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LISTA 2 - FENÔMENOS

1) $V = (6 \times 10 \times 4) \text{ m}^3 = 240 \text{ m}^3$

$P_1 = 100 \text{ kPa}$

$t_1 = 25^\circ\text{C} + 273 = 298$

$R_{AR} = 0,287 \text{ kJ.m/kg.K}$

$PV = mRT$

$m = \frac{PV}{RT} = \frac{100 \times 240}{0,287 \cdot 298} = 280,6 \text{ kg}$

2.) $V = 0,5 \text{ m}^3$

$m = 10 \text{ kg}$

$M = 24 \text{ kg/kmol}$

$t_1 = 25^\circ\text{C} + 273 = 298$

$\bar{R} = 8,31 \text{ kJ.m/kmol.K}$

$R = \frac{\bar{R}}{M} = \frac{8,3145}{24} = 0,346 \text{ kJ.m/kg.K}$

$PV = mRT$

$P = \frac{mRT}{V} = \frac{10 \cdot 0,346 \cdot 298}{0,5}$

$P = 2.062,26 \text{ Pa}$

3) $R = \frac{\bar{R}}{M} = \frac{8,3145}{28,01} = 0,2968 \text{ kJ.m/kmol.K}$

a) $t = 30^\circ\text{C} \rightarrow 273 = 303 \text{ K}$

$m = \frac{PV}{RT} = \frac{4200 \cdot 4}{0,2968 \cdot 303} = 186,8 \text{ kg}$

b) $t = -120 + 273 = 153 \text{ K}$

$m = \frac{PV}{RT} = \frac{4200 \cdot 4}{0,2968 \cdot 153} = 369 \text{ kg}$

4) $V = 0,6 \text{ m}^3$

$P = 200 \text{ kPa}$

$m = ?$

$t = 20^\circ\text{C} + 273 = 293 \text{ K}$

$\bar{R} = 0,287 \text{ kJ.m/kg.K}$

$P_{atm} = 100 \text{ kPa}$

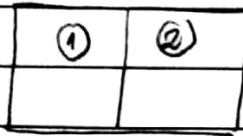
$P_{abs} = P_{atm} + P_{man}$

$P_{abs} = 100 \text{ k} + 200 \text{ k} = 300 \text{ kPa}$

$m = \frac{300 \cdot 0,6}{0,287 \cdot 293} = 2,14 \text{ kg}$

$0,287 \cdot 293$

(5)



$$m_2 = 1 \text{ kg}$$

$$P_2 = 1,2 \text{ MPa}$$

$$T_2 = 55^\circ\text{C} = 328 \text{ K}$$

$$T_f = 10^\circ\text{C} = 283 \text{ K}$$

$$P_f = 120 \text{ kPa}$$

$$V_f = ?$$

$$V_1 = 0,01 \text{ m}^3$$

$$P_1 = 0,8 \text{ MPa}$$

$$T_1 = 25^\circ\text{C} = 298 \text{ K}$$

$$R_{\text{AR}} = 0,287 \text{ kJ / kg K}$$

$$pV = mRT \Rightarrow m = \frac{pV}{RT}$$

$$m_I = m_F \Rightarrow m_1 + m_2 = m_F$$

$$\frac{P_1 V_1}{R T_1} + m_2 = \frac{P_f V_f}{R T_f}$$

$$V_f = \left(\frac{P_1 V_1}{R T_1} + m_2 \right) \frac{R T_f}{P_f}$$

$$V_f = \left(\frac{P_1 V_1}{T_1} + m_2 R \right) \frac{T_f}{P_f}$$

$$V_f = 0,74 \text{ m}^3$$

(6)

$$m = 1,5 \text{ kg} \rightarrow \text{CO}_2$$

$$V = 0,05 \text{ m}^3$$

$$R_{\text{CO}_2} = 0,1889 \text{ kJ}$$

$$\text{kg K}$$

$$t_0 = -20^\circ\text{C} \quad t_f = 90^\circ\text{C}$$

$$t_0 = -20^\circ\text{C} \rightarrow 253 \text{ K}$$

$$t_f = 90^\circ\text{C} \rightarrow 363 \text{ K}$$

$$P_f \cdot 0,05 = 1,5 \cdot 0,1889 \cdot 363$$

$$P_0 = ?$$

$$P_f = 2058 \text{ kPa}$$

$$P_f = ?$$

$$pV = mRT$$

$$P_0 \cdot 0,05 = 1,5 \cdot 0,1889 \cdot 253$$

$$P_0 = 1434 \text{ kPa}$$

7) $V_1 = 1 \text{ m}^3$

$t_1 = 25^\circ\text{C} + 273 = 298 \text{ K}$	}	$m_2 = 5 \text{ kg}$	}	$t_f = 20^\circ\text{C} + 273 = 293 \text{ K}$
$P_1 = 500 \text{ kPa}$		$t_2 = 35^\circ\text{C} + 273 = 308 \text{ K}$		$V_2 = ?$
$P_1 V_1 = m_1 R T_1$		$P_2 = 200 \text{ kPa}$		$P_f = ?$
$m_1 = \frac{P_1 V_1}{R T_1}$				$R_{\text{ar}} = 0,287 \frac{\text{kJ}}{\text{kg K}}$
$m_1 = \frac{500 \text{ k} \cdot 1}{287 \cdot 298} = 5,846 \text{ kg}$				

