Action and Reaction

Newton's third law of motion states:

_____

_____

_____

In other words:

_____

_____

Some examples of this law include:

_____

_____

_____

Action _____

Reaction _____

Result _____

Newton's third law can be used to describe how a swimmer moves through the water. With each stroke, the swimmer's arm _____ on the _____. The water _____ on the _____ with an _____ force in the _____ direction. The swimmer moves forward because the _____ force acts on the _____; the _____ force acts on the

_____. The swimmer, having _____ than the pool full of water, _____ than the water.

An important point to keep in mind when dealing with Newton's third law is that action-reaction forces always act on _____ objects. So, even though the forces may be _____, they are not _____. In the case of the swimmer, water _____ her _____, overcoming the _____ (or _____) she encounters. Thus, a net force, or _____ force, acts on the swimmer, and a _____ can take place.

Momentum

If a toy truck rolls toward you, you can easily stop it with your hand. However, you probably would not fare very well if it were a full-size semi, even if it were moving at the same speed as the toy truck. It takes more _____ to stop a semi because it has more _____ than the toy truck. _____ is a property a _____ has because of its _____ and _____. Momentum can be calculated with the equation below, in which _____ represents momentum.

_____ = _____ x _____

OR _____

The unit for momentum is _____.

A large boulder and a small boulder may be careening down a mountain at the same velocity, but the _____ rock has _____ momentum because it has _____ mass. A speeding bullet has _____ momentum

because it has _____ velocity, even if it has a _____ mass. A bumbling elephant may have low _____, but because of its _____ mass, it has a _____ momentum.

Conserving Total Momentum

The momentum of an object doesn't change unless its _____, or _____, or _____ change. But momentums can be _____ from one object to another. Think about a game of pool. Before the game starts, all of the balls are motionless. Therefore, the total momentum of the balls is _____. There can be _____ because _____ of the balls has a _____.

Think about what happens when a cue ball rolls across the pool table and hits the group of balls that are standing still. At first, the rolling ball has _____, and the motionless balls _____. When the cue ball collides with the balls that were at rest, all of the balls begin _____. They _____ momentum. The cue ball _____ _____ and _____ momentum. If you were to measure the total momentum of all the balls before and after the collision, it would be the _____. The momentum the group of balls _____ is _____ to the momentum that the cue ball _____. Total momentum is _____— it _____.

The law of conservation of momentum states:

_____

_____

_____