

Date: _____

Unit 3: Momentum and Energy

1. A 1055-kg van, stopped at a traffic light, is hit directly in the rear by a 715-kg car traveling with a velocity of +2.25 m/s. Assume that the transmission of the van is in neutral, the brakes are not being applied, and the collision is elastic. What is the final velocity of
 - (a) the car and
 - (b) the van?
2. A 2.50-g bullet, traveling at a speed of 425 m/s, strikes the wooden block of a ballistic pendulum, such as that in Figure 7.14. The block has a mass of 215 g.
 - a. Find the speed of the bullet/block combination immediately after the collision.
 - b. How high does the combination rise above its initial position?

3. A cue ball (mass = 0.165 kg) is at rest on a frictionless pool table. The ball is hit dead center by a pool stick, which applies an impulse of +1.50 N·s to the ball. The ball then slides along the table and makes an elastic head-on collision with a second ball of equal mass that is initially at rest. Find the velocity of the second ball just after it is struck.
4. A 5.00-g bullet is fired into a 1.00-kg ball that is hanging from a long string, as shown in the drawing. The bullet emerges from the ball with a horizontal velocity of +250 m/s. If the ball rises to a maximum height of 0.300 m, find the velocity of the bullet just before the collision.
5. A 0.150-kg projectile is fired into a 3.00-kg block that is initially at rest on a frictionless table. The projectile is completely inelastic. Immediately after the collision, the block slides across the table with a speed of 1.20 m/s. Find the velocity with which the projectile struck the block.