

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 $m = 3.98 \times 10^{15}$ kg and velocity $v = -7.00 \times 10^3$ m/s. The Earth has mass $M = 5.98 \times 10^{24}$ kg and velocity $V = +2.99 \times 10^4$ 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.
 - a. What is the mass of the second ball?
 - b. 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 $m_1 = 1.0$ kg is sitting at the origin of a coordinate system. A second rigid ball of mass $m_2 = 2.5$ kg is sitting at rest on the x -axis of a coordinate system. Someone comes along and gives m_2 a nudge causing the ball to roll along the x -axis at a speed of 6.0 m/s towards m_1 . 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 slide into a region where the coefficient of kinetic friction is $\mu_k = 0.250$ and comes to a stop a distance d within that region.
- What is the speed of block 1 at the bottom of the hill?
 - What is the final speed of the two blocks if the collision is completely inelastic?
 - How far do the two blocks slide after the collision into the region where there is friction, d ?

