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.

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3. A 140 kg hoop rolls along a horizontal floor so that the hoop's center of mass has a speed of 0.150 m/s. How much work must be done on the hoop to stop it?

Answer: -3.15 J

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9. In Fig. 11-33, a solid ball rolls smoothly from rest (starting at height H = 6.0 m) until it leaves the horizontal section at the end of the track, at height h =2.0 m. How far horizontally from point A does the ball hit the floor?

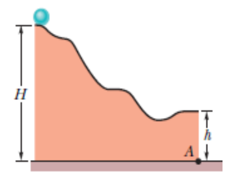

Fig. 11-33 Problem 9.

Answer: 4.8 m

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14. In Fig. 11-37, a small, solid, uniform ball is to be shot from point P so that it rolls smoothly along a horizontal path, up along a ramp, and onto a plateau. Then it leaves the plateau horizontally to land on a game board, at a horizontal distance d from the right edge of the plateau. The vertical heights are h_1= 5.00 cm and h_2 = 1.60 cm. With what speed must the ball be shot at point P for it to land at d = 6.00 cm?

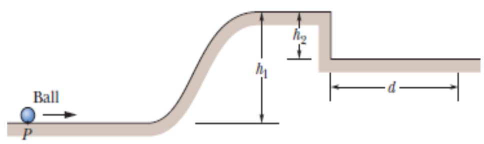

Fig. 11-37 Problem 14.

Answer: 1.34 m/s

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23. Force $\vec{F} = (2.0\text{ N})\hat{\imath} - (3.0\text{ N})\hat{k}$ acts on a pebble with position vector $\vec{r} = (0.50\text{ m})\hat{\jmath} - (2.0\text{ m})\hat{k}$ relative to the origin. In unit vector notation, what is the resulting torque on the pebble about (a) the origin and (b) the point (2.0 m, 0, − 3.0 m)?

Answer: (a) $(-1.5\,\hat{\imath} - 4.0\,\hat{\jmath} - 1.0\,\hat{k})\text{ N}\cdot\text{m}$ (b) $(-1.5\,\hat{\imath} - 4.0\,\hat{\jmath} - 1.0\,\hat{k})\text{ N}\cdot\text{m}$

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27. At one instant, force $\vec{F} = 4.0\,\hat{\jmath}$ N acts on a 0.25 kg object that has position vector $\vec{r} = (2.0\hat{\imath} - 2.0\hat{k})\text{m}$ and velocity vector $\vec{v} = (-5.0\,\hat{\imath} + 5.0\hat{k})\text{m/s}$. About the origin and in unit-vector notation, what are (a) the object's angular momentum and (b) the torque acting on the object?

Answer: (a) 0 (b) $(8.0\text{ N}\cdot\text{m})\,\hat{\imath} + (8.0\text{ N}\cdot\text{m})\,\hat{k}$

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34. A particle is to move in an xy plane, clockwise around the origin as seen from the positive side of the z axis. In unit-vector notation, what torque acts on the particle if the magnitude of its angular momentum about the origin is (a) 4.0 kg· m^2/s, (b) 4.0 t^2 kg· m^2/s,(c) $4.0/\sqrt{t}$ kg· m^2/s and (d) 4.0/t^2 kg·m^2/s?

Answer: (a) 0 (b) $(-8.0\,t\text{ N}\cdot\text{m})\hat{k}$ (c) $\left(-\frac{2.0}{\sqrt{t}}\,\hat{k}\right)\text{N}\cdot\text{m}$ (d) $\left(-\frac{8.0}{t^3}\,\hat{k}\right)\text{N}\cdot\text{m}$

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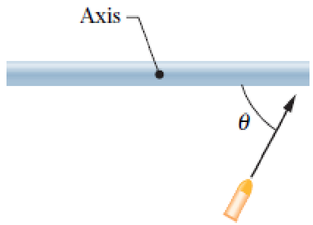
46. The rotational inertia of a collapsing spinning star drops to $\frac{1}{3}$ its initial value. What is the ratio of the new rotational kinetic energyto the initial rotational kinetic energy?

Answer: 3

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 θ= 60.0° 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?



Answer: 1.3×10^3 m/s