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**Worksheet: Momentum & Impulse Section 9.1-9.3**

1. Calculate the linear momentum for the following cases:
2. A 75 kg sprinter with a speed of 10 m/s.
3. The earth who mass is 5.98 x 1024 kg moving at an orbital speed of 2.98 x 104 m/s.
4. Determine the impulse for the following cases:
5. A force of 30 N acts for 0.5 seconds.
6. A 0.4 kg soccer ball approaches a player horizontally with a velocity of 18 m/s. The player strikes the ball and causes it to move in the opposite direction with a velocity of 22 m/s. What impulse was delivered?
7. A bullet has a mass of 0.010 kg and a speed of 450 m/s. Determine the momentum.
8. The momentum of a football is 20 kg m/s. If the speed of the football is 25 m/s, determine the mass of the object.
9. A fly has a mass of 0.0001 kg. If the momentum of the fly is 0.00015 kg m/s, how fast is it flying?
10. Wade has a mass of 75 kg and his skateboard has a mass of 1.5 kg. What is the momentum of Wade and his skateboard together if they are traveling 9.5 m/s?
11. A hockey player makes a slap shot, exerting a force of 30 N on the hockey puck for 0.16 seconds.
12. What impulse is given the puck?
13. If the puck had a mass of 0.115 kg and was at rest before the shot, with what speed does it head toward the goal?
14. Mrs. P is upset with the performance of his trombone section. She leaps from his cherry picker in frustration. She falls for 2.5 seconds and reaches a speed of 24.5 m/s.
15. If Mrs. P has a mass of 100 kg, what would be his momentum at the instant that he touches the ground?
16. If it takes Mrs. P 0.0005 seconds to come to a stop, what would be the impact force?
17. What happens to the impact force if the time to stop is lengthened?
18. An 845 kg dragster accelerates from rest to 28 m/s in 1.2 seconds.
19. What is the change in momentum in the car?
20. What average force is required to bring about the change in momentum?
21. A 0.25 kg soccer ball is rolling at + 6.0 m/s towards a player. The player kicks the ball back in the opposite direction at a velocity of -14 m/s.
22. What is the change in velocity?
23. What is the change in momentum?
24. What is the average force required if the foot and ball are in contact for 0.02 seonds?
25. A car moving at 10 m/s crashes into a barrier and stops in 0.24 meters.
26. Determine the accelerations of the car.
27. Determine the time needed to stop.
28. If a 20 kg child were to be stopped in the same time as the car, what average force must be exerted?
29. Could you hold back this child with one arm? Would a seat belt be more effective?
30. A force of 1.21 x 103 N is needed to bring a moving car at 22 m/s to a halt in 20 seconds. What is the mass of the car?
31. Before a collision, a 25 kg object is moving at +12 m/s. Find the impulse that acted on this object if after the collision it moves at
32. + 8 m/s
33. – 8m/s
34. In 1993, a generator with a mass of 1.24 x 105 kg was flown from Germany to a power plant in India. This constituted the heaviest single piece of cargo every carried by a plane. Suppose the plane took off with a speed of 101 m/s towards the southeast and then accelerated to a final cruising speed of 197 m/s. During this acceleration, a force of 4 x 105 N in the southeast direction was exerted on the generator. For how much time did the force act on the generator?
35. The “human cannonball” has long been a popular and dangerous circus stunt. In order for a 45 kg person to leave the cannon with the fastest speed yet achieved by a human cannonball, a 1.6 x 103 N force must be exerted on that person for 0.68 seconds. What is the speed at which a person has been shot from these circus cannon?