

# Unit 3: Energy, Forces, and Motion

Content Area: **Science**  
Course(s): **Science**  
Time Period: **Generic Time Period**  
Length: **Weeks**  
Status: **Published**

## Unit Overview

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In the Energy, Forces, and Motion unit, students will explore the concepts of energy, forces, and motion. Students will learn about different types of energy, but the focus will be on solar energy. Along with the effects of the sun, students will be able to describe and demonstrate how friction and gravity affect an object's motion as well as drive Earth systems.

## Standards

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SCI.5-6.5.2.6.E.1	Model and explain how the description of an object's motion from one observer's view may be different from a different observer's view.
SCI.5-6.5.2.6.E.2	Describe the force between two magnets as the distance between them is changed.
SCI.5-6.5.2.6.E.3	Demonstrate and explain the frictional force acting on an object with the use of a physical model.
SCI.5-6.5.4.6.E.1	Generate a conclusion about energy transfer and circulation by observing a model of convection currents.
SCI.7-8.5.1.8.B.2	Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.

## Essential Questions

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- How do forces affect the motion of an object?
- Why can the descriptions of an object's motion from one observer's view be different from another's view?
- Where and how can you see the effects of energy?

## Application of Knowledge and Skills...

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## Students will know that...

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- A. Vocabulary- motion, gravity, friction, force, accelerate, energy, convection current

- B. Newton's Laws of Motion
- C. Energy is neither created nor destroyed
- D. Ways to reduce friction
- E. Gravitational forces can act at distances
- F. The Sun is the major source of energy for circulating the atmosphere and oceans
- G. What convection currents are

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## Students will be able to...

- Calculate the amount of work done
- Demonstrate gravitational forces with magnets
- Describe and demonstrate how gravity and friction affect an object's motion
- Explain how force and mass affect acceleration
- Explain Newton's Laws of Motion
- Give examples of the different types of friction
- Measure force using a spring scale
- Use the formula,  $Work = Force \times Distance$

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## Assessments

### KWL Chart

Diagnostic: Instructional/Assessment Focus

Students will complete a KWL chart regarding the topics of forces, energy, and motion. (5.2.6 E1, E2, E3 and 5.4.6 E1)

### Friction and Gravity

Formative: Instructional/Assessment Focus

Assess on knowledge of friction and gravity. (5.2.6 E2, E3)

### Calculating Force and Work

Formative: Instructional/Assessment Focus

Assess students' ability to measure force and calculate work using the formula,  $Work = Force \times Distance$ . (5.1.8 B2)

### Types of Energy

Formative: Instructional/Assessment Focus

Assess on the different types of energy. Focus on solar- How do we know the sun is energy? (5.4.6 E1)

### Energy, Forces, and Motion Benchmark

Summative: Benchmark Assessment

(5.2.6 E1, E2, E3; 5.4.6 E1; 5.1.8 B2)

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## Activities

- **Experiment with Force-** Pull a brick across the floor. Then have the students use wooden dowels. Compare the force needed.
- **Experiment with Magnets-** What happens when you put two magnets together? Discuss north and south poles. What happens when the distance between the magnets is increased? decreased?
- **"Off to the Races" Ramp Activity-** Put five classroom objects, such as an eraser, coin, post-it, etc., at the top of a ramp. Experiment to see which objects move first and discuss why this may happen.
- **Rollercoaster Lab-** demonstrate potential and kinetic energy
- **Colorful Convection Currents-** Use four bottles of water (2 warm and 2 cold) and food coloring to color the warm water yellow and the cold water blue. Stack the bottles on top of each other and observe convection currents.
- **Experiment with Change in Force-** You need three different sized wooden balls, a small box or lid, and a ramp. Place the box at the edge of a ramp. Roll each ball down the ramp so that it hits the box. Experiment to see what happens when the applied force is changed.
- **Experiment with Change in Mass-** You need a wooden ball, eight washers, ramp, and a small box or lid. Place the box at the edge of a ramp. Start with no washers in the lid. Roll the ball down the ramp so it hits the box. Each trial add one more washer to the lid to see how the change in mass affects acceleration.
- **Experiment with Friction-** Pull a brick across a wooden board, then on waxed paper, then on sandpaper. Measure the force required with a spring scale.

### **Activities to Differentiate Instruction**

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- Satellite Motion- investigate how gravity is responsible for satellite motion in space
- NASCAR- investigate how forces affect car racing
- outline of class notes
- student and teacher completed study guides
- modified tests and quizzes
- tier 1, tier 2, tier 3 classwork and homework assignments

### **Integrated/Cross-Disciplinary Instruction**

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- People in Science- Sir Issac Newton
- Writing Activity-Have students list ten ways in which they experience Newton's laws of motion at home or at school. They can choose one situation and write about how this everyday experience reflects a universal law.
- Writing Activity- Have students write a short story that takes place in a world without gravity or without friction.
- Forces that act in the same direction add like regular numbers. A girl and a boy pull a wagon to the right. The girl applies 10 newtons. The boy applies 8 newtons. What's the total force on the wagon?

## Resources

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- Newton's Toy Box Delta Science Reader
- HSP New Jersey Science
- [http://www.globio.org/glossopedia/article.aspx?art\\_id=37](http://www.globio.org/glossopedia/article.aspx?art_id=37) for information on the sun
- <http://www.stevespanglerscience.com/experiment/00000031> for information on the Colorful Convection Currents Demonstration