

Name: _____ Date: _____ Period: _____

Collision Practice Problems

$$\begin{array}{lll} P = mv & Ft = mv_2 - mv_1 & m_1v_1 = -m_2v_2 \\ m_1v_1 + m_2v_2 = m_1v_3 + m_2v_4 & & m_1v_1 + m_2v_2 = (m_1 + m_2)v_3 \end{array}$$

- 1) A 13,500 kg railroad freight car travels on a level track at a speed of 4.5 m/s. It collides and couples with a 25,000 kg second car, initially at rest and with brakes released. What is the speed of the two cars after collision?

- 2) A 40 kg girl skates at 3.5 m/s on ice toward her 65 kg friend who is standing still, with open arms. As they collide and hold each other, what is the speed of the couple?

- 3) A 0.01 kg bullet has a speed of 700 m/s before it strikes a 0.95 kg wooden block that is stationary on a horizontal frictionless surface and remains inside of it. What is the speed of the block after the bullet becomes embedded in it?

- 4) A 55 kg skater at rest on a frictionless rink throws a 3 kg ball, giving the ball a velocity of 8 m/s. What is the velocity of the skater immediately after?

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5) A 0.015 kg bullet is fired at a 1.5 kg block initially at rest. The bullet, moving with an initial speed of 500 m/s, emerges from the block with a speed of 400 m/s. What is the speed of the block after the collision?

6) Two objects, A and B, with masses of 3.2 kg and 1.8 kg, move on a frictionless horizontal surface. Object A moves to the right at a constant speed of 5.1 m/s while object B moves to the right at a constant speed 1.4 m/s. They collide and stick together (a perfectly inelastic collision).

a. Determine the total momentum of the system (both objects) before the collision

b. Determine the total kinetic energy of the system before the collision

c. Find the speed of the two objects after the collision

d. Find the total kinetic energy of the system after the collision.

e. Is the kinetic energy of the system conserved? Explain.