

Dados

$$1 \times 10^{-9} \text{m} = 1 \text{nm} \bullet 1 \text{m}^3 = 10^{-6} \text{cm} = 1000 \text{L} \bullet 1 \text{atm} = 101,3 \text{kPa} \bullet \rho_{\text{água}} = 1000 \text{kg/m}^3$$
$$\kappa_b = 1,38 \times 10^{-23} \text{J/mol} \cdot \text{K} \bullet u_{\text{massa}} = 1,66 \times 10^{-27} \text{kg} \bullet R = 8,314 \text{J/mol} \cdot \text{K}$$

$$v^{\text{som-ar}} = 343 \text{m/s} \bullet v^{\text{luz}} = c = 3,0 \times 10^8 \text{m/s}$$

$$\text{Espectro da Radiação Visível: } \lambda = [400, 700] \text{nm}$$

$$F/A = Y \Delta L/L_0$$

$$p_A + \frac{1}{2} \rho v_A^2 + \rho g y_A = \text{cte} \bullet p = p_0 + \rho g h \bullet Q = mc \Delta T \bullet Q = mL \bullet P = \epsilon \sigma A T^4$$

$$PV = N \kappa_B T = nRT$$

$$c_p - c_v = R \bullet \gamma = c_p/c_v \bullet T_a V_a^{\gamma-1} = T_b V_b^{\gamma-1} \bullet P_a V_a^{\gamma} = P_b V_b^{\gamma}$$

$$\Delta E^{\text{term}} = Q + W^{\text{sobre}} = Q - \int p dV$$

$$\eta = W^{\text{util}}/Q_Q \bullet K = Q_F/W^{\text{entrada}} \bullet \eta_{\text{Carnot}} = 1 - T_F/T_Q \bullet K_{\text{Carnot}} = T_F/(T_Q - T_F)$$

$$\lambda = \frac{1}{4\sqrt{2}\pi(N/V)r^2} \quad \epsilon_{\text{med}} = \frac{3}{2} \kappa_b T$$

$$E_{\text{term}}^{\text{gas}} = n c_v T \bullet v_{\text{rms}} = \sqrt{3 \kappa_b T/m} \bullet E_{\text{term}}^{\text{sistema}} = E_{\text{term}}^{\text{gas1}} + E_{\text{term}}^{\text{gas2}} + \dots + E_{\text{term}}^{\text{gasN}}$$

$$\text{Aproximação: } f = f_o(v^{\text{onda}} + v^{\text{obs}})/(v^{\text{onda}} - v^{\text{obs}}) \bullet \text{Afastamento: } f = f_o(v^{\text{onda}} - v^{\text{obs}})/(v^{\text{onda}} + v^{\text{obs}})$$

$$D(r,t) = 2A \cos(\Delta\Phi/2) \sin(kr - \omega t); \Delta\Phi = k\Delta r + \Delta\Phi_o$$

$$I = P/\text{área} \bullet \beta = (10 \text{dB}) \log(I/I_0) \bullet I_0 = 1,0 \times 10^{-12} \text{W/m}^2$$

$$d \sin(\theta_m) = m \lambda; m = 0, 1, 2, \dots \bullet a \sin(\theta_p) = p \lambda; p = 1, 2, 3, \dots \bullet \Delta m = 2\Delta L/\lambda; m = 0, 1, 2, \dots \bullet \theta_1 = 1,22 \lambda/D$$

$$n_1 \sin(\theta_1) = n_2 \sin(\theta_2) \bullet 1/f = 1/s + 1/s' = (n-1)(1/R_1 - 1/R_2) \bullet m = -s'/s$$

$$\text{Tubo}_{\text{aberto-aberto}}: L = m \lambda/2; m = 1, 2, 3, \dots \bullet \text{Tubo}_{\text{aberto-fechado}}: L = n \lambda/4; n = 1, 3, 5, \dots$$