

Transforming electrical energy investigation

Teachers Notes - Lesson 3 - Slide 2

Investigating Conductors and Insulators

Task: Identify materials that conduct electricity and insulate electricity.

A hands-on student driven investigation to explore and determine the materials that conduct electricity.

Teacher Background Information

If an electric charge can easily flow through something, that something is referred to as a conductor. Most metals are considered conductors of electricity. Water is also a good conductor of electricity and that means so is the human body. Since our bodies are made up mostly of water, electricity can easily move through our bodies on its way to the ground. If an electrical current cannot easily pass through an object, that object is called an insulator. Most non-metallic items, like rubbers and plastics, are considered insulators. Electricity travels at the speed of light, so if a person comes in contact with electricity he/she will feel the electrical jolt immediately. Electric current flowing through your body can cause damage to your nerves and tissues, so it's important to be very careful around electricity.

Assessment

Formative assessment – monitoring students' learning and developing understanding via observation and providing feedback to extend learning

Equipment

- Role badges used in Lesson 4
- Each team member's science journal
- 1.5 volt battery
- Light bulb and lamp holder
- Multimeter (if available, but not essential for experiment)
- 3 connecting wires
- Variety of items for testing, e.g. paper-clips, aluminium foil, rubber band, string, texta, wooden ruler and other classroom items

Activity steps:

- Discuss with students how we know that electrons are flowing in a circuit.
- Ask students how they could test different materials for electrical conductivity.
 - Guide students to suggest constructing an open circuit that includes a battery, wires and a light bulb. The items being tested should then be used to complete the circuit. If the light glows, then the material is a conductor of electricity.
- Discuss with students:
 - The idea of a "fair test".
 - How can we ensure that the test is fair?
 - What variables must we keep the same? (length of wires, same battery, etc.)
 - How will we record our observations?

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- Have students construct a table in their science journal with a list of approximately ten objects in the left hand column. Have them predict conductivity. Example shown below:

Object	Material	Prediction: Will it conduct electricity? Yes/No	Does the light bulb glow?
Paper-clip	steel		
Plastic ruler	plastic		

- Divide class into groups, assign roles and hand out badges.
- Ask Lab Technicians to collect equipment.
- Ask each group to make a prediction about which materials will conduct electricity.
- Have students construct an open circuit.
- Ask students to test their circuit by using the object to complete the circuit. If the light globe glows then the object is a conductor of electricity. If the object did not allow the light to glow then it is an insulator.
- Have students test the provided objects. Ensure students record their observations.
- Have students present their findings to the class.
 - List the conductors and insulators.
 - Is there a pattern in the results?
 - Was the outcome different to their predictions?
 - Do the results support their prediction?
 - What difficulties did they experience when completing this investigation?
 - How could they improve this investigation?
- Have students suggest reasons why electrical wires are coated in plastic. Why should frayed electrical cords be replaced?
- Discuss:
 - Why is it useful to know which materials conduct electricity?
 - Will the human body conduct electricity? What injuries may happen to a person who has received an electric shock?

Extension Activity

- Ask the students to design their own switch. The switch must be safe and able to be switched on and off repeatedly.
- In groups students draw a labelled diagram of their design.
- Students construct and present their designs to the class.
- Students discuss the safety features incorporated in their designs and how their design could be improved.