

Name _____ Date _____ Period _____

Integrated Science A Day

Newton's First Law

Isaac Newton (a 17th century scientist) put forth a variety of laws that explain why objects move (or don't move) as they do. These three laws have become known as Newton's three laws of motion. The focus of Lesson 1 is Newton's first law of motion - sometimes referred to as the **law of inertia**. Newton's first law of motion is often stated as

An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force.

The behavior of all objects can be described by saying that objects tend to "keep on doing what they're doing" (unless acted upon by an unbalanced force). If at rest, they will continue in this same state of rest. If in motion, they will continue in this same state of motion. If in motion with a leftward velocity of 2 m/s, they will continue in this same state of motion (2 m/s, left). The state of motion of an object is maintained as long as the object is not acted upon by an unbalanced force. All objects resist changes in their state of motion - they tend to "keep on doing what they're doing."

There is an important condition that must be met in order for the first law to be applicable to any given motion. The condition is described by the phrase "... unless acted upon by an unbalanced force." As long as the forces are not unbalanced - that is, as long as the forces are balanced - the first law of motion applies.

Everyday Applications of Newton's First Law

There are many applications of Newton's first law of motion. Consider some of your experiences in an automobile. Have you ever observed the behavior of coffee in a coffee cup filled to the rim while starting a car from rest or while bringing a car to rest from a state of motion? Coffee "keeps on doing what it is doing." When you accelerate a car from rest, the road provides an unbalanced force on the spinning wheels to push the car forward; yet the coffee (that was at rest) wants to stay at rest. While the car accelerates forward, the coffee remains in the same position; subsequently, the car accelerates out from under the coffee and the coffee spills in your lap. On the other hand, when braking from a state of motion the coffee continues forward with the same speed and in the same direction, ultimately hitting the windshield or the dash. Coffee in motion stays in motion.

NEWTON'S FIRST LAW OF MOTION

1. Newton's first law of motion is also known as the LAW OF _____.
2. Newton's first law says that a. an object that IS NOT MOVING, or is at _____, will stay at _____, AND an object that IS MOVING will keep moving with constant _____, which means at the same _____ and in the same _____, UNLESS an _____ force acts on that object.
3. What is inertia? _____
4. What property of an object determines how much inertia it has? _____
5. Which of the following has more inertia?
A. Bowling ball B. Tennis ball C. Hammer D. Feather
6. When you accelerate a car, what applies the unbalance force on the tires? _____
7. TRUE OR FALSE. All objects resist a change in their motion. _____
8. If you have coffee in your hand in a car and the car accelerates, what happens to the coffee? _____
9. If an object has a left velocity of 2 m/s N and no unbalanced force acts upon it, at what velocity will the object move? _____