

## Formulas and Constants Test 3

$$g = 9.8 \text{ m/s}^2 \quad \rho_{\text{water}} = 1000 \text{ kg/m}^3 \quad \rho_{\text{air}} = 1.29 \text{ kg/m}^3 \quad P_{\text{atm}} = 1.013 \times 10^5 \text{ Pa} \quad \text{Pa} = \text{N/m}^2$$

$$C_{\text{circle}} = 2\pi R \quad A_{\text{disk}} = \pi R^2 \quad V_{\text{sphere}} = \frac{4}{3}\pi R^3$$

$$\theta = \frac{s}{r} \quad \bar{\omega} = \frac{\Delta\theta}{\Delta t} \quad \bar{\alpha} = \frac{\Delta\omega}{\Delta t} \quad \omega = \omega_0 + \alpha t \quad \Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2 \quad \omega^2 = \omega_0^2 + 2\alpha\Delta\theta$$

$$v_{\text{linear}} = v_T = r\omega \quad a_{\text{linear}} = a_T = r\alpha \quad a_c = r\omega^2 \quad a_{\text{total}} = \sqrt{a_T^2 + a_c^2}$$

$$I_{\text{point}} = mr^2 \quad I_{\text{rod,axis at center}} = \frac{1}{12}ML^2 \quad I_{\text{sphere,axis at center}} = \frac{2}{5}MR^2 \quad I_{\text{system}} = I_1 + I_2 + \dots$$

$$\text{torque} = \tau = F\ell \sin\theta = F\ell_{\perp} \quad \tau_{\text{net}} = I\alpha \quad \text{KE}_{\text{rot}} = \frac{1}{2}I\omega^2$$

$$L = I\omega \quad \tau_{\text{ext}} = \frac{\Delta L}{\Delta t} \quad \text{equilibrium: } \sum F = 0 \quad \text{and} \quad \sum \tau = 0$$

$$F = -kx \quad f = \frac{1}{T} \quad \omega = 2\pi f = \frac{2\pi}{T} \quad \mathbf{F} = m\mathbf{a}$$

$$x(t) = A \cos(\omega t) \quad v_{\text{max}} = A\omega \quad a_{\text{max}} = A\omega^2 \quad \omega = \sqrt{\frac{k}{m}}$$

$$\text{PE}_{\text{spring}} = \frac{1}{2}kx^2 \quad E_{\text{tot}} = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2 + mgh + \frac{1}{2}kx^2$$

$$\omega_{\text{simple pend}} = 2\pi f = \sqrt{\frac{g}{L}} \quad \omega_{\text{phys pend}} = 2\pi f = \sqrt{\frac{mgL}{I}}$$

$$\rho = \frac{m}{V} \quad P = \frac{F}{A} \quad P_2 = P_1 + mgh \quad F_B = W_{\text{displaced fluid}}$$

$$\text{mass flow rate} = \rho Av \quad \rho_1 A_1 v_1 = \rho_2 A_2 v_2 \quad (\text{if incompressible}) : A_1 v_1 = A_2 v_2$$

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2$$

$$\text{Conservation of Angular Momentum: } I_i = I_f$$