Textbook problems for Pre-AP Physics – Ch. 7-8

Ch 7 p. 270 #'s 37, 38, 39, 43, 47, 48 and 52.. Ch. 8 p. 305 #'s 9, 20, 46 and 50.

37. A roller-coaster car speeds down a hill past point A and then rolls up a hill past point B, as shown in **Figure 7-17.**

a. The car has a speed of 20.0 m/s at point *A*. If the track exerts a force on the car of 2.06×10^4 N at this point, what is the mass of the car?

b. What is the maximum speed the car can have at point B for the gravitational force to hold it on the track?

(See Sample Problem 7H.)

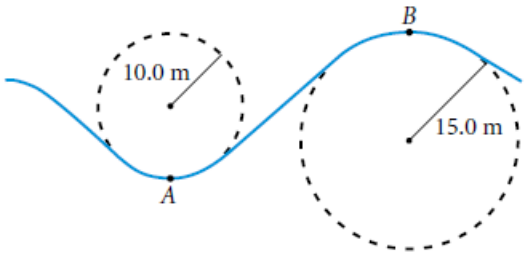

Figure 7-17

38. Tarzan tries to cross a river by swinging from one bank to the other on a vine that is 10.0 m long. His speed at the bottom of the swing, just as he clears the surface of the river, is 8.0 m/s. Tarzan does not know that the vine has a breaking strength of 1.0×10^3 N. What is the largest mass Tarzan can have and make it safely across the river?
(See Sample Problem 7H.)

39. The gravitational force of attraction between two students sitting at their desks in physics class is 3.20×10^{-8} N. If one student has a mass of 50.0 kg and the other has a mass of 60.0 kg, how far apart are the students sitting?
(See Sample Problem 7I.)

43. An airplane is flying in a horizontal circle at a speed of 105 m/s. The 80.0 kg pilot does not want the centripetal acceleration to exceed 7.00 times free-fall acceleration.

a. Find the minimum radius of the plane's path.

b. At this radius, what is the *net* force that maintains circular motion exerted on the pilot by the seat belts, the friction against the seat, and so forth?

47. A 13 500 N car traveling at 50.0 km/h rounds a curve of radius 2.00×10^2 m. Find the following:

a. the centripetal acceleration of the car

b. the force that maintains centripetal acceleration

c. the minimum coefficient of static friction between the tires and the road that will allow the car to round the curve safely

48. A 2.00×10^3 kg car rounds a circular turn of radius 20.0 m. If the road is flat and the coefficient of static friction between the tires and the road is 0.70, how fast can the car go without skidding?

52. An air puck of mass 0.025 kg is tied to a string and allowed to revolve in a circle of radius 1.0 m on a frictionless horizontal surface. The other end of the string passes through a hole in the center of the surface, and a mass of 1.0 kg is tied to it, as shown in **Figure 7-19.** The suspended mass remains in equilibrium while the puck revolves on the surface.

a. What is the magnitude of the force that maintains circular motion acting on the puck?

b. What is the linear speed of the puck?

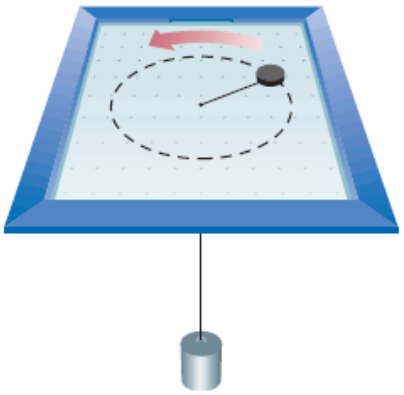

Figure 7-19

9. A bucket filled with water has a mass of 54 kg and is hanging from a rope that is wound around a 0.050 m radius stationary cylinder. If the cylinder does not rotate and the bucket hangs straight down, what is the magnitude of the torque the bucket produces around the center of the cylinder?
(See Sample Problem 8A.)

20. A window washer is standing on a scaffold supported by a vertical rope at each end. The scaffold weighs 205 N and is 3.00 m long. What is the force each rope exerts on the scaffold when the 675 N worker stands 1.00 m from one end of the scaffold?
(See Sample Problem 8B.)

46. If the torque required to loosen a nut that holds a wheel on a car has a magnitude of 58 N•m, what force must be exerted at the end of a 0.35 m lug wrench to loosen the nut when the angle is 56°?

50. A 0.100 kg meterstick is supported at its 40.0 cm mark by a string attached to the ceiling. A 0.700 kg mass hangs vertically from the 5.00 cm mark. A mass is attached somewhere on the meterstick to keep it horizontal and in *both* rotational and translational equilibrium. If the force applied by the string attaching the meterstick to the ceiling is 19.6 N, determine the following:

a. the value of the unknown mass
b. the point where the mass attaches to the stick