



FÓRMULAS

Asist.: Ilán Gómez

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**–MECÁNICA–
 Cinemática (1D):
 traslación uniforme**

$$a(t) = ctte. \quad (1a)$$

$$v(t) = v_i + a \Delta t \quad (1b)$$

$$s(t) = s_i + v_i \Delta t + \frac{1}{2} a (\Delta t)^2 \quad (1c)$$

**Cinemática (1D):
 rotación uniforme**

$$\alpha(t) = ctte. \quad (2a)$$

$$\omega(t) = \omega_i + \alpha \Delta t \quad (2b)$$

$$\theta(t) = \theta_i + \omega_i \Delta t + \frac{1}{2} \alpha (\Delta t)^2 \quad (2c)$$

$$s = R \theta \quad (3a)$$

$$v = R \omega \quad (3b)$$

$$a_t = R \alpha \quad (3c)$$

$$a_n = \frac{v^2}{R} \quad (3d)$$

**Cinemática (1D):
 movimiento armónico simple**

$$s(t) = A \sin(\omega_0 * t + \phi) \quad (4a)$$

$$v(t) = \omega_0 A \cos(\omega_0 * t + \phi) \quad (4b)$$

$$a(t) = -\omega_0^2 A \sin(\omega_0 * t + \phi) \quad (4c)$$

Frecuencia (angular) natural:

$$\omega_o = \sqrt{\frac{k_e}{m}} \quad (5a)$$

$$\omega_o = \sqrt{\frac{g}{l}} \quad (5b)$$

Cantidad de movimiento lineal:

$$\vec{p} = m \vec{v} \quad (6)$$

Impulso:

$$\vec{I} = \Delta \vec{p} = \vec{p}_f - \vec{p}_i \quad (7)$$

Momento de inercia: (ver tabla)

$$I \propto m r^2 \quad (8)$$

Cantidad de movimiento angular:

$$\vec{L} = I \vec{\omega} \quad (9)$$

Torque:

$$\vec{\mathbb{T}} = \vec{r} \times \vec{F} \quad (10a)$$

$$\mathbb{T} = r F \sin \theta \quad (10b)$$

2da. Ley de Newton:

$$\sum_j \vec{F}_j = \frac{d\vec{p}}{dt} \xrightarrow{m=ctte.} \sum_j \vec{F}_j = m\vec{a} \quad (11)$$

$$\sum_j \vec{\mathbb{T}}_j = \frac{d\vec{L}}{dt} \xrightarrow{m=ctte.} \sum_j \vec{\mathbb{T}}_j = I\vec{\alpha} \quad (12)$$

Fuerzas:

$$\vec{F}_g = m g \hat{y} \quad (13a)$$

$$\vec{F}_G = G \frac{M m}{d^2} \hat{r} \quad (13b)$$

$$\vec{F}_E = K_E \frac{Q q}{d^2} \hat{r} \quad (13c)$$

$$\vec{F}_B = q\vec{v} \times \vec{B} \quad (13d)$$

$$\vec{F}_e = -k_e (r - r_N) \hat{r} \quad (13e)$$

$$F_{\mu D} = \mu_D N \quad (13f)$$

$$F_{\mu E}^{(MAX)} = \mu_E N \quad (13g)$$

Trabajo:

$$W = F d \cos \theta \quad (14)$$

Potencia:

$$\mathbb{P} = \frac{W}{\Delta t} \quad (15)$$

Energía cinética:

$$E_c = \frac{1}{2} m v^2 \quad (16a)$$

$$E_c = \frac{1}{2} I \omega^2 \quad (16b)$$



Energía potencial:

$$E_{pg} = m g h \quad (17a)$$

$$E_{pG} = -G \frac{M m}{d} \quad (17b)$$

$$E_{pE} = K_E \frac{Q q}{d} \quad (17c)$$

$$E_{pe} = \frac{1}{2} k_e (r - r_N)^2 \quad (17d)$$

Energía mecánica:

$$E_M = E_c + E_p \quad (18)$$

Variación de las energías:

$$\Delta E_M = W_{NC} \quad (19a)$$

$$\Delta E_C = W_{Tot} \quad (19b)$$

$$\Delta E_P = -W_C \quad (19c)$$

-ONDAS-

Frecuencia:

$$f = \frac{\omega_0}{2\pi} \quad (20)$$

Periodo:

$$\tau = \frac{1}{f} \quad (21)$$

Rapidez de onda:

$$v = \frac{\lambda}{\tau} \quad (22)$$

Efecto Doppler:

$$f_R = \left(\frac{v + v_R}{v + v_F} \right) f_F \quad (23)$$

Experimento de Young

$$d \sin \theta = m \frac{\lambda}{2} \quad (24)$$

-FLUIDOS-

Densidad:

$$\rho = \frac{m}{V} \quad (25)$$

Fuerza empuje:

$$\varepsilon = \rho_L V_s g \quad (26)$$

Caudal:

$$C = A v \quad (27)$$

Ec. de continuidad:

$$\rho_1 A_1 v_1 = \rho_2 A_2 v_2 \quad (28)$$

Ec. de Bernoulli

$$P_1 + \frac{1}{2} \rho_1 v_1^2 + \rho_1 g h_1 = P_2 + \frac{1}{2} \rho_2 v_2^2 + \rho_2 g h_2 \quad (29)$$

