Practice Test#3 (Chapters 8,9, and 10 from Tipler)

$M\vec{r}_{cm} = \sum_i m_i \vec{r}_i$; $\vec{p} = m\vec{v}$; $F_{net,ext} = \frac{d\vec{p}}{dt}$;

$K = \frac{1}{2}mv^2$; $U = mgh$; $\vec{I} = \int_i^f \vec{F}dt = \Delta\vec{P}$; $\vec{F}_{av} = \frac{\vec{I}}{\Delta t}$

$v_{2f} - v_{1f} = -(v_{2i} - v_{1i})$; *relative speed of particles in an elastic collision.*

$\omega = \frac{d\theta}{dt}$; $\alpha = \frac{d\omega}{dt}$; $v_{tt} = r_i\omega$; $a_{tt} = r_i\alpha$; $a_{ic} = \frac{v_i^2}{r_i} = r_i\omega^2$

$\omega = \omega_0 + \alpha t$; $\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$; $\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$

$\tau = \vec{r} x \vec{F} = rF\sin\phi$; $I = \sum_i mr_i^2$; $I = I_{cm} + Mh^2$

$\tau_{net,ext} = I\alpha$; $v = R\omega$; $a = R\alpha$;

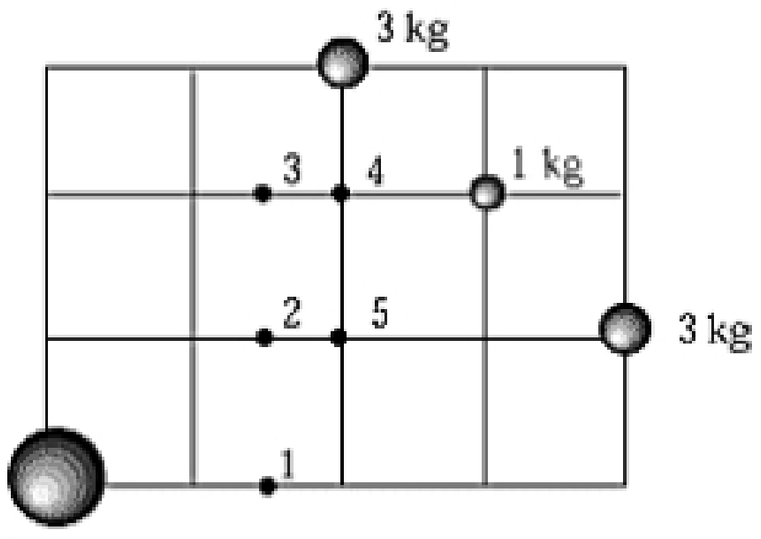
$K = \frac{1}{2}I\omega^2$; $K = \frac{1}{2}I_{cm}\omega^2 + \frac{1}{2}Mv_{cm}^2$; $v_{cm} = R\omega$

$AXB = AB\sin\phi\hat{n}$; $AXB = -BXA$;

$\hat{i} \times \hat{j} = \hat{k}$; $\hat{j} \times \hat{k} = \hat{i}$; $\hat{k} \times \hat{i} = \hat{j}$; $\hat{i} \times \hat{i} = \hat{j} \times \hat{j} = \hat{k} \times \hat{k} = 0$

$L = r \times p$; $L = I\omega$; $\vec{\tau}_{net,ext} = \frac{dL}{dt}$;

1.

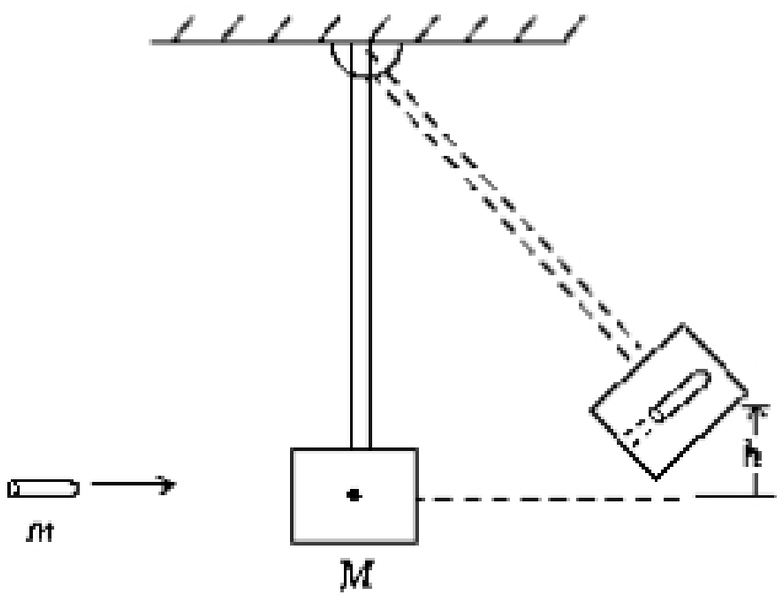


The center of mass of the system of particles shown in the diagram is at point

A) 1 B) 2 C) 3 D) 4 E) 5

2. A boy and girl on ice skates face each other. The girl has a mass of 20 kg and the boy has a mass of 30 kg. The boy pushes the girl backward at a speed of 3.0 m/s. As a result of the push, what is the speed of the ?

3.



A bullet, m = 0.500 kg, traveling with a velocity of 100 m/s strikes and embeds itself in the bob of a ballistic pendulum, M = 9.50 kg. The combined masses rise to a height h = 1.28 m. Calculate the speed V_f of the combined masses immediately following impact.

4. A pitcher throws a baseball with a velocity of 27 m/s. After being struck by a bat the ball

travels in the opposite direction with a velocity of 40 m/s. If the ball has a mass of 0.11 kg and is in contact with the bat for 3.0 ms, calculate the average force exerted by the bat on the ball.

5. A 0.060-kg tennis ball, moving with a speed of 2.5 m/s, has a head-on collision with 0.090-kg initially moving away from it at a speed of 1.00 m/s. Assuming a perfectly elastic collision, what is the speed of each ball after the collision?

6. A wheel of diameter of 68.0 cm slows down uniformly from 8.40 m/s to rest over a distance of 115 m. What is the angular acceleration?

7. What constant torque, in the absence of friction, must be applied to a wheel to give it an angular velocity of 50 rad/s if it starts from rest and is accelerated for 10 s? The moment of inertia of the wheel about its axle is 9.0 $kg \cdot m^2$.

8. The moment of inertia of a slim rod of mass m and length L about a transverse axis through one end is $mL^2/3$. Calculate the moment of inertia of such a rod about a transverse axis through the rod at a distance $L/3$ from one end.