Physics 2305 20 March, 2000
Quiz 10—Form A

1. If rolled down a ramp from rest, which of the following would reach the bottom first?

   A) A uniform sphere
   B) A lightweight sphere with a heavy compact mass at its center
   C) A uniform cylinder
   D) A circular hoop

2. The moment of inertia of a sphere is (2/5) $m\ r^2$. If the Earth were suddenly compressed to half its current radius, by what factor would the rotational velocity at the equator increase?

   A) 1 C) 4
   B) 2 D) 8

Useful equations:

$I = \sum m_i\ r_i^{\,2}$	$\tau = \mathbf{r} \times \mathbf{F}$	$v = \omega\ r$
$K = (½)\ I\omega^2 + (½)\ mv^2$	$\mathbf{L} = \mathbf{r} \times \mathbf{p}$	$L = I\ \omega$
$\sum \tau = I\alpha = \mathrm{d}\mathbf{L}/\mathrm{d}t$	$T = 2\pi/\omega$	$\mathrm{g} = 9.8\ \mathrm{m/s^2}$

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Quiz 10—Form B

1. A solid cylinder has a moment of inertia of (½) $m\ r^2$. What is its kinetic energy when rolling?

A) (1/6) $m\ v^2$ C) (3/4) $m\ v^2$

B) (1/2) $m\ v^2$ D) $m\ v^2$

2. The moment of inertia of a sphere is (2/5) $m\ r^2$. If the Earth were suddenly compressed to half its current radius, by what factor would its period of rotation decrease?

A) 1 C) 4

B) 2 D) 8

Useful equations:

$I = \sum m_i\ r_i^2$	$\tau = \mathbf{r} \times \mathbf{F}$	$v = \omega\ r$
$K = (½)\ I\omega^2 + (½)\ mv^2$	$\mathbf{L} = \mathbf{r} \times \mathbf{p}$	$L = I\ \omega$
$\sum \tau = I\alpha = \mathrm{d}\mathbf{L}/\mathrm{d}t$	$T = 2\pi/\omega$	$\mathrm{g} = 9.8\ \mathrm{m/s^2}$

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Quiz 10—Form C

1. A solid cylinder has a moment of inertia of (½) $m\ r^2$. If it rolls down a ramp, how fast is its center of mass moving after a vertical drop of 0.50 m?

A) 2.2 m/s C) 3.1 m/s
B) 2.6 m/s D) 5.4 m/s

2. A sphere has a moment of inertia of (2/5) $m\ r^2$. If a sphere of mass 1.0 kg and radius 0.25 m is subjected to a torque of 1.0 N m, what is its angular acceleration?

A) 8.0 rad/s^2 C) 20 rad/s^2
B) 16 rad/s^2 D) 40 rad/s^2

Useful equations:

$I = \sum m_i\, r_i^2$ $\tau = \mathbf{r} \times \mathbf{F}$ $v = \omega\, r$
$K = (½)\, I\omega^2 + (½)\, mv^2$ $\mathbf{L} = \mathbf{r} \times \mathbf{p}$ $L = I\,\omega$
$\sum \tau = I\alpha = \mathrm{d}\mathbf{L}/\mathrm{d}t$ $T = 2\,\pi\,/\,\omega$ $g = 9.8$ m/s^2