Classroom Teacher Preparation

Physics 18: Ohm's Law

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

Description:

This lesson is a more advanced version of our lesson on Circuits. Students are assumed to have a thorough understanding of the basics of electricity. Ohm's Law is discussed in depth and resistors are introduced as useful circuit elements. The use of multiple resistors in a circuit is explored; specifically the effect of using them in series vs. parallel. This lesson is aimed at older (6-8th grade) students. For an introduction to the topic of circuits and electricity, see P02: Electricity or P08: Circuits.

Lesson Objectives – SWBAT ("Students Will Be Able To…"):

6th-8th

- Know that electrons flow from negative to positive terminals, but current is defined as flowing from positive to negative
- Define a resistor, output device, and switch
- Predict the effect of adding resistors to the circuit in series or in parallel
- Design and build a circuit with multiple resistors
- Calculate the total resistance provided by two resistors in parallel

Disciplinary Core Idea (DCI)

PS3 Energy – PS3.C Conservation of Energy and Energy Transfer

- (6th-8th) Kinetic energy can be distinguished from the various forms of potential energy. *Energy changes to and from each type can be tracked through physical or chemical interactions.* The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter.

Science & Engineering Practice (SEP)

Using Mathematics and Computational Thinking

Preparation:

Students should be comfortable with the concept of electricity being the flow of electrons, and should understand that a circuit is a closed loop through which electricity can flow. In addition, students should have been introduced to series and parallel circuits, covered in lesson *P08: Circuits.*

Room Set Up for Activities:

For the activity, students will work in small groups of 2-3 to build circuits on a breadboard. No special equipment or space is required.

Safety:

Care must be taken when working with electricity, and the components are delicate. The circuits should be tested only briefly to avoid burning out any components.

Related Modules:

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

Physics 2: Electricity – A basic introduction to electricity and circuits for younger audiences without prior exposure. Students create a simple circuit, battery, and test the conductance of various materials.

Physics 9: Electromagnetism – Students build their own electromagnet using wire coils and a nail and learn how to make a field stronger.

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: http://www.sciencefromscientists.org/standards/

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

After Our Visit:

Extend this lesson by building a simple circuit with a constructed resistor

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:

WGBH Videos and Activities: The PBS educational site is a great, **free** resource for educators but you must create an account to use the materials. The first time you log in to the PBS Learning Media website you will be asked to create an account and provide an email and password. Once you have logged in, select "keep me logged in" to avoid having to repeat the process.

- Electric circuit lesson plans: http://mass.pbslearningmedia.org/resource/phy03.sci.phys.mfe.lp_electric/electric-circuits/