

Physical Science: Magnetism

Teacher's Guide

Grade Level: 6–8

Curriculum Focus: Physical Science

Lesson Duration: 2–3 class periods

Program Description

Magnetism exists at the atomic level, as the movement of electrons creates magnetic fields. But it also exists on a universal scale, with stars and planets being the largest magnets. The force of magnetism coming from an object is its magnetic field. Earth's magnetic field, or magnetosphere, shields the planet from harmful radiation and particles carried on solar winds. In the early 1800s, it was discovered that electricity produces a magnetic field. Soon inventors learned how to generate electricity with magnets, and the generator was born. We rely on magnets to store data on computer disks and videotapes, to run electric motors, and to carry radio and television signals. Animals rely on magnetism to navigate during long migrations. It's the magnetite (lodestone) in their bodies that helps detect Earth's magnetic field and find direction. But look out. Earth's magnetic field isn't always stable. From time to time it drifts, shifts, or even reverses. Flow disturbances in Earth's molten iron core are to blame.

Discussion Questions

- Explain how magnetism works at the atomic level.
 - What is a magnetic field? What is the magnetosphere, and how does it protect Earth?
 - How are electricity and magnetism related?
 - What are some uses of magnetism in everyday life?
 - Name some animals that rely on magnetism to migrate or navigate. How are they able to detect Earth's magnetic field?
 - What is lodestone?
 - Explain how Earth's magnetic field is produced.
 - Why don't Earth's geographic and magnetic poles always line up? What causes the magnetic poles to shift over time, and how have scientists been able to detect the shifts?
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Lesson Plan

Student Objectives

- Be able to define magnetism.
- Learn about uses of magnetism and how it is important to our lives.
- Perform experiments with magnets and write a fantasy story about being able to manipulate magnetic fields.

Materials

- Computer with Internet access
- Print resources about magnetism
- Other materials specified in experiments mentioned below

Procedures

1. Review concepts of magnetism with the class. For online reviews visit the following Web sites:
 - <http://en.wikipedia.org/wiki/Magnetism>
 - http://www.sciencetech.technomuses.ca/english/schoolzone/Info_Magnets.cfm
 - <http://science.nasa.gov/ssl/pad/sppb/edu/magnetosphere/bullets.html>
 - <http://micro.magnet.fsu.edu/electromag/index.html>
2. Even more fun is to experiment with magnets first hand. Magnet activities abound. Here are just some of the online sources, most using magnets and other easy-to-come-by materials:
 - Discovery School has two lesson plans featuring magnet experiments:
Curriculum Center: Magnetism
<http://school.discovery.com/curriculumcenter/magnetism/>
and Understanding Magnetism
<http://school.discovery.com/lessonplans/programs/understanding-magnetism/index.html>
 - The Exploratorium: Snacks About Magnetism
<http://www.exploratorium.edu/snacks/iconmagnetism.html>
 - Magnet Man: Cool Experiments with Magnets
<http://my.execpc.com/~rheadley/magindex.htm>
3. A great way to wrap up your magnet studies and to emphasize the importance of magnetism in our lives is to let students walk in the shoes of a superhero with ability to manipulate magnetic fields. Have students write a brief essay beginning with the sentence: "If I could control magnetism, I would" In their essays, students should focus on technologies or natural



phenomena they could affect with their super power. How would they use that power? What might be the result?

4. Share the essays with the entire group.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students were highly engaged in class discussions; successfully conducted magnet experiments; wrote a creative, thoughtful story.
- **2 points:** Students participated in class discussions; conducted magnet experiments; wrote a good story.
- **1 point:** Students participated minimally in class discussions; did not successfully conduct magnet experiments; turned in a poorly written story.

Vocabulary

aurora

Definition: Bands of light that can be seen in the skies at high latitudes

Context: Auroras are created when charged particles from the sun get caught in Earth's magnetic field.

electromagnetism

Definition: The relationship between electricity and magnetism

Context: Thanks to electromagnetism, magnets and wire can be used to generate electricity.

magnetism

Definition: A force created by the movement of electrons

Context: Magnetism exists at the atomic level and on a universal scale, with stars being the largest magnets.

magnetic field

Definition: A force that exists around a magnet or electric current

Context: Magnetic fields have two poles, one positive and one negative.

magnetite (lodestone)

Definition: A mineral that is naturally magnetic

Context: Traces of magnetite in animals' bodies helps them detect Earth's magnetic field.

magnetosphere

Definition: Earth's magnetic field

Context: The magnetosphere shields Earth from radiation and solar particles.



Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K–12. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>

This lesson plan addresses the following national standards:

- Physical Science: Transfer of energy; Science as Inquiry: Abilities necessary to do scientific inquiry

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K–12 Education addresses 14 content areas. To view the standards and benchmarks, visit

<http://www.mcrel.org/compendium/browse.asp>

This lesson plan addresses the following national standards:

- Science: Physical Sciences – Understands forces and motion; Nature of Science – Understands the nature of scientific inquiry
 - Language Arts: Viewing – Uses viewing skills and strategies to understand and interpret visual media; Writing – Uses the general skills and strategies of the writing process, Gathers and uses information for research purposes; Reading – Uses reading skills and strategies to understand and interpret a variety of informational texts
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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