PHYS 124, LEC A01 : Particles and Waves
Instructor : Marc de Montigny
Final Examination, December 18, 2007

Formula Sheet

Name: _____
Student ID: _____

Add your formulas on both sides. You will lose 10 marks (out of 50) if :

1. **full solutions are included, or**
2. **if this sheet is not returned with your examination.**

$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \quad \cos\theta = \frac{\text{adj}}{\text{hyp}} \quad \tan\theta = \frac{\text{opp}}{\text{adj}} \qquad v = \frac{2\pi r}{T} \quad a_{CP} = \frac{v^2}{r} = \omega^2 r$$

$$f_K = \mu_K N \qquad f_S \le \mu_S N \qquad W = Fd\cos\theta \qquad K = \frac{1}{2}mv^2 \qquad \Delta K = W_{\text{net}}$$

$$E = K + U \quad \Delta E = \Delta K + \Delta U = W_{NC} \qquad U_{\text{grav}} = mgy\left(g = 9.81\,\text{m/s}^2\right) \quad U_{\text{spring}} = \frac{1}{2}kx^2$$

$$K_{\text{rot}} = \frac{1}{2}I\omega^2 \qquad I = \sum m_i r_i^{\,2} \qquad I_{\text{pulley}} = \frac{1}{2}MR^2$$

$$\theta = \frac{s}{r} \qquad v_T = \omega r \qquad a_T = \alpha r \qquad 180° = \pi \text{ radians}$$

$$\vec{I} = \Delta\vec{p} = \vec{F}\Delta t \qquad \vec{p} = m\vec{v} \qquad x_{CM} = \frac{m_1 x_1 + \cdots m_N x_N}{m_1 + \cdots m_N}$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2 \qquad \omega = \omega_0 + \alpha t \qquad \omega^2 = \omega_0^{\,2} + 2\alpha\left(\theta - \theta_0\right)$$

$$\tau = rF\sin\theta = F_\perp r = Fr_\perp \qquad \sum\tau = I\alpha \quad \sum F_x = 0 \quad \sum F_y = 0 \quad \sum\tau = 0 \quad L = I\omega \quad L_i = L_f$$

$$F = -kx \qquad E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2 = \frac{1}{2}mv_{\max}^{\,2} = \frac{1}{2}kA^2$$

$$x = A\cos(\omega t) \quad v = -\omega A\sin(\omega t) \quad a = -\omega^2 A\cos(\omega t) \qquad \omega = \sqrt{k/m} \quad \omega = \sqrt{g/L}$$

$$v = \lambda f \quad f = \frac{1}{T} \quad \omega = 2\pi f = \frac{2\pi}{T} \qquad v = \sqrt{\frac{F}{\mu}} \quad \mu = \frac{m}{L} \qquad I = \frac{P}{A} \quad I = \frac{P}{4\pi r^2}$$

$$f_n = nf_1 \quad f_1 = \frac{v}{2L} \quad f_1 = \frac{v}{4L} \qquad \tan\theta = \frac{y}{L}$$

$$\Delta d = m\lambda \quad \Delta d = \left(m + \frac{1}{2}\right)\lambda \qquad d\sin\theta = m\lambda \quad d\sin\theta = \left(m + \frac{1}{2}\right)\lambda \quad W\sin\theta = m\lambda$$

$$E = hf \qquad E_n = nhf \quad h = 6.626\times10^{-34}\,\text{J}\cdot\text{s} \quad f_0 = \frac{W_0}{h} \quad K_{\max} = hf - W_0$$

$$\lambda = \frac{h}{p} \qquad 2d\sin\theta = m\lambda$$