


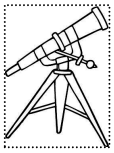

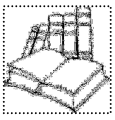

An Introduction to Electricity

2008
25 minutes

Teacher Notes:
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Program Synopsis

The program begins by introducing the students to the earliest observations of electricity such as lightning, and the attraction of dust and straw fragments to a piece of amber that has been rubbed with cloth. Students observe how static electricity is related to positive and negative charges, how they repel and attract and where these charges come from. They are introduced to the concept of current electricity and simple circuits; both parallel and series, and the analogy of a stream is used to explain the concepts of voltage and resistance. The program covers the generation of electricity and both renewable and non-renewable energy sources.

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Related Programs

- Methods of Heat Transfer
- Electromagnetic Radiation – Wave and Particle Modes of Light

Introduction

This program explores how electricity was observed by ancient people as lightning, and in the attraction of small fragments of straw to a piece of amber that had been rubbed with some cloth. Students are introduced to the concept of static electricity and they see how rubbing some materials removes one charge, leaving the object charged with the opposite charge. The program explains how these charges come from the atoms, and that like charges repel and unlike charges attract. The program investigates current electricity and demonstrates how a simple circuit allows the current to flow, and the difference between series and parallel circuits. It is explained how current is measured in amperes, and the analogy of a stream of water is used to explain the concepts of voltage and resistance. The program concludes after showing how electricity is generated from both renewable and non-renewable energy sources.

Program Rationale

The program is aimed at students in the first years of secondary school where the topic 'Electricity' is part of most science curriculum. It is also suitable for use in the last years of primary school where students may be questioning how their electric lamps or other appliances work, or why a plastic pen or comb will pick up small pieces of paper when rubbed with an item of clothing. The program should answer most of the questions students of this age are likely to ask, and will possibly raise questions that teachers can use for more in-depth research.

Program Timeline

00:00:00	Introduction
00:01:30	What is electricity?
00:03:05	Static electricity
00:08:25	Using electricity
00:11:45	Measuring electricity
00:23:55	Credits
00:25:09	End program

Useful Resources

Books and Other Print Resources

- Any standard junior science text book
- Achieve Science Series "Energy Electricity Movement" by Gill Murphy, Published by Blake Education
- Assignments in Junior Science Book 1 Electricity by Suada Bilau and Chris Greef, published by Blake Education

Internet Resources:

- http://www.edfenergy.com/powerup/
- www.physics4kids.com

Program Worksheet

Before the Program

1. List all of your daily activities that use some form of electricity. This could include using an electric toothbrush, listening to the television, radio or even using a toaster.

2. One hundred years ago people did not have such a convenient form of energy available to them. Write a paragraph describing how different your life would be if there was no electricity.

During the Program

1. What was the first example of electricity seen by the earliest humans?

2. What is amber?

   a. What did Thales discover he could pick up with rubbed amber?

   b. What does the word electricity and electron mean?

3. What two materials were rubbed together in the demonstration to show static electricity?

4. What are all substances around us made up of?

   a. The positively charged particles in the atoms are called?

   b. The negatively charged particles in the atom are called?

5. When the number of protons and electrons are NOT equal, the object becomes….

6. Circle the correct answer. Opposite charges attract repel

   a. Give two examples of where you can become charged.

   b. Circle the correct answer. Opposite charges attract, but the same charges attract repel

   c. When strands of hair stand on end, do the strands have the same or opposite charges?

7. What is current electricity?

_____

8. What type of material are electrical wires made of?

_____

9. The particles that move in a wire when an electric current is flowing are called?

_____

10. What do we call the completed pathway through which electricity flows?

_____

11. What provides the energy needed to push the electrons along a wire?

_____

12. An electric circuit in which two globes are in the same path is called a _____ circuit.

_____

13. A circuit in which two globes are in their own path is called a _____circuit.

_____

14. The word used to describe how well a material can conduct electricity is?

_____

15. In each case below, circle the wire that has the greatest resistance.

    a. A long piece of wire or a shorter piece of the same wire?

    b. A thin piece of wire or a thicker piece of the same wire?

16. a. What do we call material that is not good at carrying electricity?