-TERMOESTÁTICA-

Escala de temperatura:

$$T_C = \frac{5}{9} (T_F - 32^\circ) \quad (30a)$$

$$T_K = T_C + 273,15 \quad (30b)$$

Expansión térmica:

$$\Delta L = \alpha L_i \Delta T \quad (31a)$$

$$\Delta V = \beta V_i \Delta T \quad (31b)$$

$$\beta = 3 \alpha \quad (31c)$$

Calor:

$$Q = c m \Delta T \quad (32a)$$

$$Q = \pm L m \quad (32b)$$

Transferencia de calor media:

$$\frac{\Delta Q}{\Delta t} = k_Q A \frac{\Delta T}{\Delta l} \quad (33a)$$

$$\frac{\Delta Q}{\Delta t} = A e \sigma_{SB} (T_{in}^4 - T_{out}^4) \quad (33b)$$

$$\sigma_{SB} = 5,670400(40) \times 10^{-8} \frac{W}{m^2 K^4}$$

Gas ideal:

$$P V = n R T \quad (34a)$$

$$E_c = \frac{3}{2} k_B T \quad (34b)$$

$$U = \frac{3}{2} n R T \quad (34c)$$

$$C_P = C_V + R \quad (34d)$$

$$\gamma = C_P / C_V \quad (34e)$$

$$P V^\gamma = \text{cte. (adiabático)} \quad (34f)$$

$$R = 8,314472(15) \frac{J}{mol K}$$

$$R = 0,08206 \frac{L atm}{mol K}$$

$$k_B = 1,3806503(24) \times 10^{-23} J/K$$

1ra. Ley de la Termodinámica

$$\Delta U = Q - W \quad (35)$$

–ELECTRICIDAD–

$$q = ne \quad (36a)$$

$$\vec{E} = \frac{\vec{F}_E}{q} \quad (36b)$$

$$V = \frac{E_p E}{q} \quad (36c)$$

$$I = \frac{q}{t} \quad (36d)$$

$$V = IR \quad (36e)$$

$$R = \rho_R \frac{L}{A} \quad (36f)$$

$$\Delta\rho_R = \rho_{Ri} \alpha \Delta T \quad (36g)$$

–Optica–

Índice de refracción:

$$c = nv \quad (37)$$

Ley de reflexión:

$$\theta_i = \theta_R \quad (38)$$

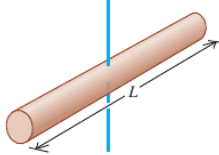
Ley de refracción (Snell):

$$n_i \sin \theta_i = n_T \sin \theta_T \quad (39)$$

Momentos de inercia de diversos cuerpos

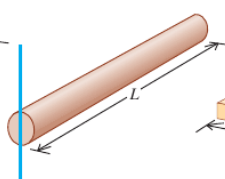
a) Varilla delgada, eje por el centro

$$I = \frac{1}{12} ML^2$$



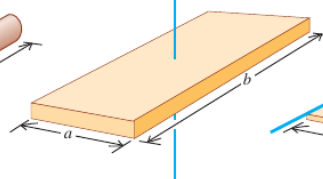
b) Varilla delgada, eje por un extremo

$$I = \frac{1}{3} ML^2$$



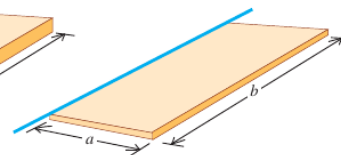
c) Placa rectangular, eje por el centro

$$I = \frac{1}{12} M(a^2 + b^2)$$



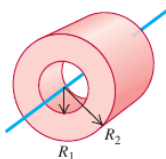
d) Placa rectangular delgada, eje en un borde

$$I = \frac{1}{3} Ma^2$$



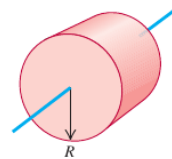
e) Cilindro hueco

$$I = \frac{1}{2} M(R_1^2 + R_2^2)$$



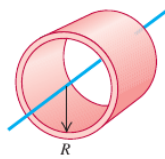
f) Cilindro sólido

$$I = \frac{1}{2} MR^2$$



g) Cilindro hueco de pared delgada

$$I = MR^2$$



h) Esfera sólida

$$I = \frac{2}{5} MR^2$$



i) Esfera hueca de pared delgada

$$I = \frac{2}{3} MR^2$$

