



Classroom Teacher Preparation

Physics 9: Electromagnetism

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

Description:

This lesson introduces electromagnetism as students explore electric current producing a magnetic field. Students build and test their own electromagnets, gaining an experiential understanding of how electromagnets work and how to modify the magnetic fields they produce.

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

6th-8th

- Explain how the strength of an electromagnet is affected by the number of coils around the core material, number of batteries, and/or the type of core material
- Demonstrate that the magnetic field of an electromagnet can be turned on and off by turning the electric current on and off

Disciplinary Core Idea (DCI)

PS2 Motion and Stability: Forces and Interactions - PS2.B Types of interactions

- (6th-8th) Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object.

Science & Engineering Practice (SEP)

Asking Questions and Defining Problems

- (6th-8th) Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

Developing and Using Models

- (6th-8th) Develop and/or use a model to predict and/or describe phenomena.

Crosscutting Concept (CCC)

Energy and Matter: Flows, Cycles, and Conservation

- (6th-8th) Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).

Preparation:

It is helpful if the students have some experience with magnets, and the fact that they can attract some metal objects, as well as a basic understanding that an electrical circuit must be complete in order for charge to flow.

Room Set Up for Activities:

Students will work in pairs at tables or clusters of desks.



Safety:

We will use batteries to power the electromagnets; the batteries and circuit components will get warm if left connected for too long. Students need to follow instructions regarding disconnecting the circuit whenever they are not actively testing their electromagnets.

Related Modules:

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

Physics 2: Electrical Conductivity – A basic introduction to electricity, insulators, & conductors. Students build a simple circuit, test the conductivity of various materials, and explore how a switch works.

Physics 8: Circuits – This lesson focuses on the path of electrons through a closed circuit, as students explore and create three circuits with light bulbs: a simple circuit, a series circuit, & a parallel circuit.

Physics 7: Electrostatics – Students will learn the fundamentals of electrostatics and its role in everyday life.

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:

Extend this lesson by creating a compass using a sewing needle, a piece of cork, and a magnet.

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:

- A thorough review of electromagnets, how they work, how to make them, and their applications is available here: <http://science.howstuffworks.com/electromagnet.htm>
- For a little more perspective on the importance of the topic, check out this SciShow episode: <https://youtu.be/cy6kba3A8vY> (3:17)