Name: ______________________ Class: _________________ Date: _________ **ID: A**

Cp physics web review ch 6 momentum

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. The reason padded dashboards are used in cars is that they
   a. look nice and feel good.
   b. decrease the impulse in a collision.
   c. increase the force of impact in a collision.
   d. decrease the momentum of a collision.
   e. increase the time of impact in a collision.

____ 2. A table tennis ball launcher is fired. Compared to the force on the ball, the force on the launcher is
   a. larger.
   b. the same.
   c. smaller.

____ 3. If all people, animals, trains and trucks all over the world began to walk or run towards the east, then
   a. Earth would spin a bit slower.
   b. Earth's spin would not be affected at all.
   c. Earth would spin a bit faster.

____ 4. A ball is moving at 6.0 m/s and has a momentum of 24.0 kg·m/s. What is the ball's mass?
   a. 0.3 kg
   b. 4.0 kg
   c. 24.0 kg
   d. 144.0 kg
   e. none of the above

____ 5. When comparing the momentum of two moving objects, which of the following is correct?
   a. The object with the higher velocity will have less momentum if the masses are equal.
   b. The more massive object will have less momentum if its velocity is greater.
   c. The less massive object will have less momentum if the velocities are the same.
   d. The more massive object will have less momentum if the velocities are the same.

____ 6. A roller coaster climbs up a hill at 4 m/s and then zips down the hill at 30 m/s. The momentum of the roller coaster
   a. is greater up the hill than down the hill.
   b. is greater down the hill than up the hill.
   c. remains the same throughout the ride.
   d. is zero throughout the ride.

____ 7. If a force is exerted on an object, which statement is true?
   a. A large force always produces a large change in the object's momentum.
   b. A large force produces a large change in the object's momentum only if the force is applied over a very short time interval.
   c. A small force applied over a long time interval can produce a large change in the object's momentum.
   d. A small force always produces a large change in the object's momentum.

____ 8. The impulse experienced by a body is equivalent to the body's change in
   a. velocity.
   b. kinetic energy.
   c. momentum.
   d. force.

____ 9. A 75 kg person walking around a corner bumped into an 80 kg person who was running around the same corner. The momentum of the 80 kg person

a. increased.
b. decreased.
c. remained the same.
d. was conserved.

____ 10. Two objects with different masses collide and bounce back after an elastic collision. Before the collision, the two objects were moving at velocities equal in magnitude but opposite in direction. After the collision,

a. the less massive object had gained momentum.
b. the more massive object had gained momentum.
c. both objects had the same momentum.
d. both objects lost momentum.

____ 11. A soccer ball collides with another soccer ball at rest. The total momentum of the balls

a. is zero.
b. increases.
c. remains constant.
d. decreases.

Problem

12. A 40-kg football player leaps through the air to collide with and tackle a 50-kg player heading toward him, also in the air. If the 40-kg player is heading to the right at 9 m/s and the 50-kg player is heading toward the left at 2 m/s, what is the speed and direction of the tangled players?

13. A 5-kg blob of clay moving horizontally at 4 m/s has a head-on collision with a 4-kg blob of clay that moves toward it at 2 m/s. What is the speed of the two blobs stuck together immediately after the collision?

14. A 70-kg free-floating astronaut fires 0.10-kg of gas at a speed of 30 m/s from her propulsion pistol. What is the astronaut's recoil speed?

15. What velocity must a 1340 kg car have in order to have the same momentum as a 2680 kg truck traveling at a velocity of 15 m/s to the west?

16. A cricket ball with a mass of 0.11 kg moves at a speed of 12 m/s. Then the ball is hit by a bat and rebounds in the opposite direction at a speed of 15 m/s. What is the change in momentum of the ball?

17. A train with a mass of 1.8×10^3 kg is moving at 15 m/s when the engineer applies the brakes. If the braking force is constant at 3.5×10^4 N, how long does it take the train to stop? How far does the train travel during this time?

18. A 65.0 kg ice-skater standing on frictionless ice throws a 0.15 kg snowball horizontally at a speed of 32.0 m/s. At what speed does the skater move backward?

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Answer Section

MULTIPLE CHOICE

1. E
2. B
3. A
4. B
5. C
6. B
7. C
8. C
9. B
10. A
11. C

PROBLEM

12. 2.9 m/s toward the right
13. 1.3 m/s
14. 0.04 m/s
15. 30 m/s to the west

Given
m_1 = 2680 kg
$\mathbf{v_1}$ = 15 m/s to the west
m_2 = 1340 kg

Solution
$m_1\mathbf{v_1} = m_2\mathbf{v_2}$

$$\mathbf{v_2} = \frac{m_1\mathbf{v_1}}{m_2} = \frac{\left(2.68 \times 10^3 \text{ kg}\right)(15 \text{ m/s west})}{\left(1.34 \times 10^3 \text{ kg}\right)} = 3.0 \times 10^1 \text{ m/s west}$$

16. –3.0 kg•m/s

Given
$m = 0.11\ \text{kg}$

$v_i = 12\ \text{m/s}$

$v_f = -15\ \text{m/s}$

Solution
$\Delta p = m\left(v_f - v_i\right) = \left(0.11\ \text{kg}\right)(-15\ \text{m/s} - 12\ \text{m/s}) = -3.0\ \text{kgm/s}$

17. 77 s; 5.8×10^2 m

Given
$m = 1.8 \times 10^5\ \text{kg}$

$v_i = 15\ \text{m/s}$

$v_f = 0\ \text{m/s}$

$F = -3.5 \times 10^4\ \text{N}$

Solution
$\mathbf{F}\Delta t = \Delta \mathbf{p}$

$$\Delta t = \frac{\Delta p}{F} = \frac{m\left(v_f - v_i\right)}{F} = \frac{\left(1.8 \times 10^5\ \text{kg}\right)(0\ \text{m/s} - 15\ \text{m/s})}{-3.5 \times 10^4\ \text{N}} = 77\ \text{s}$$

$$\Delta x = \tfrac{1}{2}\left(v_i + v_f\right)\Delta t = \tfrac{1}{2}(15\ \text{m/s} + 0\ \text{m/s})(77\ \text{s}) = 5.8 \times 10^2\ \text{m}$$

18. 7.4×10^{-2} m/s

Given

$m_1 = 0.15\ \text{kg}$

$m_2 = 65.0\ \text{kg}$

$v_{1,i} = v_{2,i} = 0\ \text{m/s}$

$v_{1,f} = 32\ \text{m/s}$

Solution

$m_1\mathbf{v}_{\mathbf{1,i}} + m_2\mathbf{v}_{\mathbf{2,i}} = m_1\mathbf{v}_{\mathbf{1,f}} + m_2\mathbf{v}_{\mathbf{2,f}} = 0$

$m_2\mathbf{v}_{\mathbf{2,f}} = -m_1\mathbf{v}_{\mathbf{1,f}}$

$$\mathbf{v}_{\mathbf{2,f}} = -\frac{m_1\mathbf{v}_{\mathbf{1,f}}}{m_2} = -\frac{(0.15\ \text{kg})(32\ \text{m/s})}{65.0\ \text{kg}} = -7.4 \times 10^{-2}\ \text{m/s} = 7.4 \times 10^{-2}\ \text{m/s backward}$$