



Classroom Teacher Preparation

Physics 2: Electrical Conductivity

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

Description:

In this introduction to electrical conductors and insulators, students are challenged to build a simple circuit, test and classify various materials as conductors or insulators, and add a switch to the circuit. Students will then use the evidence gathered in their exploration to explain why wires are made of a copper core encased in a plastic coating.

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

3rd-5th

- Identify the minimum requirements for a circuit (power source, a load or output device, conductor, closed loop)
- Use evidence to explain why wires are constructed as a copper (or other metal) core inside a plastic sheath

Disciplinary Core Idea (DCI)

PS3. Energy

- (3rd-5th) *PS3.B: Conservation of Energy & Energy Transfer* – Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another form.
- (3rd-5th) *PS3.D: Energy in Chemical Processes and Everyday Life* – Energy can be “produced,” “used,” or “released” by converting stored energy. Plants capture energy from sunlight, which can later be used as fuel or food.

Science & Engineering Practice (SEP)

Constructing Explanations and Designing Solutions

- (3rd-5th) Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- (3rd-5th) Identify the evidence that supports particular points in an explanation.

Crosscutting Concept (CCC)

Energy and Matter: Flows, Cycles, and Conservation

- (3rd-5th) Energy can be transferred in various ways and between objects.

Preparation:

This lesson is an introduction to electrical conductors, insulators, and simple electric circuits. Students should be familiar with the concept of energy and how energy can be converted from one form to another.

Room Set Up for Activities:

Students will work in pairs to build simple circuits and test the conductivity of different materials.



Safety:

Students will be cautioned not to wire a battery to itself with no light bulb in the circuit. This is a short circuit and can cause the battery to overheat.

Related Modules:

Physics 7: Electrostatics – Students will learn the fundamentals of electrostatics and build an electroscope, a simple tool to measure the qualitative charge produced by different materials.

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 16: Energy - This station-based module presents the concept of energy as the ability to do work and familiarizes students with many forms of energy. Students explore various conversions of energy through different activities.

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 using homemade conductive and insulating dough to build “Squishy Circuits.”

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:

- Electricity introduction (1:53) <http://mass.pbslearningmedia.org/resource/idptv11.sci.phys.energy.d4kele/electricity/>
- Electric circuit lesson plans: http://mass.pbslearningmedia.org/resource/phy03.sci.phys.mfe.lp_electric/electriccircuits/
- SciShow – “A Plastic that Conducts Electricity?” (4:39): <https://youtu.be/DILZVxNK3Jg>
- Why do metals conduct electricity? (1:04) <https://mass.pbslearningmedia.org/resource/nvtoe-sci-metalconduct/wgbh-nova-treasures-of-the-earth-why-do-metals-conduct-electricity/>