n = \frac{1,18 \cdot 24,92}{0,082 \cdot 300} = \frac{29,5}{24,6} = 1,2 \text{ mol}$$

$$\text{Gás Hidrogênio: } \text{H}_2 \quad \text{H} = 1 \quad \text{H}_2 = 2 \text{ g} \cdot \text{mol}^{-1}$$

$$m = n \cdot M$$

$$m = 1,2 \cdot 2$$

$$\boxed{m = 2,4 \text{ g}}$$

$$\textcircled{15} \quad n = \frac{PV}{RT}$$

$$P = 5 \text{ atm}$$

$$V = 3 \text{ L}$$

$$T = 27 + 273 = 300$$

$$m = 135 \text{ g}$$

$$n = \frac{5 \cdot 3}{0,082 \cdot 300} = \frac{15}{24,6} \Rightarrow n = 0,6 \text{ mol}$$

$$n = \frac{m}{M} \quad M = \frac{m}{n}$$

$$M = \frac{135 \text{ g}}{0,6}$$

$$\boxed{M = 225 \text{ g} \cdot \text{mol}^{-1}}$$

(8)

$$(16) PV = nRT$$

$$P = 2,5 \text{ atm} \quad T = 32 + 273 = 305 \text{ K}$$

$$V = \frac{nRT}{P}$$

$$n = ? \quad M_{\text{He}} = 4 \quad m = 44 \text{ g}$$

$$n = \frac{m}{M}$$

$$n = \frac{44}{4}$$

$$n = 11 \text{ mol}$$

$$V = \frac{11 \cdot 0,082 \cdot 305}{2,5} = \frac{275,11}{2,5}$$

$$\boxed{V = 110 \text{ l}}$$

$$(17) PV = nRT$$

$$P = 2,46 \text{ atm}$$

$$T = 27^\circ\text{C} = 300 \text{ K}$$

$$n = 4 \text{ mols}$$

$$V = \frac{nRT}{P} = \frac{4 \cdot 0,082 \cdot 300}{2,46} = \frac{98,4}{2,46}$$

$$\boxed{V = 40 \text{ l}}$$