Name ______________________________ Section __________

Physics 1210 Final Exam

May 2011 v2.0

This test is closed-note and closed-book. No written, printed, or recorded material is permitted. Calculators are permitted but computers are not. No collaboration, consultation, or communication with other people (other than the administrator) is allowed by any means, including but not limited to verbal, written, or electronic methods. Sharing of calculators is prohibited. If you have a question about the test, please raise your hand. For multiple choice, you may choose two answers, and if one is correct, receive half credit, etc. For full credit on written problems, show the full thought process from basic equations to final results.

$$V_{avg}=\frac{x_2-x_1}{t_2-t_1}=\frac{\Delta x}{\Delta t} \quad a_{avg}=\frac{v_2-v_1}{t_2-t_1}=\frac{\Delta v}{\Delta t} \quad a_{rad}=\frac{v^2}{R}=\frac{4\pi^2 R}{T^2}$$

$$x_1=x_0+v_0 t+\frac{1}{2}at^2 \quad v_1=v_0+at \quad v_1^2=v_0^2+2a(x_1-x_0)$$

$$\rho_{water}=1000\,kg/m^3 \quad V_{sphere}=\frac{4}{3}\pi R^3$$

$$\rho_{ice}=920\,kg/m^3 \quad V_{cylinder}=Area\times Length$$

$$2.2\,lbs=1\,kg \quad 1\,Calorie=4200\,J$$

$$1\,mi=5280\,ft=1709\,m$$

$$x_{quadratic}=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Work/Energy $\Sigma\bar{F}=m\bar{a} \quad F_{spring}=-kx \quad F_f=\mu F_n$

$$W=\bar{F}\cdot\bar{s} \quad W=\Delta K \quad U_s=\frac{1}{2}kx^2 \quad U_g=mgy \quad P=\frac{\Delta W}{\Delta t}=Fv \quad W_{grav}=-\Delta U \quad F=-\frac{dU}{dx}$$

Momentum/Impulse

$$p=mv \quad J=\Delta(mv)=Ft \quad X_{cm}=\frac{\Sigma m_i x_i}{\Sigma m_i}$$

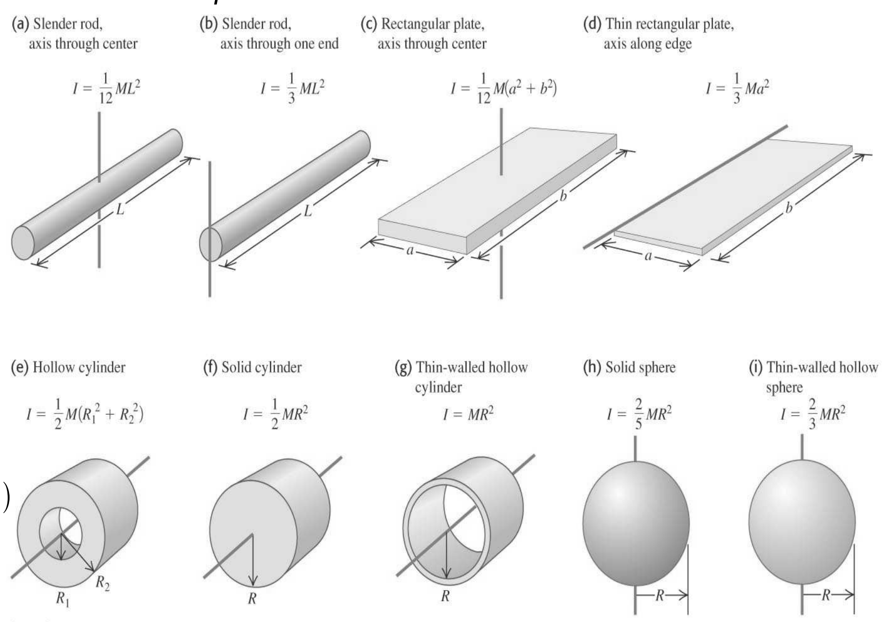
Angular Motion

$$Power_{rot}=\tau\omega \quad \theta_1=\theta_0+\omega_0 t+\frac{1}{2}\alpha t^2 \quad \omega_1=\omega_0+\alpha t \quad \omega_1^2=\omega_0^2+2\alpha(\theta_1-\theta_0)$$

$$\omega=\frac{d\theta}{dt} \quad \alpha=\frac{d\omega}{dt} \quad s=r\theta \quad v=r\omega \quad a_{tan}=r\alpha \quad a_{rad}=\omega^2 r$$

$$\Sigma\bar{\tau}=I\bar{\alpha} \quad I=\Sigma_i m_i r_i^2 \quad I_{parallel}=I_{cm}+Md^2 \quad \bar{\tau}=\bar{r}\times\bar{F}=rF\sin\phi \quad W=\Delta K=\tau\Delta\theta$$

$$K_{rot}=\frac{1}{2}I\omega^2 \quad K_{total}=\frac{1}{2}mv_{cm}^2+\frac{1}{2}I_{cm}\omega^2$$



Gravity: $G=6.67\times10^{-11}\ N\ m^2/kg^2$

$$\bar{L}=\bar{r}\times\bar{p}=rmv=I\omega \quad \Delta L=\tau\Delta t$$

$$F_g=\frac{GM_1M_2}{r^2} \quad U_g=\frac{-GM_1M_2}{r} \quad P^2=\frac{4\pi^2a^3}{GM}$$

Periodic Motion

$$f=\frac{1}{T} \quad \omega=2\pi f \quad \omega=\sqrt{\frac{k}{m}} \quad pendulum: \omega=\sqrt{\frac{g}{l}}$$

$$x=A\cos(\omega t+\phi)$$

$$\omega_{physical\ pendulum}=\sqrt{\frac{gdm}{I}} \quad v=-\omega A\sin(\omega t+\phi)$$

$$a=-\omega^2 A\cos(\omega t+\phi)$$

$$damped\ motion: x=A e^{(-b/2m)} t\cos(\omega' t)$$

$$\omega'=\sqrt{\frac{k}{m}-\frac{b^2}{4m^2}}$$

Fluids $P=\frac{dF}{dA} \quad p_2-p_1=-\rho g(y_2-y_1) \quad \rho_1 A_1 v_1=\rho_2 A_2 v_2 \quad p_1+\rho g y_1+1/2\rho v_1^2=p_2+\rho g y_2+1/2\rho v_2^2$

Mechanical Waves $v=\lambda f \quad y(x,t)=A\cos(kx-\omega t) \quad k=2\pi/\lambda \quad \omega=2\pi f=vk \quad v_{wave\ onstring}=\sqrt{F/\mu}$

$$f_{fundamental}=\frac{1}{2L}\sqrt{\frac{F}{\mu}} \quad f_n=n\frac{v}{2L}=nf_1 \quad (n=1,2,3,\ldots) \quad \frac{I_1^2}{I_2^2}=\frac{r_2^2}{r_1^2} \quad I=\frac{P}{4\pi r^2}$$

Sound

$$pressure_{max}=BkA \quad v_{longitudnal}=\sqrt{\frac{B}{\rho}} \quad v_{ideal\ gas}=\sqrt{\frac{\gamma RT}{M}} \quad v_{solid\ rod}=\sqrt{\frac{Y}{\rho}} \quad I_{sound\ intensity}=\frac{P_{max}^2}{2\rho v}$$

$$B_{sound\ intensity}=(10\,dB)\log\frac{I}{I_0} \quad f_{n(open\ pipe)}=\frac{nv}{4L} \quad f_{n(closed\ pipe)}=\frac{nv}{4L} \quad f_{beat}=|f_1-f_2| \quad f_L=\frac{v+v_L}{v+v_S}f_S$$