Assignment 8

PHY1001

NO LATE SUBMISSION IS ACCEPTED

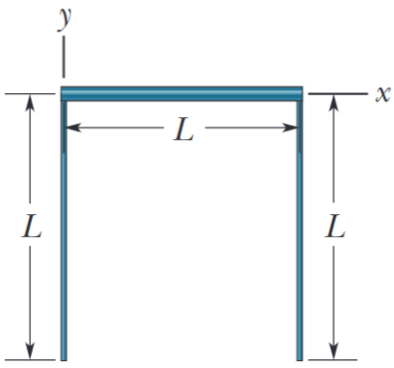

Figure 9-26 Problem 4.

4 In Fig. 9-26, three uniform thin rods, each of length $L = 24$ cm, form an inverted U. The vertical rods each have a mass of 14 g; the horizontal rod has a mass of 42 g. What are (a) the x coordinate and (b) the y coordinate of the system's center of mass?

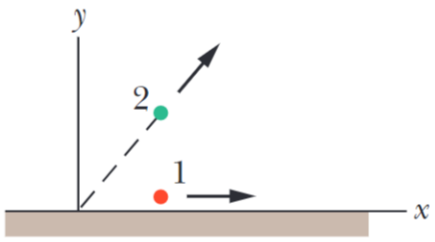

Figure 9-33 Problem 14.

14 In Figure 9-33, two particles are launched from the origin of the coordinate system at time $t = 0$. Particle 1 of mass $m_1 = 5.00$ g is shot directly along the x axis on a frictionless floor, with constant speed 10.0 m/s. Particle 2 of mass $m_2 = 3.00$ g is shot with a velocity of magnitude 20.0 m/s, at an upward angle such that it always stays directly above particle 1. (a) What is the maximum height H_{max} reached by the com of the two-particle system? In unit-vector notation, what are the (b) velocity and (c) acceleration of the com when the com reaches H_{max}?

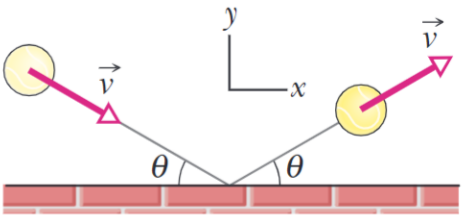

Figure 9-46 Problem 38.

38 In the overhead view of Fig. 9-46, a 300 g ball with a speed v of 6.0 m/s strikes a wall at an angle θ of 30° and then rebounds with the same speed and angle. It is in contact with the wall for 10 ms. In unit-vector notation, what are (a) the impulse on the ball from the wall and (b) the average force on the wall from the ball?

44 In Fig. 9-49, a stationary block explodes into two pieces L and R that slide across a frictionless floor and then into regions with friction, where they stop. Piece L, with a mass of 2.0 kg, encounters a coefficient of kinetic friction $\mu_L = 0.35$ and slides to a stop in distance $d_L = 0.15$ m. Piece R encounters a coefficient of kinetic friction $\mu_R = 0.50$ and slides to a stop in distance $d_R = 0.30$ m. What was the mass of the block?

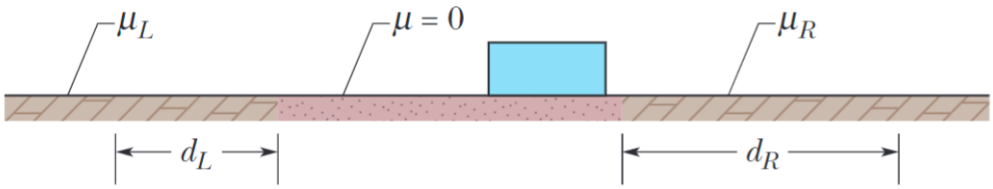

Figure 9-49 Problem 44.

57 In Fig. 9-53, a ball of mass $m = 60$ g is shot with speed $v_i = 22$ m/s into the barrel of a spring gun of mass $M = 240$ g initially at rest on a frictionless surface. The ball sticks in the barrel at the point of maximum compression of the spring. Assume that the increase in thermal energy due to friction between the ball and the barrel is negligible. (a) What is the speed of the spring gun after the ball stops in the barrel? (b) What fraction of the initial kinetic energy of the ball is stored in the spring?

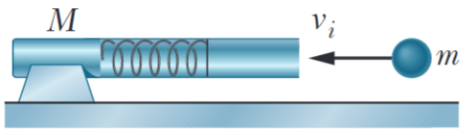

Figure 9-53 Problem 57.

66 Block 1, with mass m_1 and speed 3.0 m/s, slides along an x axis on a frictionless floor and then undergoes a one-dimensional elastic collision with stationary block 2, with mass $m_2 = 0.40m_1$. The two blocks then slide into a region where the coefficient of kinetic friction is 0.50; there they stop. How far into that region do (a) block 1 and (b) block 2 slide?

72 In the two-dimensional collision in Fig. 9-21, the projectile particle has mass $m_1 = m$, initial speed $v_{1i} = 3v_0$, and final speed $v_{1f} = \sqrt{5}v_0$. The initially stationary target particle has mass $m_1 = 2m$ and final speed $v_{2f} = v_2$. The projectile is scattered at an angle given by $\tan \theta_1 = 2.0$. (a) Find angle θ_2. (b) Find v_2 in terms of v_0. (c) Is the collision elastic?

A glancing collision that conserves both momentum and kinetic energy.

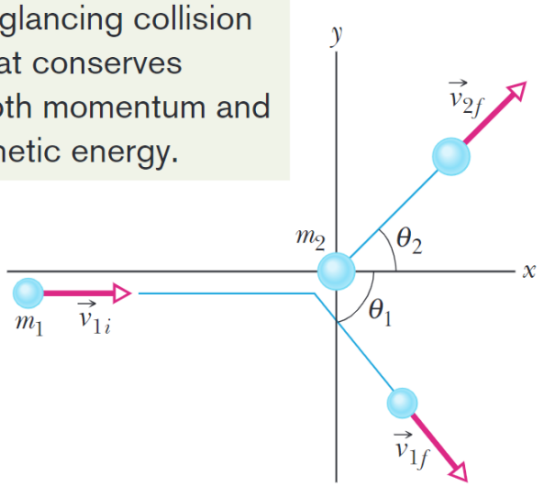

Figure 9-21 An elastic collision between two bodies in which the collision is not head-on. The body with mass m_2 (the target) is initially at rest.