FORMULÁRIO de FÍSICA (MIEEC) :

Cinemática :

$$v_x = \frac{dx}{dt};\ a_x = \frac{dv_x}{dt};\ \text{se}\ a_x = 0 \Rightarrow x = x_0 + v_x t;\ \text{se}\, a_x = c^{te} \Rightarrow x = x_0 + v_{x0} t + \frac{1}{2} a_x t^2$$

$$\vec{r} = x\hat{\mathbf{i}} + y\hat{\mathbf{j}} + z\hat{\mathbf{k}}\ ;\ \vec{v} = \frac{d\vec{r}}{dt} = v_x\hat{\mathbf{i}} + v_y\hat{\mathbf{j}} + v_z\hat{\mathbf{k}} = v\hat{\mathbf{t}}\ ;\ \vec{a} = \frac{d\vec{v}}{dt}\ ;\ a_t = \frac{dv}{dt}\ ;\ a_n = \frac{v^2}{R}$$

$$\vec{v}_{P/O} = \vec{v}_{P/O'} + \vec{v}_{O'/O}$$

Dinâmica :

$$\vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}\quad ;\quad \vec{p} = m\vec{v}\quad ;\quad \text{se}\quad \vec{F} = 0 \Rightarrow \vec{p} = \vec{C}^{te}\quad ;\quad \vec{I} = \int_{t_i}^{t_f} \vec{F} dt = \Delta\vec{p}$$

$$\vec{M} = \vec{r} \wedge \vec{F}\quad ;\quad \vec{L} = \vec{r} \wedge \vec{p}\quad ;\quad \vec{M} = \frac{d\vec{L}}{dt}\quad ;\quad \text{se}\quad \vec{M} = 0 \Rightarrow \vec{L} = \vec{c}^{te}$$

$$F_{a,est} \le \mu_e N\quad ;\quad F_{a,cin} = \mu_c N\quad ;\quad \vec{F}_{ext} = M\frac{d\vec{v}}{dt} - \vec{v}_{rel}\frac{dM}{dt}$$

Trabalho e energia :

$$W = \int_{\vec{r}_i}^{\vec{r}_f} \vec{F} \cdot d\vec{l} = \Delta E_C\quad ;\quad E_C = \frac{1}{2} mv^2\quad ;\quad P = \frac{dW}{dt} = \vec{F} \cdot \vec{v}$$

$$F_x = -\frac{dE_P}{dx}\quad ;\quad E_{P,g} = mgh\quad ;\quad E_{P,e} = \frac{1}{2} kx^2$$

Sistemas de partículas, corpo rígido e rotação :

$$\vec{R}_{CM} = \frac{\sum_i m_i \vec{r}_i}{M}\ ;\ \vec{R}_{CM} = \frac{1}{M}\int_m \vec{r} dm\ ;\ M = \sum_i m_i\ ;\ M = \int_m dm\ ;\ \vec{V}_{CM} = \frac{d\vec{R}_{CM}}{dt}$$

$$\vec{F}_{ext} = M\vec{A}_{CM} = M\frac{d\vec{V}_{CM}}{dt}\ ;\ \vec{p} = \sum_i m_i \vec{v}_i = M\vec{V}_{CM}\ ;\ \vec{L} = \sum_i m_i \vec{r}_i \wedge \vec{v}_i$$

$$\omega = \frac{d\theta}{dt}\quad ;\quad \alpha = \frac{d\omega}{dt}\quad ;\quad v = \omega r\quad ;\quad a_t = \alpha r\quad ;\quad a_n = \omega^2 r$$

$$I = \sum_i m_i r_i^2\quad ;\quad I = \int_m r^2 dm\quad ;\quad I = I_{CM} + md^2\quad ;\quad I_z = I_x + I_y$$

$$L = I\omega\quad ;\quad M = I\alpha\quad ;\quad v_{CM} = \omega R\quad ;\quad a_{CM} = \alpha R\quad ;\quad E_{C,rot} = \frac{1}{2} I\omega^2;$$

$$E_C = \frac{1}{2} M V_{CM}^{\ 2} + \frac{1}{2} I_{CM}\omega^2$$

Termodinâmica :

$$R = N_A k_B = 8{,}314\ J/(mol \cdot K)\ ;\ N_A = 6{,}023 \times 10^{23}\ ;\ k_B = 1{,}381 \times 10^{-23}\ J/K$$

$$PV = nRT = Nk_B T \quad ; \quad n = \frac{M}{M_O} = \frac{N}{N_A} \quad ; \quad P = n_V k_B T \quad ; \quad n_V = \frac{N}{V}$$

$$c_P = \frac{1}{n}\left(\frac{\Delta Q}{\Delta \mathrm{T}}\right)_P \quad ; \quad c_V = \frac{1}{n}\left(\frac{\Delta Q}{\Delta \mathrm{T}}\right)_V \quad ; \quad c_P - c_V = R$$

$$PV^{\gamma} = cons. \quad ; \quad TV^{\gamma-1} = const. \quad ; \quad \gamma = \frac{c_P}{c_V}$$

$$\Delta U = Q_{ent} + W_{viz} \quad ; \quad W_{viz} = -W = -\int_{V_i}^{V_f} PdV \quad ; \quad \eta = \frac{W}{Q_{ent}} = 1 - \frac{|Q_{sai}|}{Q_{ent}}$$

Teoria cinética :

$$\langle v \rangle = \sqrt{\frac{8k_B T}{\pi m}} \quad ; \quad v_{mp} = \sqrt{\frac{2k_B T}{m}} \quad ; \quad v_{rms} = \sqrt{\langle v^2 \rangle} = \sqrt{\frac{3k_B \mathrm{T}}{m}}$$

$$P = \frac{1}{3} n_V m \langle v^2 \rangle \quad ; \quad \left\langle \frac{1}{2} m {v_x}^2 \right\rangle = \frac{1}{2} k_B T \quad ; \quad \langle E_c \rangle = \frac{3}{2} k_B T$$

$$\lambda = \frac{1}{n_V \pi d^2} \quad ; \quad f(v) = \frac{4}{\sqrt{\pi}} \left(\frac{m}{2k_B T}\right)^{3/2} v^2 \exp\left(-\frac{mv^2}{2k_B T}\right)$$

Condução do calor :

$$I = \frac{\Delta Q}{\Delta t} = kS \frac{\Delta \mathrm{T}}{\Delta x} \quad ; \quad R = \frac{\Delta x}{kS}$$