Name Brown Date

Period Points available:

# Physics

## Worksheet – Conservation of Momentum

Answer the following questions while keeping the concepts of momentum and impulse in mind.

1. How can a rocket change direction in space, which is essentially a vacuum?

It shoots hot gasses one way, it goes the other way
Cons. of mom. Momentum gasses = Neg Momentum Rocket

2. A ball is dropped off the roof of a building. As it falls it gains velocity and momentum. This means the balls momentum is increasing. Does this mean the law of conservation of momentum doesn't hold true? Explain.

No. There is an external force (gravity) acting on it, so no cons. of mom.

3. A 72kg father is ice skating at a speed of 2.4m/s. As he skates by his 22kg daughter who is standing still in the ice, he picks he up and the move off together. Assuming no friction, how fast are the pair moving?

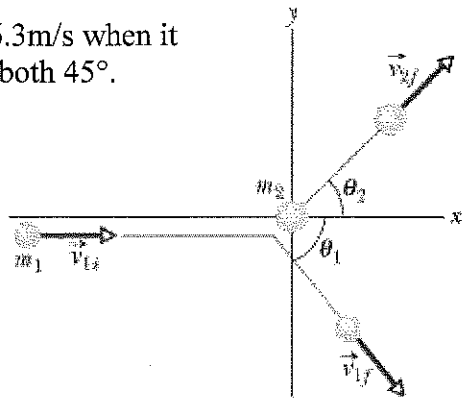
4. A 28g bullet traveling 230m/s lodges itself in a 3.6kg pendulum. How high does the pendulum swing?

5. A 55kg swimmer is standing on a stationary 210kg floating raft. The swimmer then runs off the raft with a velocity of 6.7m/s. What is the speed of the raft if you assume no friction between it and the water?

6. A spring is compressed between two blocks of wood. One has a mass of 45g and the other has a mass of 183g. The larger block has a velocity of 2.3m/s immediately after the spring is released. If $\mu_k$ is 0.76, how far apart are the blocks when they both come to a rest?

7. Pool balls have a mass of about 170g. The cue ball is moving at 6.3m/s when it strikes the 7 ball. Solve for the speed of each ball if $\theta_1$ and $\theta_2$ are both 45°.

Skip 7



3.

| K | U |
|---|---|
| $m_1 = 72$ | $V_f$ |
| $V_1 = 2.4$ | |
| $m_2 = 22$ | |
| $V_2 = 0$ | |

$p = p'$

$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v$

$72(2.4) + 0 = 94 v$

$\boxed{v = 1.84 \frac{m}{s}}$

4.

| K | U |
|---|---|
| $m_1 = .028 kg$ | $h$ |
| $V_1 = 230 \frac{m}{s}$ | $v$ |
| $m_2 = 3.6$ | |
| $V_2 = 0$ | |

$E_1 = E_2$

$mgh = \frac{1}{2} m v^2$

$h = \frac{v^2}{2g}$

$= \frac{1.78^2}{2g}$

$\boxed{h = 0.16 m}$

$p = p'$

$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_f$

$.028(230) + 0 = 3.628 v_f$

$v = 1.78 \frac{m}{s}$

5.

| K | U |
|---|---|
| $m_1 = 55 kg$ | $V_2$ |
| $m_2 = 20 kg$ | |
| $V_1 = 6.7 \frac{m}{s}$ | |

$p = p'$

$0 = m_1 v_1 + m_2 v_2$

$0 = 55(6.7) + 20(v_2)$

$\boxed{V_2 = -1.75 \frac{m}{s}}$

6.

| K | U |
|---|---|
| $m_1 = .045$ | $d$ |
| $m_2 = .185$ | $a$ |
| $V_2 = 2.3$ | $V_1$ |
| $\mu_k = 0.76$ | |

$p = p'$

$0 = m_1 v_1 + m_2 v_2$

$= .045 v_1 + .185(2.3)$

$\boxed{V_1 = 9.2 \frac{m}{s}}$

V block 1

accel of block

$F = ma$

$\mu mg = ma$

$.76(9.8) = a$

$\boxed{a = 7.45 \frac{m}{s^2}}$

block 1 dist

$V_f^2 = V_i^2 + 2ad$

$0 = 9.2^2 + 2(7.45)d$

$d = 5.68 m$

block 2 dist

$V_f^2 = V_i^2 + 2ad$

$0 = 2.3^2 + 2(7.45)d$

$d = 0.36 m$

$d = d_1 + d_2$

$= 5.68 + .36$

$\boxed{d = 6.04 m}$