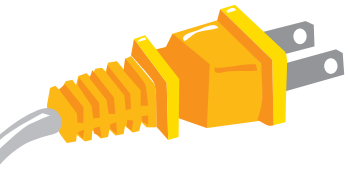


Bill Nye the Science Guy

Electrical Current

Table of Contents

National Science Education Standards

Electrical Current

Standards/Benchmarks – Grades 5-8

Science as Inquiry

Abilities necessary to do scientific inquiry

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.

Understandings about scientific inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Current scientific knowledge and understanding guide scientific investigations. Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.

Physical Science

Transfer of energy

- Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.
- Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.
- In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.
- The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

Science and Technology

Understandings about science and technology

- Scientific inquiry and technological design have similarities and differences. Scientists propose explanations for questions about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations. Technological solutions are temporary; technologies exist within nature and so they cannot contravene physical or biological principles; technological solutions have side effects; and technologies cost, carry risks, and provide benefits.

History and Nature of Science

Science as a human endeavor

- Women and men of various social and ethnic backgrounds—and with diverse interests, talents, qualities, and motivations—engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.
- Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.

Episode Guide
Electrical Current

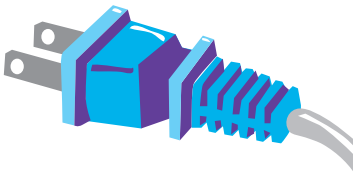
Nifty Questions in This Episode	Awesome Answers
What is electricity?	Electricity is the flow of tiny particles called electrons.
What is an electrical circuit?	An electrical circuit is a closed path for electrons to travel (the way water goes around inside a water pipe).
How much electrical power does your brain use?	Your brain uses the same amount of electrical power as a ten-watt light bulb.
What are electrons?	Electrons are tiny particles on the outsides of atoms.

Experiments shown on the video:

MAKE A CIRCUIT

Objective: To make a complete circuit.

- Tape two D-cell batteries together (positive to negative) to form a parallel circuit.
- Tape one wire to the front and one to the back (positive and negative terminals) of your battery circuit and tape the batteries to a wooden board.
- Hold a flashlight bulb to the positive terminal of the battery.
- Have a partner touch different items with both wires to make a circuit.
- The light will go on when the circuit is complete (with metal).



More interesting stuff to do:

ELECTRICAL MOMENTS

Objective: To demonstrate electricity as a form of energy.

- Wind 50 turns of insulated wire (fine-grade) around a compass very tightly.
- Close the ends of the wire together over the north and south poles of the compass.
- Attach an alligator clip (spring-aided clip with serrated edges) to each end of the wire.
- Find magnetic north and line the compass needle up with the north and south poles of the compass.
- Simultaneously touch an alligator clip to each side of a D-cell battery.
- Does the compass needle move? Explain.
- Try using solar cells (place them in the sun) instead of a battery. Is the result the same? Why?

ANOTHER GENERATION

Objective: To make a simple generator.

- Wind 100 turns of fine-grade insulated wire very tightly and close together around an empty bathroom tissue roll or a cut-down paper towel roll.
- Attach one wire to the bottom of a flashlight bulb, the other to the bulb's metal side.
- Place one end of a bar magnet into the paper tube (the quicker, the better). Does the bulb light up?
- Try placing the bulb at a greater distance from your generator and connect the bulb to the wires.
- Is the result exactly the same as when the bulb is close to the generator? Why?
- Do magnets generate electricity? Explain.

Student Recording Sheet

Name _____ Date _____

Title of Experiment _____

Question: (What are you testing?) _____

Procedure: (Describe the experiment) _____

Materials: (List what you used) _____

Observations: (Record what happened) _____

Results: (Make your own data table)

Conclusions: (Use your observations and results to describe what you learned)

Glossary

Electrical Current

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ELECTRICITY (ELECTRICAL ENERGY)

Electricity (electrical energy)
The type of energy generated by moving charged particles, such as electrons.

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ELECTRICAL CIRCUIT

Electrical Circuit
The complete path of an electric current, usually including a generating device.

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SOLAR POWER

Solar power
Energy supplied by electromagnetic radiation from the sun.

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CONDUCTOR

Conductor
A substance or body capable of readily transmitting electricity or heat.

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INSULATOR

Insulator
A non-conducting substance or body.

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VOLT

Volt
A unit of electromotive force which, when applied to a conductor whose resistance is one ohm will produce a current of one ampere.

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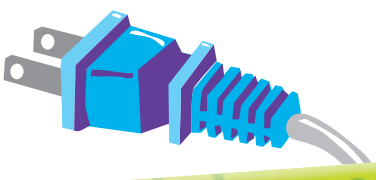
WATT

Watt
A unit of power or work of one ampere of electric current under a pressure of one volt.



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ELECTRIC POLE

Electric pole

One of two terminals of an electric cell, battery or generator; one is designated positive and the other negative.

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ALTERNATING CURRENT

Alternating Current

A periodic conduction current that reverses its direction at regular intervals.

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DIRECT CURRENT

Direct Current

An electric current flowing in one direction only.

Name _____ Date _____

Quiz

Electrical Current

True or False? Circle T or F

1. A battery converts chemical energy to electrical energy. T or F

2. A battery produces alternating current. T or F

3. Metals are good insulators. T or F

4. Falling water can be used to generate electricity. T or F

5. A light switch can be used to open or close an electrical circuit. T or F

6. Solar cells can be used to power calculators and cars, and to heat buildings. T or F

Multiple Choice: Circle the letter of the best answer.

7. An electrical current is described as being moving
   - A Protons
   - B Neutrons
   - C Electrons
   - D Atoms

8. Which of the following is NOT a term that is used to describe electrical current?
   - A Temperature
   - B Amperage
   - C Volts
   - D Watts

Quiz

Electrical Current

1. T
2. F
3. T
4. T
5. T
6. T
7. C
8. A

electrical current