Momentum and Impulse Quiz Study Guide
Physics 8

Directions: Answer the questions to the best of your ability. Be sure to show work and include units where applicable.

1. Define momentum.

2. Which of the following correctly identifies the units for momentum?
   a. Ns
   b. Kg • m/s
   c. m/s ÷ kg
   d. None of above

3. Compare the momentum of the following objects and rank them least to greatest.
   a. 1000 kg object moving at 0 m/s
   b. 100 kg cow moving at 2 m/s
   c. 2000 kg motorcycle moving at 35 m/s
   d. 2000 g cat moving at 45 m/s

4. Determine the momentum of the following…
   a. 60-kg halfback moving eastward at 9 m/s

   b. 1000-kg car moving northward at 20 m/s

   c. 40-kg dog moving southward at 2 m/s

5. A car possesses 20,000 kg • m/s of momentum. What would the car's new momentum be if…
    a. Its velocity was doubles
    b. Its velocity was tripled
    c. Its mass was doubled (by adding more passengers and a greater load)
    d. Both its velocity was doubled and its mass was doubled

6. If the truck has a mass of 2,000 kilograms, what is its momentum if it has a velocity of 35 m/s. Write your answer using kg • m/s units.

7. If the car has a mass of 1,000 kilograms, what is its momentum when traveling at a velocity of 35 m/s?

8. An 8-kilogram bowling ball is rolling in a straight line toward you. If its momentum if is 16 kg • m/s, how fast is the bowling ball traveling?

9. A beach ball is rolling in a straight line toward a person that is located eastward. The ball is traveling at a speed of 0.5 m/s. Its momentum is 0.25 kg • m/s. What is the mass of the beach ball?

10. A 15.5-kilogram baseball is thrown in a straight line at a velocity of 30 m/s in 4 seconds. What is the momentum of the baseball?

11. Define impulse.

12. What are the units for impulse?

13. Ray is pushing a box along the floor. Ray applies a force of 50 Newtons. If it takes seven seconds from the ball to move across the floor, what is the impulse (friction force is negligible)?

14. A football player kicks a ball with a force of 50N. Find the impulse on the ball if his foot stays in contact with the football for 0.01s.

15. A hockey player applies an average force of 80N to a 0.25kg hockey puck for a time of 0.2s. Determine the impulse experienced by the hockey puck.

Use impulse is equal to the change in momentum to solve the following.

16. A 0.5kg baseball experiences a 10N force for the duration of 0.1s. What is the change in velocity of the baseball?

17. A space shuttle burns fuel at the rate of 13,000kg in each second. Find the force exerted by the fuel on the shuttle if in 2s the shuttle experiences a change in momentum of 325,000kg • m/s.

Answer:

18. Define the impulse-momentum theory.

19. What is the law of conservation of momentum?

Use momentum before is equal to the momentum after a collision to answer the following:

20. A 2 kg blob of putty moving at 4 m/s slams into a 6 kg blob of putty at rest. What is the speed of the two stuck-together blobs immediately after colliding?

21. A football player runs at 8 m/s and plows into a 80 kg referee standing on the field causing the referee to fly forward at 5.0 m/s. If this were a perfectly elastic collision, what would the mass of a football player be?

22. A large truck and a Volkswagen have a head-on collision.
    a. Which vehicle experiences the greatest force of impact?

    b. Which vehicle experiences the greatest impulse?

    c. Which vehicle experiences the greatest momentum change?

    d. Which vehicle experiences the greatest acceleration

23. Miles Tugo and Ben Travlun are riding in a bus at highway speed on a nice summer day when an unlucky bug splatters onto the windshield. Miles and Ben begin discussing the physics of the situation. Miles suggests that the momentum change of the bug is much greater than that of the bus. After all, argues Miles, there was no noticeable change in the speed of the bus compared to the obvious change in the speed of the bug. Ben disagrees entirely, arguing that both bug and bus encounter the same force, momentum change, and impulse. Who do you agree with? Support your answer.

24. A baseball player holds a bat loosely and bunts a ball. Express your understanding of momentum conservation by filling in the tables below.

	Before Collision	After Collision
Bat	80	b
Ball	-40	10
Total	a	c

25. What happens to the momentum during a collision?