



Classroom Teacher Preparation

Physics 1: Introduction to Magnetism

Please use the following to prepare for the next SfS lesson.

Description:

This module provides an experience-based introduction to the behavior and properties of magnetic materials. In the unstructured option, students use the class time to investigate the materials independently, while the structured option uses independent exploration as an introduction to specific challenges. Students will use different types of magnets and items including iron filings to explore the strength of magnetic forces, as well as what happens when magnets interact.

Lesson Objectives – SWBAT (“Students Will Be Able To...”):

3rd-5th

- Describe the relationship between the strength of a magnetic force and distance
- Analyze the interaction of magnets based on the orientation of their poles

Disciplinary Core Idea (DCI)

PS2 Motion and Stability – Forces and Interactions

- (3rd-5th) *PS2.A Forces and Motion* - The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center.
- (3rd-5th) *PS2.B Types of Interactions* - Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Science & Engineering Practice (SEP)

Planning and Carrying Out Investigations

- (3rd-5th) Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Crosscutting Concept (CCC)

Cause and Effect

- (3rd-5th) Cause and effect relationships are routinely identified, tested, and used to explain change.

Preparation:

This is an introductory lesson intended for younger students. No previous exposure to the topic is required.

Room Set Up for Activities:

Students will work at their desks, sharing materials and observations with a partner.



Safety:

Students should not put magnets on their bodies, especially not on or near their faces. Making magnetic “earrings” can pinch, and sticking magnets to metal on clothing (belt buckles, etc.) is a good way to lose our magnets.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **magnetism**. Modules include:

Engineering 8: Build a Magnet Detector – Students design, build, and test a magnet detection device. During the testing process, they have the opportunity to observe that not all metals are magnetic.

Physics 9: Electromagnetism – Students build and test their own electromagnets, gaining an experiential understanding of how electromagnets work and how to modify the magnetic fields they produce.

Chemistry 4: Separation of Substances – Students design and implement a multi-step purification process for a mixture of rice, sand, and iron (providing another opportunity for the practical application of magnets).

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state:

www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

For those with no fear of mess-making, check out the Magnetic Slime extension activity!

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- Magnetism basics: <https://www.explainthatstuff.com/magnetism.html>
- Another version; check out their images of magnetic fields of different magnets, as visualized by iron filings: <https://www.first4magnets.com/magnetism-for-kids-i147>
- Students may have heard about Earth’s magnetic field “flipping”. More info on this topic can be found here: <https://www.pbs.org/wgbh/nova/earth/when-our-magnetic-field-flips.html>
- And here: <https://www.pbs.org/wgbh/nova/magnetic/>
- A higher-level discussion of magnetism, including its relationship to electricity: <https://www.wgbh.org/program/crash-course-physics/magnetism-crash-course-physics-32>