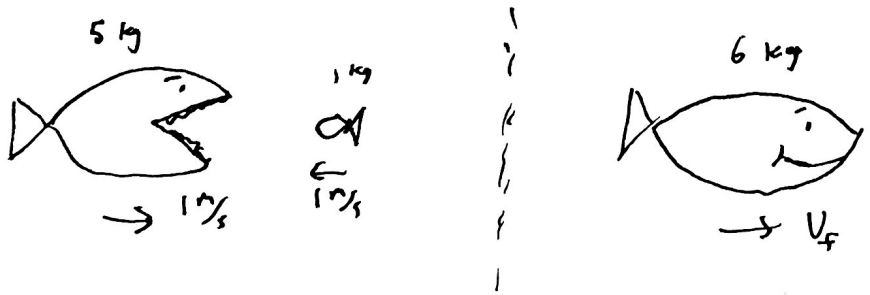
Test Review 4-3

1. Which has more momentum, a small car moving at 20 m/s or a large truck moving at 20 m/s?
2. What is the momentum of a 0.25 kg baseball moving 30 m/s towards home plate?
3. A 1.0 kg glider moving at 2 m/s to the right collides with another 1.0 kg glider initially at rest. If the 1st glider stops moving after the collision, what is the final velocity of the 2nd glider?
4. In what type of collision is kinetic energy conserved? Give an example of this type of collision?
5. A 2 kg blob of putty moving at 3 m/s collides with another 2 kg blob of putty at rest. Calculate the velocity of the two stuck together blobs of putty after colliding.
6. In terms of impulse and momentum, why are air bags a good idea?
7. A car with a mass of 1000 kg moves at 20 m/s. What braking force is needed to bring the car to a halt in 10 sec?
8. A 5 kg fish swimming at 1 m/s swallows a 1 kg fish moving towards the big fish at 1 m/s. What is the velocity of the big fish immediately after lunch?



Test Review Solutions 4-3

1. large truck, $p = mv$ & large truck has more mass, therfore more momentum

2. $p = mv = (0.25\,kg)(30\,m/s) = \underline{7.5\ kg\,m/s}$ towards home plate

3. conservation of momentum, $p_0 = p_f$ $\quad m_1 v_{1o} + m_2 v_{2o} = m_1 v_{1f} + m_2 v_{2f}$

$m_1 v_{1o} = m_2 v_{2f} \rightarrow (1.0\,kg)(2.0\,m/s) = (1.0\,kg)\,v_{f2}$

Final velocity of 2nd glider is $\boxed{2\,m/s \text{ to the right}}$

4. Elastic collision, problem 3 is an example

5. $p_0 = p_f$ $\quad m_1 v_{1o} + m_2 v_{2o} = m_1 v_{1f} + m_2 v_{2f}$ perfectly in elastic, both blobs move together after colliding. $m_1 v_{1o} + m_2 v_{2o} = (m_1 + m_2)\,v_f$

$(2\,kg)(3\,m/s) + (2\,kg)(0) = (2\,kg + 2\,kg)\,v_f \rightarrow 6\,kg\,m/s = (4\,kg)\,v_f$

$v_f = \frac{6\,kg\,m/s}{4\,kg} = \boxed{1.5\,m/s \text{ to the right}}$

6. Air bags increase your stopping time. Greater time of impact means less force of impact.

7. $\Delta p = F \Delta t$ $\quad F = \frac{\Delta p}{\Delta t} = \frac{0 - (1000\,kg)(20\,m/s)}{10\,sec} = -2000\,N$

The negative signs means the force is going in the opposite direction of the car's velocity. Magnitude of braking force is $\underline{2000N}$

8. perfectly in elastic $\quad p_0 = p_f$ $\quad m_1 v_{1o} + m_2 v_{2o} = (m_1 + m_2) v_f$

$(5\,kg)(1\,m/s) + (1\,kg)(-1\,m/s) = (5\,kg + 1\,kg)\,v_f$

little fish velocity is negative (It is going in opposite direction of big fish)

$4\,kg\,m/s = (6\,kg)\,v_f$ $\quad v_f = \frac{4\,kg\,m/s}{6\,kg} = \boxed{0.67\,m/s \text{ to the right}}$