$$P_2 V_2 = m_2 R T_2$$

$$V_2 = \frac{m_2 R T_2}{P_2} = \frac{5 \cdot 287 \cdot 308}{200 \text{ k}} = 2,21 \text{ m}^3$$

$$m_F = m_1 + m_2 = 5 + 5,846 = 10,846 \text{ kg}$$

$$V_F = V_1 + V_2 = 1 + 2,21 = 3,21 \text{ m}^3$$

$$P_F V_F = m_F R T_F$$

$$P_F = \frac{10,846 \cdot 287 \cdot 293}{3,21}$$

$$P_F = 284,1 \text{ kPa}$$

8) $V_1 = 0,70 \text{ m}^3$

$$t_1 = 30^\circ\text{C} + 273 = 303 \text{ K}$$

$$P_1 = 150 \text{ kPa}$$

$$P_2 = 200 \text{ kPa}$$

$$P_{\text{atm}} = 100 \text{ kPa}$$

$$t_1 \rho V_1 = c t_2$$

$$P_1 = 150 + 100 = 250 \text{ kPa}$$

$$P_2 = 200 + 100 = 300 \text{ kPa}$$

$$P V = m R T$$

$$m = \frac{P V}{R T}$$

$$m_1 = \frac{250 \text{ k} \cdot 0,70}{287 \cdot 303} = 2,012 \text{ kg}$$

$$m_2 = \frac{300 \text{ k} \cdot 0,70}{287 \cdot 303} = 2,415 \text{ kg}$$

$$\Delta m = 2,415 - 2,012 = 0,403 \text{ kg}$$

9) Consultando a tabela.

$$v_L = 0,001044 \text{ m}^3/\text{kg}$$

$$v_g = 0,679 \text{ m}^3/\text{kg}$$

10) $x = 7$

água + vapor 50°C $x = 45\%$

$$v_L = 0,001012 \text{ m}^3/\text{kg} \quad x = 0,45$$

$$v_g = 12,032 \text{ m}^3/\text{kg}$$

$$v = v_L + x(v_g - v_L)$$

$$v = 0,001012 + 0,45(12,032 - 0,001012)$$

$$v = 5,415 \text{ m}^3/\text{kg}$$

11) $t = ?$ → Tabela → $T = 233,9^\circ\text{C}$ ✓ TABELA.

$\sigma = ?$

$$P = 3,0 \text{ MPa}$$

$$v_L = 0,001216 \text{ m}^3/\text{kg}$$

$$x = 0,95$$

$$v_g = 0,06668 \text{ m}^3/\text{kg}$$

$$v = v_L + x(v_g - v_L)$$

$$v = 0,001216 + 0,95(0,06668 - 0,001216)$$

$$v = 0,001216 + 0,95 \cdot 0,0655$$

$$v = 0,001216 + 0,0622$$

$$v = 0,0634 \text{ m}^3$$

kg

$$12. \quad \rho = 0,05 \frac{\text{m}^3}{\text{kg}}$$

$$v = v_L + x(v_g - v_L)$$

$$0,05 = 0,001199 + x(0,7849 - 0,001199)$$

$$t = 225^\circ\text{C} \quad \left\{ \begin{array}{l} v_g = 0,7849 \\ v_L = 0,001199 \end{array} \right.$$

$$0,05 = 0,001199 + x(0,78299)$$

$$x = ?$$

$$x = 0,6313 \Rightarrow 63,13\%$$

$$13. \quad P = 500 \text{ kPa} \rightarrow 0,5 \text{ MPa} \quad t = 151,86^\circ\text{C} \quad \text{TABELA}$$

$$x = 30\% \rightarrow 0,3 \quad v_L = 0,001093 \text{ m}^3/\text{kg}$$

$$t = ? \quad v_g = 0,37490 \text{ m}^3/\text{kg}$$

$$v = ?$$

$$v = v_L + x(v_g - v_L)$$

$$v = 0,001093 + 0,30(0,37490 - 0,001093)$$

$$v = 0,001093 + 0,1121$$

$$v = 0,1132 \text{ m}^3$$

$$\text{kg}$$

LISTA 3 - FENÔMENOS - TRABALHO.

$$1) a) \quad p_0 = 200 \text{ kPa} \quad W_{1-2} = \int p \, dv$$

$$v_0 = 0,04 \text{ m}^3 \quad W_{1-2} = p \cdot \Delta v$$

$$v = 0,1 \text{ m}^3 \quad W_{1-2} = 200 \cdot \text{k} (0,1 - 0,04)$$

$$P = \text{cte} \quad W_{1-2} = 200 \cdot 0,06$$

$$W = ?$$

$$W_{1-2} = 12 \text{ kJ}$$

$$-2,30 - (-0,996)$$

$$b) \quad T = \text{cte} \quad W_{1-2} = \int_1^2 P_1 V_1 \ln \frac{v_2}{v_1} \Rightarrow 200 \text{ k} \cdot 0,04 \ln \frac{0,10}{0,04}$$

$$= 200 \text{ k} \cdot 0,04 \cdot 0,916$$

$$= 7,330,32$$

$$W_{1-2} = 7,330 \text{ kJ}$$