

Momentum Questions

- 1) In a freight yard a train is being put together from freight cars. An empty freight car, coasting at 10 m/s, strikes a loaded car that is stationary, and the cars couple together. Each of the cars has a mass of 3000 kg when empty, and the loaded car contains 12,000 kg of ipods. With what speed does the combination of the two cars start to move?
- 2) When an apple falls from a tree and strikes the ground without bouncing, what becomes of the momentum?
- 3) A tennis player returns a 30. m/s serve straight back at 25. m/s, after making contact with the ball for 0.50 s. If the ball has a mass of 0.20 kg, what is the force she exerted on the ball?
- 4) If a Mack truck and a VW bug are in collision, which experiences a greater force? A greater impulse? A greater change in velocity?
- 5) You are sitting in the middle of a frozen lake. However, this is a special lake, in that the ice is frictionless. You only have your clothes with you. How do you get to the edge of the lake? Explain your answer.
- 6) A lunar vehicle is tested on earth at a speed of 10 km/h. When it travels on the moon with the same speed, is its momentum more, less or the same?

- 7) A 50. kg cart is moving across a frictionless floor at 2.0 m/s. A 70. kg boy, riding in the cart, jumps off so that he hits the floor with zero velocity.
- What impulse did the boy give to the cart?
 - What was the velocity of the cart after the boy jumped?
- 8) Discuss the following in terms of impulse and momentum:
- Why are padded dashboards safer in automobiles?
 - Why are nylon ropes, which stretch considerably under stress, favored by mountain climbers?
- 9) Ever tried to stop a 150 pound (68kg) cannonball fired towards you at 30 mph (48km/h)? No, probably not or you would not be in class today. But you may have tried to brace yourself in a car collision, or not worn a seatbelt in a car. How are the two situations similar?
- 10) If you throw a ball horizontally while standing on roller skates, you roll backwards. Will you roll backwards if you go through the motions of throwing the ball, but hold on to it instead?
- 11) A billiard ball will stop short when it collides head-on with another ball, which is at rest. The ball cannot stop short, however, if the collision is not exactly head-on but is at an angle. Explain why this is so in terms of momentum.