

Electricity Unplugged

Grades: 2nd-9th

Duration: 30 minutes

Program Description

Play a part in a “hair-raising” experience learning about static electricity, alternating current, electromagnetic, insulators, and conductors. Guaranteed to give you thrills!

Louisiana GLE:

Science

Grade 2

1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
6. Use the five senses to describe observations (SI-E-A3)
25. Investigate ways of producing static electricity and describe its effects (PS-E-C4)

English Language Arts

Reading and Responding

Standard 7

20. Apply basic reasoning skills

Speaking and Listening

Standard 4

38. Adjust speaking tone and volume to suit purpose and audience
42. Deliver informal presentations that demonstrate an understanding of a topic
44. Use active listening strategies, including asking for clarification and explanations

Grade 3

1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
6. Use the five senses to describe observations (SI-E-A3)
29. Determine which materials insulate best by using experimental data (PS-E-C3)
30. Demonstrate and explain the movement of electricity in closed and open circuits (PS-E-C4)
31. Compare and describe the common forms of energy and explain how they are used in everyday life (e.g., light, electricity, heat, mechanical) (PS-E-C6)
32. Give examples of how energy can be used to move or lift objects (PS-E-C6)

English Language Arts

Reading and Responding

Standard 7

21. Apply basic reasoning skills

Speaking and Listening

Standard 4

38. Give and follow precise directions and instructions

42. Use active listening strategies

44. Assume the role of contributor and active listener

Grade 4

1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)

2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)

4. Predict and anticipate possible outcomes (SI-E-A2)

7. Use the five senses to describe observations (SI-E-A3)

36. Test and classify materials as *conductors* and *insulators* of electricity (PS-E-C4)

37. Demonstrate how a complete circuit is needed for conducting electricity (PS-E-C4)

English Language Arts

Speaking and Listening

Standard 4

34. Adjust pacing to suit purpose, audience, and setting when speaking

35. Interpret, follow, and give multi-step directions

37. Demonstrate active listening strategies, including asking questions, responding to cues, and making eye contact

38. Adjust speaking content according to the needs of the audience

Grade 5-8 Science and Inquiry

1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)

12. Use data and information gathered to develop an explanation of experimental results (SI-M-A4)

22. Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)

Science

Grade 5

3. Describe the structure of atoms and the electrical charge of protons, neutrons, and electrons (PS-M-A2)

14. Identify other types of energy produced through the use of electricity (e.g., heat, light, mechanical) (PS-M-C6)

English Language Arts

Speaking and Listening

Standard 4

32. Adjust diction and enunciation to suit the purpose for speaking

33. Use complete sentences and standard English grammar, diction, syntax, and pronunciation when speaking

35. Restate or describe oral directions/procedures for tasks

36. Adjust volume and inflection to suit the audience and purpose of presentations

38. Demonstrate active listening strategies

39. Deliver formal and informal presentations for a variety of purposes, including:

41. Participate in group and panel discussions

Grade 6

30. Trace energy transformations in a simple system (e.g., flashlight) (PS-M-C2)

Grade 9-12 Science and Inquiry

2. Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)

16. Use the following rules of evidence to examine experimental results:

(d) Were standards and controls applied and maintained?

Physical Science

44. Illustrate the production of static electricity (PS-H-G2)

47. Explain how electricity and magnetism are related (PS-H-G2)

Key Terms

Alternating Current – Also called AC; electricity that flows back and forth through a wire

Atom – The smallest particle of matter that exists in nature.

Circuit – An arrangement of electronic elements, including conductors, resistors, and the like, through which electric current moves

Conductor – A materials that allows the flow of electrons

Current – The flow of electrons in a conductor (measured in amperes)

Direct Current – Also called DC; electricity that flows only in one direction through a wire

Electricity – A physical phenomenon caused by the movement of certain charged particles such as electrons, esp. between points having different electrical charges, and seen in naturally occurring phenomena such as lightning and magnetic attraction and repulsion.

Electron – A negatively charged particle, considered a fundamental unit of matter, that exists independently or outside the nucleus of an atom.

Electromagnet – A magnet in which an iron or steel core is magnetized by the electric current in the coil of insulated wire wound around it.

Insulators – A materials that impedes the flow of electrons

Magnet – An object that attracts iron and some other materials by virtue of a natural or induced force field surrounding it.

Magnetism – The class of phenomena exhibited by the lines of force surrounding a moving charged particle; these lines of force are created by particles all moving in the same direction

Magnetic Field – Consists of imaginary lines of flux coming from moving or spinning electrically charged particles. Examples include the spin of a proton and the motion of electrons through a wire in an electric circuit

Nucleus – The positively charged mass within an atom, composed of neutrons and protons, and possessing most of the mass but occupying only a small fraction of the volume of the atom.

Neutron – An electrically neutral particle, considered a fundamental unit of matter, that exists inside the nucleus of an atom.

Parallel Circuit – A closed electrical circuit in which the current is divided into two or more paths and then returns via a common path to complete the circuit

Proton – A positively charged particle found in the nucleus of an atom

Resistance – A measurement (in ohms) of how much a material opposes the flow of electricity (Wood has high resistance so it is a poor conductor of electricity. Copper has low resistance, so it is a good conductor of electricity.)

Series Circuit – An electric circuit connected so that current passes through each circuit element in turn without branching.

Static Electricity – An accumulation of electric charge on an insulated body; electric discharge resulting from the accumulation of electric charge on an insulated body

Voltage – Electrical force or pressure (measured in volts); potential difference between charges

Connections to Permanent Exhibits: All of these exhibits are found in the Physical Sciences Gallery on the second floor.

Voltage Divider: Slide the contact of a rheostat and see the light bulbs wired between the slider and the ends change in intensity; balance the lights; meters show how the voltages are changing.

Polar Power-Electric Wand: Move the bar back and forth through the coil. What happens? Why?

Polar Power-Magnetic Force: Push the button. What happens? Why?

Polar Power-Motors: Push the button. What happens? Why?

Polar Power-Generators: Crank the handle on the right. Crank the handle on the left. How are they different? What do they do? Why?

Plasma Tower: Touch a glowing tube of gas. The glow intensifies and reaches toward your fingers.

Series and Parallel Circuits: Wire up bulbs and other circuit elements in series and parallel circuits and observe the effects.

Bulbs and Batteries: Your students can connect bulbs and batteries to light up the bulbs.

What's a Watt?: Pedal a bicycle generator; select a light bulb, hand drill or hair dryer to power by yourself.

Horsepower: Crank the engine. How much horsepower do you generate?

Jumping Ring: When you push a button; electric charge causes an aluminum ring to leap up into the air.

Jacob's Ladder: Send a high voltage charge between two metal rods to see electrical ionization.

Resources!

Electricity and Magnetism Montessori Schools Albany, New York
<http://webhelp.albany.k12.ny.us/suny/em/index.html>

