Edventures! BrickLab

Teacher Guide

Physics #11

NEWTON'S THIRD LAW OF MOTION

Objective: Students will experiment with LEGO® materials to gain an understanding of Newton's third law of motion.

***Vocabulary:**
SIR ISAAC NEWTON
FORCE
MOMENTUM
NEWTON'S THIRD LAW OF MOTION
MASS
VELOCITY

Materials: LEGO® bricks, String, Large rubber bands, Scissors, Rulers, Smooth, round pencils to act as rollers.

Preparation: Prepare and test your own device prior to having your students do this experiment.

Discussion: Lead a discussion focusing on key vocabulary terms. Introduce **Sir Isaac Newton** and his **third law of motion**: For every action, there is an equal and opposite reaction. This means it is not possible to exert a **force** on an object without exerting a force in the opposite direction. **Momentum** is an object's **mass** multiplied by its **velocity**. Newton's third law is often called the law of ***conservation of momentum***. When an object is given momentum in a certain direction, some other body will receive an equal momentum in the opposite direction. A real-life example is the recoil of a gun.

*Use the PCS Edventures™ Term Browser, http://www.edventures.com, or a dictionary to find vocabulary definitions.

Activity 1: Create a LEGO® launch pad and projectile using an 8x16 brick, LEGO® bricks, rubber bands, string, and pencils as shown. Use the scissors to snip the string and smoothly launch the projectile brick. Have students observe the amount of recoil by measuring the launch pad's movement in the opposite direction. Stage an informal challenge where students strive to get the most distance out of their recoil. Hint: Increasing the projectile mass, or the velocity of the launch, should increase this distance.

Activity 2: Challenge your students to collectively design a larger version of the Conservation of Momentum Machine built in activity 1. Form small groups and encourage them to work together to create this super slider using LEGO® materials and found objects.

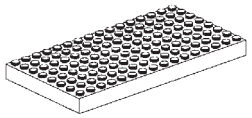
Activity 3: Challenge your students to identify and draw a diagram of unique examples of Newtons' third law in action in the real world.

Activity 4: Challenge your students to write a fictional newspaper article that announces the discovery of Newton's Third Law of Motion. Require them to use all of the pertinent vocabulary terms in the article.

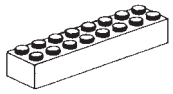
Project Plans

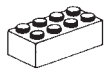
NEWTON'S THIRD LAW OF MOTION

Required Materials:


1 - 8x16 brick


2 - 2x2 bricks


2 - 2x8 bricks


11- 2x4 bricks

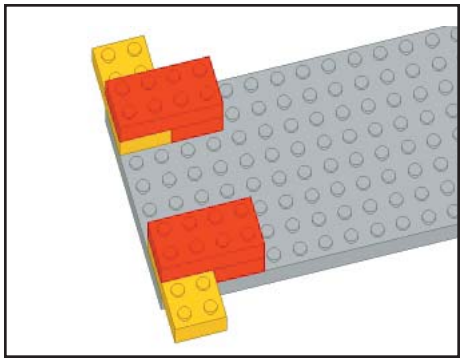

2 round pencils


string


rubber band

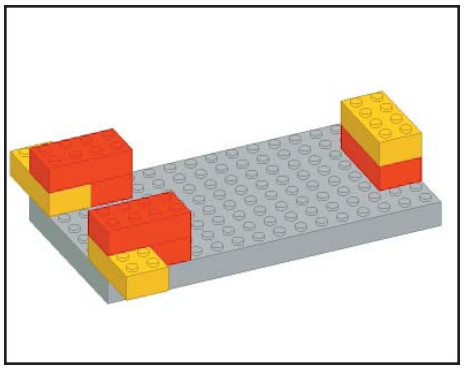
1. Place a 2x4 brick on the left-most corner of your building brick. Make the brick hang towards you with two studs out. Place a 2x2 flush with the edge next to the 2x4. Stack a final 2x4 over the 2x4 and 2x2. Repeat on the opposite side.

Check off when complete ☐



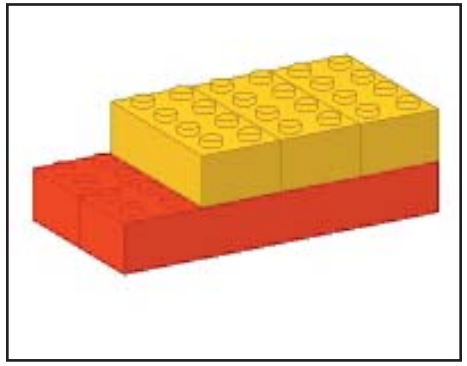
2. On the other end, place a stack of two 2x4 bricks two studs from either side and make them flush with the right side of the building brick.

