Physics 2305   28 February, 2000
Quiz 8—Form A

1. A train car collides and couples with a stationary train car. After the collision, they move together at 3.0 km/h. What was the velocity of the center of mass of the two cars before the collision?

   A) 1.5 km/h
   B) 3.0 km/h
   C) 6.0 km/h
   D) More information is needed.

2. What is the recoil velocity of a 4.4 kg rifle firing a 12 g bullet with a muzzle velocity of 850 m/s?

   A) 0.31 m/s
   B) 2.3 m/s
   C) 8.5 m/s
   D) 850 m/s

Useful equations:

$$\mathbf{p} = m\mathbf{v} \qquad v_{cm} = \Sigma\, m\, v\, /\, \Sigma\, m \qquad \mathbf{F} = d\mathbf{p}/dt$$

1. A car travelling 40 km/h collides with a stationary car of equal mass. If they stick together in the impact, how fast are they moving just afterwards?

   A) 0 km/h
   B) 20 km/h
   C) 40 km/h
   D) 60 km/h

2. Susan is standing on an icy (frictionless) surface when she throws a 175-g frisbee. If the frisbee flies away at 25 m/s and she weighs 62 kg, what is her recoil velocity?

   A) 7.1 cm/s
   B) 8.9 cm/s
   C) 14 cm/s
   D) 18 cm/s

Useful equations:

$$\mathbf{p} = m\mathbf{v} \qquad v_{cm} = \Sigma\, m\, v\, /\, \Sigma\, m \quad \mathbf{F} = d\mathbf{p}/dt$$

1.   A baseball weighs 5 ounces (140 g). If there were no friction between a 95-kg catcher and the dirt underneath him, how fast would he recoil after catching a 100 mile/hour fastball (v = 45 m/s)?

   A) 0 m/s
   B) 3.1 cm/s
   C) 6.6 cm/s
   D) 31 m/s

2.   An explosion blows a spaceship into two pieces of equal mass. If the spaceship was moving at 480 km/s before the explosion, what is the velocity of the center of mass of the two pieces afterwards?

   A) 0 km/s
   B) 240 km/s
   C) 480 km/s
   D) 960 km/s

Useful equations:

$$\mathbf{p} = m\mathbf{v} \qquad v_{cm} = \Sigma\, m\, v\, /\, \Sigma\, m \quad \mathbf{F} = d\mathbf{p}/dt$$