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Momentum and Impulse Practice Problems

1. When the force of impact on an object is extended in time, does the impulse increase or decrease?
2. Does impulse equal momentum, or a change in momentum?
3. For constant force, suppose the duration of impact on an object is doubled.
4. How much is the impulse increased?
5. How much is the resulting change in momentum increased?
6. In a car crash, why is it advantageous for an occupant to extend time during which the collision takes place?
7. If the time of impact in a collision is extended by four times, how much does the force of impact change?
8. Why is it advantageous for a boxer to ride with the punch? Why should he avoid moving into an oncoming punch?
9. Visualize yourself on a skateboard.
10. When you throw a ball, do experience an impulse?
11. Do you experience an impulse when you catch a ball of the same speed?
12. Do you experience an impulse when you catch it and then throw it out again?
13. Which impulse is greatest?
14. Why is more impulse delivered during a collision when bouncing occurs than during one when it doesn’t?
15. Distinguish between an elastic and inelastic collision.
16. In terms of impulse and momentum, why are airbags in automobiles a good idea?
17. Why is it difficult for a firefighter to hold a hose that ejects large amounts of water at high speed?
18. You can’t throw a raw egg against the wall without breaking it, but you can throw it at the same speed into a sagging sheet without breaking it. Explain.
19. Does an object with momentum always have energy? Does an object with energy always have momentum? Explain.
20. A 70 kg man runs at a constant velocity of 2 m/s. What is the magnitude of his momentum? (140 kg m/s)
21. A 10 N force is applied to a hockey puck over a period of 0.1 s. What is the change in momentum of the hockey puck? ( 1 kg m/s)
22. A 1000 kg car moving at a constant velocity is +11.0 m/s strikes a concrete barrier and comes to a complete stop in 2.0 s. What is the average force acting on the car? (-5500 N)
23. A 10 kg box is sliding across an ice rink at 10 m/s. A skater exerts a constant force of 10 N against it. How long will it ake for the box to come to a complete stop? (10s)
24. Two balls of equal mass collide in a perfectly elastic collision. Ball A moves to the right at 10 m/s. Ball B moves to the left at 5 m/s. After the collision ball B moves to the right at 3 m/s. What is the velocity of ball a after the collision?......assume frictionless surface (2 m/s)
25. A 150 kg halfback is running down the field carrying the ball at a velocity of 5 m/s. A 50 kg linebacker from the opposing team is running at him in the opposite direction. The linebacker hopes to wrap him in a tackle with perfectly inelastic collision. Is this possible, and if so at what velocity must the linebacker run? (-15 m/s)
26. A 140 kg fullback is running with the football at 10 m/s. A 70 kg defender runs at him in the opposite direction at 5 m/s. The defender wraps his arms around the fullback. What is the velocity of the two players after the collision?….assume frictionless surface. (5 m/s)
27. A 70 kg stuntman free falls from a building for 2.5 s and hits an airbag. The airbag exerts a force on him over a period of 2 s, and he comes to a complete stop. What was the approximate magnitude of the average force exerted by the airbag. (875 N)