**Homework: Ch. 8**

1. What is the difference between a completely elastic and a completely inelastic collision?
2. What happens to the momentum of a system when no external force acts on the system? Justify your answer.
3. A 1350 kg car with a speed of 80.0 km/h hits a wall and comes to a complete stop after 5.00 × 10-3 seconds. Calculate the magnitude of the impulse and the average force exerted on the car by the wall.
4. In a scary science fiction movie, an asteroid is on a direct collision path with the Earth. The asteroid has mass *m* = 3.98 × 1015 kg and velocity *v* = −7.00 × 103 m/s. The Earth has mass *M* = 5.98 × 1024 kg and velocity *V* = +2.99 × 104 m/s. Assuming the collision is perfectly inelastic and that no mass is lost from the Earth/asteroid system, determine the velocity of the Earth after the collision.
5. A 0.500 kg ice hockey puck moving at 5.00 m/s hits the walls and bounces back at 4.20 m/s. Assuming the collision lasts 0.0200 seconds, calculate the average force exerted on the ball and how much kinetic energy was lost during this collision.
6. A 600.0 kg car moving at 30.0 m/s collides inelastically with a 1400 kg truck at rest. Calculate the final combined speed if they are moving in the same direction after collision.
7. A ball of mass 220 g that is moving with speed 7.5 m/s collides head-on, elastically with another ball initially at rest. Immediately after the collision, the incoming ball bounces backward with a speed of 3.8 m/s.
   1. What is the mass of the second ball?
   2. What is the velocity of the second ball after the collision?
8. A 1.0 kg cart on an air track moving towards right at a speed of 1.0 m/s hits a 0.90 kg cart moving to the left at a speed of 1.2 m/s. What is the total momentum just before they collide? What is their final speed if they stick to each other after collision?
9. A rigid ball of mass *m1* = 1.0 kg is sitting at the origin of a coordinate system. A second rigid ball of mass *m2* = 2.5 kg is sitting at rest on the *x*-axis of a coordinate system. Someone comes along and gives *m2* a nudge causing the ball to roll along the *x*-axis at a speed of 6.0 m/s towards *m1*. If the collision is completely elastic, what is the final speed of the two balls?
10. In the figure below, block 1 of mass 1.00 kg slides from rest along a frictionless ramp from height *h* = 6.00 m and then collides with stationary block 2, which has mass 3.00 kg. After the collision, the blocks slides into a region where the coefficient of kinetic friction is *μk* = 0.250 and comes to a stop a distance *d* within that region.
    1. What is the speed of block 1 at the bottom of the hill?
    2. What is the final speed of the two blocks if the collision is completely inelastic?
    3. How far do the two blocks slide after the collision into the region where there is friction, *d*?