_____

17. Give two examples of insulating materials.

_____

_____

18. Which situations below are safe in a lightning storm? Write ‘safe’ or ‘not safe’ for each.

    a. Inside an aeroplane. _____

    b. Inside a stationary car. _____

    c. In a sailing boat. _____

    d. Under a tree. _____

    e. Inside a metal shed with timber posts. _____

19. The unit of electricity, measuring the rate at which electrons move around the wire, is called?

    _____

20. What do we call the force, provided by batteries, with which the electrons are pushed around the wire?

    _____

21. What are the two sources of electricity mentioned?

    _____

    _____

22. What is a fossil fuel commonly used to generate electricity?

    _____

23. List three renewable sources of energy mentioned.

    _____

    _____

    _____

24. How many more times efficient is a compact fluorescent globe compared to a traditional incandescent one?

    _____

After the Program

1. Research one of the scientists listed below who have made an important contribution to the development of our understanding of electricity. In each case find out the following information about them:

   a. The date of their birth and death.

   b. Where (country and city) they lived and carried out their work.

   c. A description of their discoveries and how this contributed to the understanding of electricity.

   d. When they made these discoveries.

   Scientists to research: Thales of Miletus, William Gilbert, Otto von Guericke, Robert Boyle, Pieter van Musschenbroek, Benjamin Franklin, Joseph Priestley, Luigi Galvani, Alessandro Volta, Michael Farraday, Georg Simon Ohm, Thomas Edison, William Stanley, Nikola Tesla.

2. Create a word search using following words:

   AMBER
   AMPERE
   ATOMS
   ATTRACT
   BATTERY
   CIRCUIT
   CONDUCTOR
   CURRENT
   ELECTRICITY
   ELECTRON
   GENERATOR
   INSULATOR
   LIGHTNING
   OHM
   PARALLEL
   PROTON
   REPEL
   RESISTANCE
   SERIES
   STATIC
   VOLT or VOLTAGE

Suggested Student Responses

During the Program

1. What was the first example of electricity seen by the earliest humans?
   Lightning

2. What is amber?
   Fossilised tree sap

   a. What did Thales discover he could pick up with rubbed amber?
      Straw

   b. What does the word electricity and electron mean?
      Amber

3. What two materials were rubbed together in the demonstration to show static electricity?
   Hair and balloon

4. What are all substances around us made up from?
   Atoms

   a. What are the positively charged particles in the atoms called?
      Protons

   b. What are the negatively charged particles in the atoms called?
      Electrons

5. When the number of protons and electrons are NOT equal, the object becomes?
   Charged

6. Circle the correct answer. Opposite charges **attract.**

   a. Two examples of where you can become charged is…
      Walking across carpet, touching a van de Graaff generator, jumping on trampoline etc.

   b. Circle the correct answer. Opposite charges attract, but the same charges **repel.**

   c. When strands of hair stand on end, do the strands have the same or opposite charges?
      Same – they repel.

7. What is current electricity?
   A flow of charges

8. What type of material are electrical wires made of?
   Metal like copper

9. The particles that move in a wire when an electric current is flowing are called?
   Electrons

10. What do we call the completed pathway through which electricity flows?
    Circuit

11. What provides the energy needed to push the electrons along a wire?
    Battery

12. An electric circuit in which two globes are in the same path is called a **series** circuit.

13. A circuit in which two globes are in their own path is called a **parallel** circuit.

14. The word used to describe how well a material can conduct electricity is?
    Resistance

15. In each case below, circle the wire that has the greatest resistance.

    a. a **long piece of wire** or a shorter piece of the same wire?

    b. a **thin piece of wire** or a thicker piece of the same type?

16. a. What do we call material that is not good at carrying electricity?
    Insulator

17. Give two examples of insulating materials.
    Rubber, glass, plastic or wood

18. Which situations below are safe in a lightning storm? Write 'safe' or 'no safe' for each.

    a. Inside an aeroplane. **safe**

    b. Inside a stationary car. **safe**

    c. In a sailing boat. **some are safe**

    d. Under a tree. **not safe**

    e. Inside a metal shed with timber posts. **not safe**

19. The unit of electricity, measuring the rate at which electrons move around the wire, is called?
    Amperes

20. What do we call the force with which the electrons are pushed around the wire as provided by the batteries?
    Voltage

21. What are the two sources of electricity mentioned?
    Batteries and generator

22. What is a fossil fuel commonly used to generate electricity?
    Coal

23. List three renewable sources of energy mentioned.
    Hydro-electricity, solar and wind power

24. How many more times efficient is a compact fluorescent globe compared to a traditional incandescent one?
    Five times