Check off when complete ☐



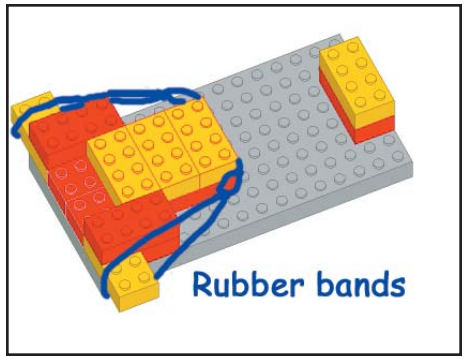
3. Build the launching cart by placing two 2x8 bricks side by side. Cover the 2x8s with three 2x2 bricks.

Check off when complete ☐



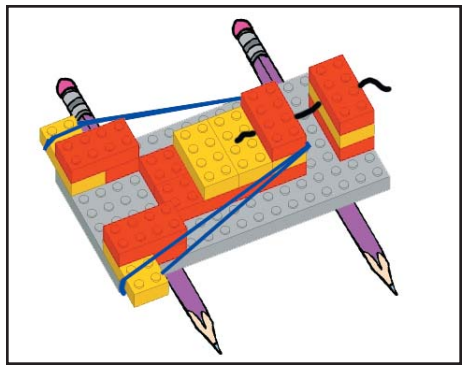
4. Loop one large rubber band, (or connect a few small rubber bands together) each end around the 2x4 bricks that stick off the building brick.

Check off when complete ☐



5. Place one end of a piece of string on the cart, then cover it with a 2x4 brick. Stretch the rubber band and place the other end of the string on the stack of 2x4s. Cover with a 2x4. Place two round pencils underneath. Cut the string to experiment!

Check off when complete ☐



Assessment

NEWTON'S THIRD LAW OF MOTION

Vocabulary Review:

SIR ISAAC NEWTON NEWTON'S THIRD LAW OF MOTION

FORCE MOMENTUM MASS VELOCITY

Multiple Choice:

1. The Third Law of Motion states that every action:

- ◯ Requires mass
- ◯ Has an equal and opposite reaction
- ◯ Has no opposite reaction
- ◯ None of the above

2. The Law of Conservation of Momentum:

- ◯ Was defined by Dr. Momentum in the year 1704
- ◯ States mass doesn't matter when calculating momentum
- ◯ Is also called Newton's Third Law of Motion
- ◯ None of the above

3. The formula for calculating momentum is:

- ◯ Momentum = Mass X Acceleration divided by Velocity
- ◯ Momentum = Mass X Velocity divided by Acceleration
- ◯ Momentum = Mass X Velocity
- ◯ None of the above

Questions to Ponder:

(Use these questions as a starting point for your journal entry.)

1. Explain Newton's third law of motion in your own words.

2. Is Newton's third law of motion true on the Moon?

3. Describe a real world example of Newton's third law.

Journal Entry:

Name: _____

Date: _____

Grade _____

Teacher Guide

Physics #12

VISIBLE LIGHT SPECTRUM

Objective: Students will learn about the visible light spectrum.

***Vocabulary:**
VISIBLE LIGHT SPECTRUM
REFRACTION
RAINBOW
WHITE LIGHT
COLOR

Materials: LEGO® bricks, Sunlight, Straight-sided glass tumbler filled with water

Preparation: Build the LEGO® device and conduct the experiment yourself first. Make certain you do the experiment on a sunny day and that the glass you use is straight and clear.

Discussion: Lead a discussion focusing on light and the visible light spectrum. Sunlight is **white light** and appears to have no **color**, however it can be **refracted**, or deflected from its straight path, to display its component colors. This occurs naturally when you see a **rainbow** after a rainfall. The **visible light spectrum** is comprised of Red, Orange, Yellow, Green, Blue, Indigo, and Violet. Introduce the pmnemonic, ROY G. BIV, to remember the visible light spectrum. For example, "Roy G. Biv is a friend of mine - he's a light hearted fellow."

*Use the PCS Edventures™ Term Browser, http://www.edventures.com, or a dictionary to find vocabulary definitions.

Activity 1: Students will build a LEGO® wall on a 8x16 building brick. It should be 14 bricks tall and have a slit one LEGO® stud in width (approximately 8 mm) running from the 8x16 brick base to the final capping row. Have the students place this device in a sunny window or outside so that sunlight projects through the slotted opening. Place the glass of water in front of this beam of light and it will refract the white light causing the visible light spectrum to be displayed. Have the students write down the colors displayed and their order. As a group, discuss the findings of each experiment and compare them to the actual colors of the visible light spectrum. Introduce the pneumonic Roy G. Biv for remembering the spectrum.

Activity 2: Challenge your students to use their refraction machine to test other light sources such as a fluorescent light bulb, halogen light, or regular incandescent bulb. Are the results the same?

Activity 3: Challenge your students to identify and diagram real-world examples of light, refraction, and the individual colors of the spectrum.

Activity 4: Challenge your students to pretend they are Sir Isaac Newton in the year 1702. They have just successfully conducted the first color spectrum experiment that proves white light is comprised of multiple colors. They need to write a letter to their mother (or other relative) explaining this remarkable discovery and what it means.