Name ____

Physics 1210 Exam 3

15 May 2019

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 or come to the front table. 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 including a diagram and basic starting equations.

1mile=5280 ft=1609 m
1 ft = 0.3048 m
2.2lbs=1 kg, 1Ton=2000 lbs
$\rho_{water} = 1000\text{kg/m}^3$

Linear Kinematics/Dynamics

$v_{\text{avg}} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t}$, $\quad a_{\text{avg}} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t}$, $\quad$ Quadratic formula $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

$a_{\text{rad}} = \frac{v^2}{R} = \frac{4\pi^2 R}{T^2}$, $\quad \sum \vec{F} = m\vec{a}$, $\quad F_s = -kx$, $\quad F_f = \mu F_N$

Work and Energy

$W_F = \vec{F} \cdot \vec{s} = Fs\cos\varphi$, $\quad W_{\text{tot}} = \Delta KE$, $\quad KE_{tot} = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$, $\quad U_g = mgh$, $\quad U_s = \frac{1}{2}kx^2$

$F = -\frac{dU}{dx}$, $\quad P = \frac{\Delta W}{\Delta t} = Fv$

Momentum

$p = mv$, $\quad x_{cm} = \frac{\sum m_i x_i}{\sum m_i}$, $\quad \vec{L} = \vec{r} \times \vec{p} = I\omega$

Angular Kinematics/Dynamics

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

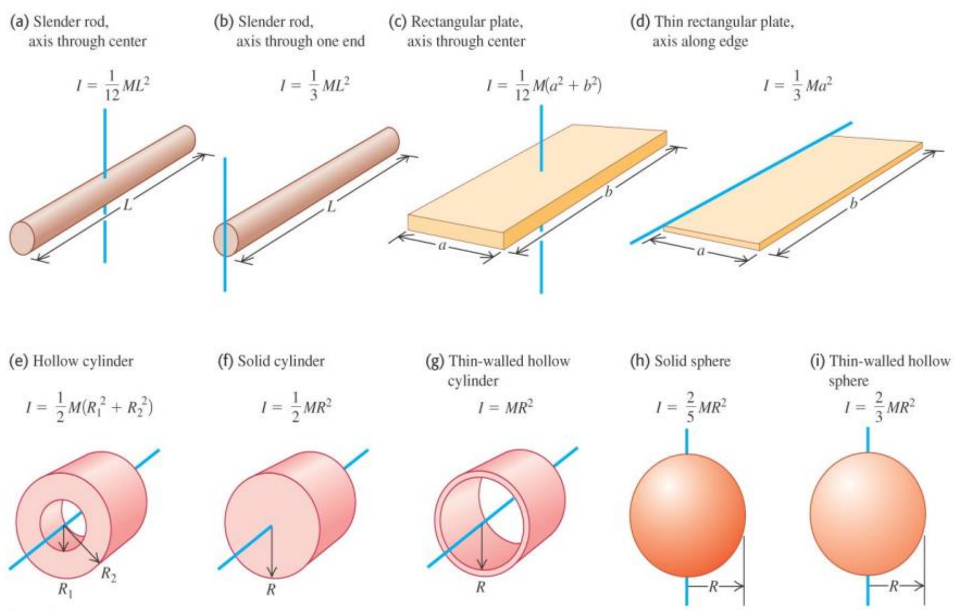
$s = R\theta$, $\quad v = R\omega$, $\quad a_{\tan} = R\alpha$, $\quad a_{\text{rad}} = \omega^2 R$, $\quad \tau = \vec{r} \times \vec{F} = rF\sin\phi$, $\quad \Sigma\vec{\tau} = I\vec{\alpha}$

$I = \sum m_i {r_i}^2$, $\quad I_{parallel} = I_{cm} + Md^2$

Gravity G=6.67× $10^{-11}\text{N m}^2/\text{kg}^2$

$$F_g = \frac{GM_1M_2}{r^2}, U_g = -\frac{GM_1M_2}{r}$$

$$P^2 = \frac{4\pi^2 a^3}{GM}$$



Periodic Motion $\omega = 2\pi f = \sqrt{\frac{k}{m}}$

$f = \frac{1}{T}$, $x = A\cos(\omega t + \phi)$,

pendulum: $\omega = \sqrt{\frac{g}{l}}$,

physical pendulum: $\omega = \sqrt{\frac{gdM}{I}}$

Damped Motion

$$x = Ae^{-bt/2m}\cos(\omega' t)$$

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

Fluids $P = \frac{F}{A}$, $\quad p_2 - p_1 = -\rho g(y_2 - y_1)$, $\quad p_1 + \rho g y_1 + .5\rho {v_1}^2 = p_2 + \rho g y_2 + .5\rho {v_2}^2$

Mechanical Waves $y(x,t) = A\cos(kx - \omega t)$, $\quad \upsilon = \lambda f$, $\quad k = \frac{2\pi}{\lambda}$, $\quad \omega = 2\pi f = \upsilon k$, $\quad$ on a string: $\upsilon = \sqrt{F/\mu}$