Demonstrating Electrical Induction

Electricity All Around Us
Activity
Grade Level: 5-8

Main Objectives

This activity is designed to help learners understand electrical induction and provides learners with an opportunity to reinforce the concepts of manipulated variable and responding variable in an experiment. Learners will undergo four experiments which pose problems and will develop predictions. Learners will then test those predictions as part of the activity.

Learning Outcomes

By the end of this activity, learners will:

- Describe a set-up for the production of small amounts of electricity by means of electrical induction.
- Describe several factors affecting the induction of electricity, such as:
    - Number of turns of wire in the coil
    - The strength of the magnet
    - The velocity of the magnet
    - The proximity of the magnet to the coil
    - Moving the magnet through or over the coil
- Describe the importance of electrical induction in everyday life.

Length of Activity

1.5 hours

Materials List

Internet-enabled device
Demonstrating Electrical Induction Backgrounder
Demonstrating Electrical Induction Learner Worksheet
Galvanometer
3 metres of enamelled magnet wire (22 to 28 gage, or similar)
Popsicle stick
Small ceramic magnet
Large ceramic magnet
Test leads
Cardboard tube (from foil, toilet paper, or similar)
Electrical tape

Before you begin: Please note that the educator will conduct four experiments for the learners to observe. Learners will then record their observations in the table in the Learner Worksheet.

Procedure

Step 1: Preparation

a. Prepare your apparatus before starting the demonstration.
b. Make the first of the two coils by wrapping the cardboard tube with 10 turns of wire. Remove and tape the coil, leaving about 10 cm of wire for connections.
c. Make the second coil the same way you did the first, using 30 turns of wire. Secure this coil with tape as before.
d. On each coil, strip the insulation from the two exposed ends of the wire. A match or lighter can be used to burn off the insulation, making it easier to expose the copper underneath. A utility knife can also be used. Sand the exposed ends with sandpaper.

e. Connect the coil to the galvanometer.
f. Make a magnet wand by gluing a permanent ceramic magnet to a popsicle stick.
g. Test your set-up to make sure you can observe currents. Wave the want over the coil and see if the needle of the galvanometer moves.

Step 2: Demonstration: Electrical Induction

a. Explain the purpose of the activity and electrical induction (see the Demonstrating Electrical Induction Backgrounder)
b. Explain the purpose of the **galvanometer**.
    I. The galvanometer is designed to indicate the presence of a current. By connecting it to the coil, any electrons flowing in the wire will cause the needle to move. The galvanometer is quite sensitive and can detect very small currents.
c. Be sure learners have their worksheets and are ready to record results.
d. Wave the small magnet over the coil and observe the deflection of the galvanometer needle.
e. Explain that the magnet is inducing a current in the coil and that this is the basic principle behind the generation of most of Alberta's electricity.

Step 3: Experiment 1

Does the number of turns of wire in a coil affect the strength of the current?

a. Explain that the experiment is a test to see if the number of turns of wire in a coil has an effect on the amount of electrical current produced. Ask the learners to record their prediction on their observation sheets.
b. Set the large coil and the small coil side by side. Ask the learners to predict which coil will product the greatest current.
c. Connect the small coil to the galvanometer.
d. Wave the large magnet over the small coil am dote roughly how much the galvanometer needle moved.
e. Repeat these steps with the large coil connected to the galvanometer.
f. Have the learners record which coil produced the greatest amount of current by making "stronger" or "weaker" in the appropriate spaces on their observation sheet.

Step 4: Experiment 2

Does the speed of the magnet affect the size of the induced current?

a. Explain that the experiment is a test to see if the speed of the magnet has an effect on the amount of electrical current produced. Ask the learners to record their prediction on their observation sheet.
b. Connect the large coil to the galvanometer.
c. Wave the large magnet over the coil slowly. Repeat and note how much the galvanometer needle moved.
d. Wave the large magnet quickly over the coil. Repeat. Which magnet generated the largest current? Have learners record the information on their observation sheets.

Step 5: Experiment 3

Does the strength of the magnet affect the amount of electricity induced in a coil?

a. Explain that the experiment: to test to see if the strength of the magnet has an effect on the amount of electrical current produced. Ask the learners to record their prediction on their worksheets.
b. With the large coil connected to the galvanometer, wave the small magnet over the coil.
c. Next, wave the large magnet over the coil. Which magnet produced the largest pulse of electricity? Have learners record the information on their worksheets.

Step 6: Experiment 4

Is it possible to pass the magnet through the coil or cover it. Which movement produces the most electricity?

a. Explain that the experiment is a test to see if passing the magnet through the coil or over the coil has an effect on the amount of

electrical current produced. Ask the learners to record their predictions on their worksheets.

b. With the large coil connected to the galvanometer, wave the magnet over the coil. Note how much the galvanometer needle moved.
c. Lift the coil and try passing the magnet through the middle at about the same speed you used to pass over the coil. Which movement, over or through, seemed to produce the most electricity? Have the learners record the information in their worksheets.