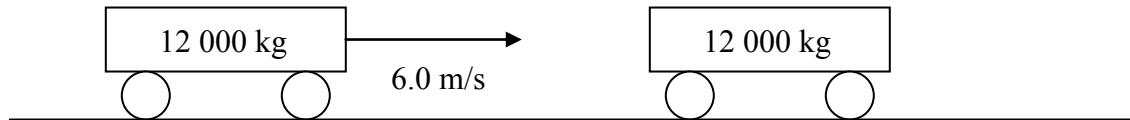


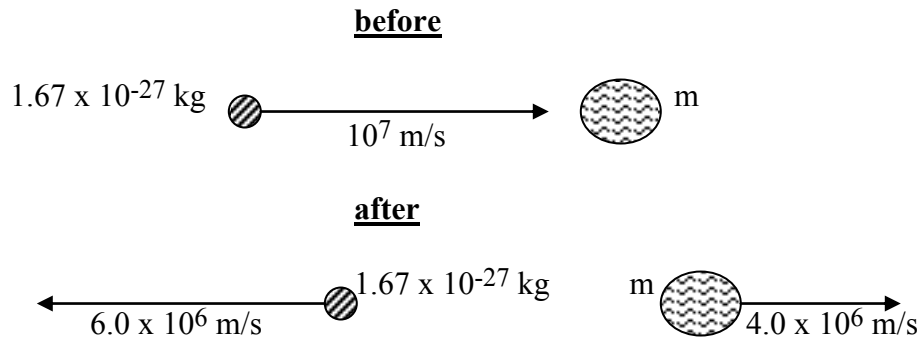
PHYSICS 11 MOMENTUM ETC. WORKSHEET 2

1. A rifle bullet of mass 60 g leaves the muzzle of a rifle with a velocity of 600 m/s. If the rifle is held very loosely, with what velocity will it recoil if its mass is 3.0 kg?
2. A railroad car of mass 12 000 kg is traveling at a speed of 6.0 m/s when it collides with an identical car at rest. If the two cars lock together, what is their common speed after the collision?



3. A bowling ball of mass 8.0 kg is traveling at 10.0 m/s when it strikes a 1.5 kg bowling pin. After being hit by the ball, the pin flies backward (in the direction that the ball was travelling) at 20.0 m/s, while the ball continues forward in the same direction. What is the velocity of the ball after impact?
4. A loaded freight car of mass 5000 kg breaks away and moves down the track with a speed of 4.0 m/s. It finally collides with two stationary freight cars of mass 1500 kg each. If they all couple together, at what rate do they move down the track?
5. A 92 kg hockey player skates with a velocity of 8.0 m/s in order to slam into a member of the opposing team who is standing still. They become tangled together and move down the ice with a velocity of 5.0 m/s. What is the mass of the other player?
6. A 53.0 kg skateboarder on a 2.0 kg skateboard is coasting along at 1.6 m/s. If the skateboarder collides with another stationary skateboarder of mass 43.0 kg who is on an identical skateboard and the two skateboarders become entangled and coast off in the direction of motion of the 53.0 kg skateboarder, what velocity will the combined skateboarders have?
7. A 1.5×10^3 kg car traveling at 44.0 m/s collides head-on with a 1.0×10^3 kg car traveling 22.0 m/s in the opposite direction. If the cars stick together on impact, what is the velocity of the wreckage immediately after impact?
8. Professor Frink designs a lightweight gun that shoots heavy bullets. The 50.0 N bullets leave the 40.0 N gun with a velocity of 200.0 m/s.
 - a) What is the recoil velocity of this gun?
 - b) Should Frink patent his invention? Explain.

9. A proton traveling at 10^7 m/s collides with a stationary particle and bounces back at 6.0×10^6 m/s. The particle moves forward at a speed of 4.0×10^6 m/s. If the proton has a mass of 1.67×10^{-27} kg, what is the mass of the particle?



10. A large compressed spring is placed between a 4000 kg railway car and a 6000 kg boxcar at rest. The spring is released and the two cars move off in opposite directions. If the heavier car moves at 2.4 m/s, how fast will the other move?
11. A 0.20 kg golf ball, moving at 80.0 m/s, hits a watermelon of 10 kg mass at rest on a frictionless table, and sticks in it. How fast does the watermelon move after the impact?

1. 12 m/s 2. 3.0 m/s 3. 6.25 m/s 4. 2.5 m/s 5. 55 kg 6. 0.88 m/s 7. 17.6 m/s 8. 250 m/s
 9. 6.68×10^{-27} kg 10. 3.6 m/s 11. 1.6 m/s