



Classroom Teacher Preparation

Physics 8: Circuits

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

Description:

This lesson focuses on the path of electrons through a closed circuit. Students will experiment by creating three circuits with light bulbs: a simple circuit, a series circuit, & a parallel circuit. They will use their observations to explain why a string of lights wired in series will all go out if one bulb is removed, but not if the lights are wired in parallel. Students will then explain that energy is converted into different forms by electrical circuits.

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

3rd-5th

- Trace the path of electrons through simple, series, and parallel circuits
- Explain that electricity is a form of energy that can be converted into other forms of energy

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...

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.

Crosscutting Concept (CCC)

Energy and Matter: Flows, Cycles, and Conservation

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

Preparation:

In terms of wiring, this lesson is slightly more advanced than *P02: Electrical Conductivity* (only simple circuits).

In addition, students are asking to trace the path of electrons in their circuit, thus they need a basic understanding of what electrons are: students should know that atoms are made of electrons orbiting a nucleus and that electricity is the flow of electrons.

Room Set Up for Activities:

Students will work in groups of 2-3 to build simple and complex circuits and explain how the electricity flows through them.



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 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 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 16: Energy - This station-based module 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 experimenting with batteries in parallel and series.

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:

- Science for Kids - What are Series Circuits (8:17): <https://youtu.be/2d8CUQokims>
- Science for Kids – What are Parallel Circuits (4:36): <https://youtu.be/YaBdEvJpvMk>
- Bozeman Science – Series & Parallel Circuits (8:04): https://youtu.be/x2EuYqj_0Uk
- Building a battery bank (4:53): <https://www.youtube.com/watch?v=w1Mqn6Ewvio>
- The Physics Classroom lessons on circuit electricity: <http://www.physicsclassroom.com/class/circuits>