

Suggested problems Chapter 11

The quiz questions will be same or very similar to the following text-book problems.

Refer to the course website for the latest version of this document.

You are encouraged to seek the help of your instructor during his office hours.

12. In Fig. 11-35, a solid brass ball of mass 0.320 g will roll smoothly along a loop-the-loop track when released from rest along the straight section. The circular loop has radius $R = 12.0$ cm, and the ball has radius $r \ll R$. (a) What is h if the ball is on the verge of leaving the track when it reaches the top of the loop? If the ball is released at height $h = 6.00R$, what are the (b) magnitude and (c) direction of the horizontal force component acting on the ball at point Q?

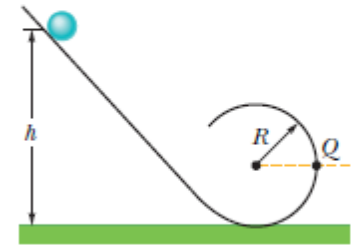


Fig. 11-35 Problem 12.

Answer: (a) 32.4 cm ; (b) 2.24×10^{-2} N; (c) The direction is toward the center of the loop

22. A particle moves through an xyz coordinate system while a force acts on the particle. When the particle has the position vector $\vec{r} = (2.00 \text{ m})\hat{i} - (3.00 \text{ m})\hat{j} + (2.00 \text{ m})\hat{k}$, the force is given by $\vec{F} = F_x\hat{i} + (7.00 \text{ N})\hat{j} - (6.00 \text{ N})\hat{k}$ and the corresponding torque about the origin is $\vec{\tau} = (4.00 \text{ N} \cdot \text{m})\hat{i} + (2.00 \text{ N} \cdot \text{m})\hat{j} - (1.00 \text{ N} \cdot \text{m})\hat{k}$. Determine F_x .

Answer: -5.00 N

41. Figure 11-45 shows a rigid structure consisting of a circular hoop of radius R and mass m , and a square made of four thin bars, each of length R and mass m . The rigid structure rotates at a constant speed about a vertical axis, with a period of rotation of 2.5 s. Assuming $R = 0.50$ m and $m = 2.0$ kg, calculate (a) the structure's rotational inertia about the axis of rotation and (b) its angular momentum about that axis.

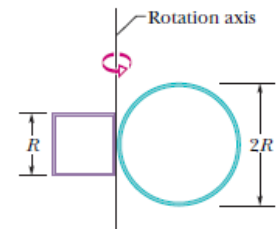


Fig. 11-45 Problem 41.

Answer: (a) $1.6 \text{ kg} \cdot \text{m}^2$ (b) $4.0 \text{ kg} \cdot \text{m}^2/\text{s}$

53. A uniform thin rod of length 0.500 m and mass 4.00 kg can rotate in a horizontal plane about a vertical axis through its center. The rod is at rest when a 3.00 g bullet traveling in the rotation plane is fired into one end of the rod. As viewed from above, the bullet's path makes angle $\theta = 60.0^\circ$ with the rod (Fig. 11-50). If the bullet lodges in the rod and the angular velocity of the rod is 10 rad/s immediately after the collision, what is the bullet's speed just before impact?

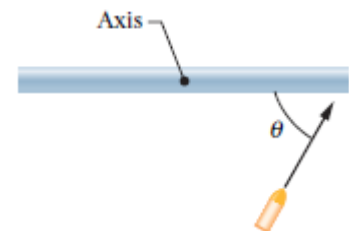


Fig. 11-50 Problem 53.

Answer: 1.3×10^3 m/s