Quiz 7, Physics 2a, Nov 12 2010

Double check that you bubble in your code number correctly.

If there's a mistake, your score will be lowered –as a penalty.

1. A rifle bullet with mass $0.01kg$ strikes and embeds itself in a block of wood with mass $.99kg$ that rests on a frictionless horizontal surface and is attached to a coil spring. The impact causes the spring to compress $0.1m$. The spring is such that a force of $2.5N$ is required to compress the spring by $0.001m$.

   What was the block's velocity just after impact?

   (a) 2m/s

   (b) 5m/s

   (c) 10m/s

   (d) $50m/s$

2. Same setup. What was the bullet's initial speed?

   (a) 200m/s

   (b) 1000m/s

   (c) 500 m/s

   (d) 5000m/s

3. Blocks A and B are moving towards each other. Block A has a mass of $2.0kg$ and velocity of $+6m/s$, while block B has a mass of $4.0kg$ and velocity of $-3m/s$. They have a completely inelastic collision. The kinetic energy lost in the collision is

   (a) 0

   (b) 27J

   (c) 54J

   (d) 100J

4. A $30kg$ child stands on a frozen pond 12m away from its shore. The child throws a $2kg$ stone in the direction opposite the shore at a speed of $3m/s$. The pond is horizontal and frictionless. The time the child will take to reach the shore is:

   (a) 60s

   (b) 78s

   (c) 92s

   (d) 24s.

5. Max pitches a baseball of mass $0.2kg$. The ball arrives at home plate with a speed of $40m/s$ and is batted straight back to Max at a return speed of $60m/s$. If the bat is

in contact with the ball for $0.02s$, what is the magnitude of the impulse (the change of momentum) experienced by the ball?

(a) 360 N s

(b) 20 N s

(c) 400 N s

(d) 4 N s

6. Same setup, what is the average force exerted on the ball by the bat?

(a) 1000N

(b) 100N

(c) 10N

(d) 1N

7. A ball of mass $1kg$ moving at $+3m/s$ makes a head on collision with a second ball of mass $2kg$, that is initially at rest on a horizontal, frictionless surface. Take the direction of motion of the first ball as the $+x$ direction. If the collision is completely elastic, what is the velocity of the first ball after the collision?

(a) $-1m/s$

(b) $1m/s$

(c) $-2m/s$

(d) $-2m/s$

8. Same setup. How much energy was lost to heat in the collision?

(a) $\frac{9}{2}J$

(b) 9J

(c) 0

(d) not enough information given.

9. Mike has mass $m_M = 50kg$ and is initially at $x = 0$, running with velocity $v_M = 10m/s$. Bubba has mass $m_B = 200kg$ and is initially at $x = 25m$, running with velocity $v_B = 2.5m/s$. Where is the center of mass x_{CM} of Mike and Bubba?

(a) 0

(b) $12.5m$

(c) $20m$

(d) $25m$.

10. Same setup. What is their center of mass velocity?

(a) $1m/s$

(b) $2m/s$

(c) $3m/s$

(d) $4m/s$