E 3.1.1.1. Physics: A. Newton’s Three Laws of Motion
Parent Lesson Plan: Introduction to Newton’s First Law

Abstract

This parent lesson provides a basic introduction to Newton’s First Law of Motion, “an object in motion or at rest will stay in motion or at rest unless acted upon by an outside force.” This introductory information prepares students for their work with the chosen appendix.

Time: 15 Minutes

Objectives: Physics: A. Newton’s Three Laws of Motion

1. The learner will recognize examples of Newton’s Laws in the physical world.
2. The learner will demonstrate that an object in motion or at rest will stay in motion or at rest unless acted upon by an outside force. *(First Law)*
3. The learner will predict and determine the acceleration of an object when given the variables of mass and force. *(Second Law)*
4. The learner will conclude every action is followed by a reaction equal in magnitude and opposite in direction. *(Third Law)*

Lesson Plan

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* Complete the parent lesson and at least one of the appendices listed.
E 3.1.1.1. Physics: A. Newton’s Three Laws of Motion
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Pertinent Information

» Required Appendix: This parent lesson plan must be completed along with one of the approved accompanying appendices listed on page one.
**Key Vocabulary**

*Force*—A push or a pull that gives energy to an object, sometimes causing a change in the motion of the object.

*Inertia*—The tendency of an object to resist a change in motion. An object at rest will remain at rest unless an outside force acts on it. An object in motion will continue in the same direction at the same speed, unless an outside force acts on it. Newton’s First Law of Motion pertains to inertia.

*Scientific law*—A statement of fact meant to describe, in concise terms, an action or set of actions. It is generally accepted to be true and universal, and can sometimes be expressed in terms of a single mathematical equation. Scientific laws are similar to mathematical postulates and do not need any complex external proofs; they are accepted at face value based upon the fact that they have always been observed to be true. Specifically, scientific laws must be simple, true, universal, and absolute.
Newton’s First Law of Motion - Inertia

Newton’s Laws of Motion describe why objects move (or don’t move) as they do. We often state the first law as, “An object at rest tends to stay at rest, and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force.” We refer to this property as “inertia.” It is a tendency for an object to keep doing whatever it is currently doing, whether it is moving or staying still. Below are several examples of inertia (Henderson, 2012):

- A descending elevator makes a sudden stop and causes blood to rush from one’s head to their feet.
- Tightening the head of a hammer onto its wooden handle by banging the bottom of the handle against a hard surface.
- Dislodging ketchup from its bottle by turning the bottle upside down and thrusting it downward and then abruptly halting it.
- Whiplash injuries during rear-end collisions.
- Flying forward off a skateboard when hitting a curb, which abruptly halts the motion of the skateboard.
Instructor Preparation:  ✔ Select the appendix that you will use to complete the lesson investigation, following the outlined procedures.
Lesson:

1. From the students, elicit a definition for “force” by recalling previous lessons or personal knowledge. Guide the students to define force as a push or a pull, which transfers energy from one object to another.

2. Explain that Sir Isaac Newton lived almost 400 years ago and studied force and motion. His investigations established a set of laws, the “Laws of Motion.”

   Define a scientific law as something that we generally expect as always being true, regardless of time, place, or circumstance. We can observe Newton’s “Laws of Motion” at this very moment, all over the classroom.

3. Demonstrate, using a simple object such as a marker, that an object at rest will stay at rest unless an outside force acts upon it. Question students about the object at rest.

   Ask: Is the object at rest? (Yes, it is not moving.)

   Ask: What would have to happen for it to become an object in motion? (Someone or something would have to apply a force to it to make it move or become an object in motion.)

4. Explain Newton also observed that the opposite is also true: An object in motion will continue to travel along the same path of motion, at a constant speed, unless an outside force acts upon it. (This part of the law is much harder to observe because forces are in operation all around us, even those we can’t “see,” such as friction and gravity. It is likely the students have never seen an object that continued to move without stopping.) We call this tendency of an object to resist change in motion “inertia.”

   Ask: Is there somewhere we could go where the baseball would continue to travel at the same speed and same direction because friction or gravity would not act upon it? (Space, until it came close enough to another object that has gravitational pull.)

Strategic Questions:

Inertia states that an object in motion will stay in motion at the same speed and in the same direction forever unless a force acts on it. When we throw a baseball, why doesn’t it continue at the same speed and in the same direction forever? (Forces of gravity and friction act on the ball.)

Is there somewhere we could go where the baseball would continue to travel at the same speed and in the same direction because friction or gravity would not act upon it? (Space, until it came close enough to another object that has gravitational pull.)
Suggested Final Assessment Questions

1. In your own words, explain the Law of Inertia.

2. If you were to place an object in a room and close the door and you did not allow anyone or anything to open the door for 100 years, where would that object be when the door is opened?

3. In the picture to the right, what objects are at rest?

   What is in motion?

   What are some outside forces at work?

   What do you think will happen next?

4. A group of passengers are going uphill in a roller coaster when the track turns sharply down and to the left. What will happen to the bodies of the passengers?
Newton’s Third Law Assessment

Suggested Final Assessment Questions

Comprehension 1. In your own words, explain the Law of Inertia.

Answer: Something that is at rest will not move, but will stay at rest. It will always be at rest until some outside force makes it move. Once it starts moving, it will keep on moving in the same direction and at the same speed until some outside force makes it stop.

Application 2. If you were to place an object in a room and close the door and you did not allow anyone or anything to open the door for 100 years, where would that object be when the door is opened?

Possible answer: It would most likely be in the same place you left it because keeping the door shut will keep out an outside force. However, an earthquake, a flood, or a strong wind, like a tornado, could be an outside force that could cause the object to move.

Analysis 3. In the picture to the right, what objects are at rest?

Answer: The floor, the gutter, and the bowling pins.

What is in motion?

Answer: The bowling ball.

What are some outside forces at work?

Answer: The person pushing the ball, gravity, friction, the floor, and the pins.

What do you think will happen next?

Possible answer: The ball will hit the pins and the wall. They will act as an outside force and cause the ball to stop moving.

Synthesis 4. A group of passengers are going uphill in a roller coaster when the track turns sharply down and to the left. What will happen to the bodies of the passengers?

Answer: The passengers’ bodies will lean backward and toward the right because that is the direction they were already moving.
References:

