Momentum 2

Elastic Collisions?



For each collision, find the velocity of the center of mass, and the initial and final velocities of each cart. Use this information to show the elasticity (or not) of each collision.

Collision #1:

Cart 1 = 0.5 kg

Cart 2 = 0.5 kg

Collision #2:

Cart 1 = 1 kg

Cart 2 = 0.5 kg

Collision #3:

Cart 1 = 0.5 kg

Cart 2 = 1 kg

1. Which one of the following is characteristic of an *inelastic collision*?

A) Total mass is not conserved.

B) Total energy is not conserved.

C) Linear momentum is not conserved.

D) Kinetic energy is not conserved.

E) The change in momentum is less than the total impulse.

2. An object of mass 3*m*, initially at rest, explodes breaking into two fragments of mass *m* and 2*m,* respectively. Which one of the following statements concerning the fragments *after the explosion* is true?

A) They may fly off at right angles.

B) They may fly off in the same direction.

C) The smaller fragment will have twice the speed of the larger fragment.

D) The larger fragment will have twice the speed of the smaller fragment.

E) The smaller fragment will have four times the speed of the larger fragment.

3. A 100-kg cannon at rest contains a 10-kg cannon ball. When fired, the cannon ball leaves the cannon with a speed of 90 m/s. What is the recoil speed of the cannon?

A) 4.5 m/s B) 9 m/s C) 45 m/s D) 90 m/s E) zero

4. An 80-kg astronaut carrying a 20-kg tool kit is initially drifting toward a stationary space shuttle at a speed of 2 m/s. If she throws the tool kit toward the shuttle with a speed of 6 m/s as seen from the shuttle, her final speed is

A) 1 m/s toward the shuttle. D) 4 m/s toward the shuttle.

B) 1 m/s away from the shuttle. E) 6 m/s away from the shuttle.

C) 2 m/s toward the shuttle.

5. A 58.5-kg astronaut is floating toward the front of her stationary ship at 0.15 m/s, relative to the ship. She wishes to stop moving, relative to the ship. She decides to throw away the 2.50-kg book she's carrying. What should the speed and direction of the book be to achieve her goal?

A) 0.15 m/s, toward the front of the ship D) 0.30 m/s, toward the back of the ship

B) 3.5 m/s, toward the back of the ship E) 1.8 m/s, toward the front of the ship

C) 3.7 m/s, toward the front of the ship

6. Different types of collisions between interacting bodies are *categorized* on the basis of

A) kinetic energy conservation. D) the magnitude of the forces involved.

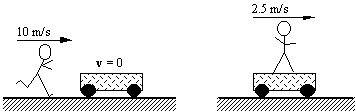
B) mechanical energy conservation. E) the temporal duration of the collision.

C) linear momentum conservation.

7. Jennifer is walking at 1.63 m/s. If Jennifer weighs 583 N, what is the magnitude of her momentum?

A)97.0 kg • m/s B)137 kg • m/s C) 68.6 kg • m/s D) 672 kg • m/s E)951 kg • m/s

8. A 50.0-kg boy runs at a speed of 10.0 m/s and jumps onto a cart as shown in the figure. The cart is initially at rest.



If the speed of the cart with the boy on it is 2.50 m/s, what is the mass of the cart?

A) 150 kg B) 175 kg C) 210 kg D) 260 kg E) 300 kg