

You may detach this formula sheet from the test. It does not need to be handed in.

University Physics I and IA: Equation Sheet for Tests and Final

Equations

$$\bar{v} = \frac{d\bar{x}}{dt}$$

$$\bar{a} = \frac{d\bar{v}}{dt}$$

$$v_x = v_{ox} + a_x t$$

$$x = x_o + v_{ox} t + \frac{1}{2} a_x t^2$$

$$v_x^2 = v_{ox}^2 + 2a_x (x - x_o)$$

$$x = x_o + \frac{1}{2}(v_{ox} + v_x) t$$

$$a_{centripetal} = \frac{v^2}{r} \quad \sum \vec{F} = m\bar{a} = \frac{d\vec{p}}{dt}$$

$$f_k = \mu_k |\vec{n}| \quad f_s \leq \mu_s |\vec{n}|$$

$$W = \int \vec{F} \cdot d\vec{r} = \int F dr \cos(\theta) = \int F_x dx + \int F_y dy + \int F_z dz$$

$$F_x = -\frac{dU}{dx}$$

$$U_{spring} = \frac{1}{2} kx^2$$

$$U_{grav} = mgh$$

$$P = \frac{dW}{dt} = \vec{F} \cdot \vec{v}$$

$$E_{mech,f} = E_{mech,i} + W_{non-cons}$$

$$E_{mech} = U_{grav} + U_{spring} + K$$

$$K_i + U_{gi} + U_{el,i} = K_f + U_{gf} + U_{el,f} + \Delta U_{int}$$

Math

$$\vec{A} \cdot \vec{B} = |\vec{A}| |\vec{B}| \cos(\theta) = A_x B_x + A_y B_y + A_z B_z$$

$$\int x^m dx = \frac{x^{m+1}}{m+1} + C \quad (m \neq -1)$$

$$\frac{dx^m}{dx} = mx^{m-1}$$

$$\text{If } ax^2 + bx + c = 0$$

$$\text{Then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

$$= (A_y B_z - A_z B_y) \hat{i} + (A_z B_x - A_x B_z) \hat{j} + (A_x B_y - A_y B_x) \hat{k}$$

$$|\vec{A} \times \vec{B}| = |\vec{A}| |\vec{B}| \sin \theta$$

$$K = \frac{1}{2} mv^2$$

$$W_{net} = K_f - K_i$$

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$$\bar{p} = m\bar{v} \quad \bar{J} = \int \bar{F} dt = \bar{F}_{av} \Delta t = \Delta \bar{p} \quad I = \sum_i m_i r_i^2 = \int r^2 dm \quad I = I_{cm} + Md^2$$

$$\bar{\omega} = \frac{d\bar{\theta}}{dt} \quad \bar{\alpha} = \frac{d\bar{\omega}}{dt} \quad \bar{\tau} = \bar{r} \times \bar{F} \quad \bar{l} = \bar{r} \times \bar{p} \quad L_z = I\omega_z$$

$$\omega = \omega_o + \alpha t \quad s = r\theta \quad \sum \bar{\tau} = I\bar{\alpha} = \frac{d\bar{L}}{dt} \quad \bar{r}_{cm} = \frac{\sum m_i \bar{r}_i}{\sum m_i} = \frac{\int \bar{r} dm}{M}$$

$$\theta = \theta_o + \omega_o t + \frac{1}{2} \alpha t^2 \quad v_i = r\omega \quad W = \int_{\theta_1}^{\theta_2} \bar{\tau} \cdot d\bar{\theta} \quad P = \bar{\tau} \cdot \bar{\omega}$$

$$\omega^2 = \omega_o^2 + 2\alpha(\theta - \theta_o) \quad a_t = r\alpha \quad K_{rot} = \frac{1}{2} I\omega^2 \quad K_{tot} = \frac{1}{2} mv_{axis}^2 + \frac{1}{2} I\omega_{axis}^2$$

$$\theta = \theta_o + \frac{1}{2}(\omega_o + \omega)t \quad a_{centripetal} = r\omega^2$$

$$x(t) = A \cos(\omega t + \phi) \quad \omega = \frac{2\pi}{T} = 2\pi f \quad \frac{d^2 x}{dt^2} = -\omega^2 x \quad T = 2\pi \sqrt{\frac{m}{k}} \quad T = 2\pi \sqrt{\frac{I}{mgd}}$$

$$\frac{\partial^2 y(x,t)}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 y(x,t)}{\partial t^2} \quad y(x,t) = A \cos(kx \pm \omega t + \phi) \quad k = \frac{2\pi}{\lambda} \quad v = \lambda f = \frac{\omega}{k}$$

$$v = \sqrt{\frac{F_T}{\mu}} \quad v = \sqrt{\frac{B}{\rho}} \quad \frac{F_{\perp}}{A} = Y \frac{\Delta l}{l_o} \quad I = \frac{P}{4\pi r^2} \quad y_{sw}(x,t) = A_{sw} \sin(kx) \sin(\omega t)$$

$$\beta = (10dB) \text{Log}_{10} \left(\frac{I}{I_o} \right) \quad I_o = 10^{-12} \text{ W / m}^2 \quad f_L = f_s \left(\frac{v \pm v_L}{v \pm v_s} \right) \quad f_{beat} = |f_1 - f_2|$$

$$|\bar{F}_{grav}| = G \frac{m_1 m_2}{r^2} \quad U_{grav} = -G \frac{m_1 m_2}{r} \quad G = 6.674 \times 10^{-11} \text{ N} \cdot \text{m}^2 / \text{kg}^2 \quad g = 9.80 \text{ m / s}^2$$

Speed of Sound = 343 m/s