# Galvanometers

## *Overview:*

Students learn about galvanometers, an instrument used to measure electricity created by a change in a magnetic field. Electric current generated by changes in the magnetic field created by the aurora can cause destructive corrosion to metal objects such as the trans-Alaska pipeline.

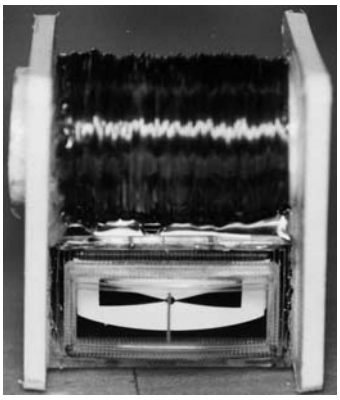
## *Objectives:*

The student will:

- observe that a galvanometer measures electricity;
- discover that a change in magnetic field generates electricity; and
- conclude the amount of electricity a magnet and electric coil can generate depends on the amount of wire in the coil and the strength of the magnet.

## *Materials:*

- Galvanometer
- Cow magnet (strong) and bar magnet (weaker)
- STUDENT WORKSHEET: “Galvanometer Observations”



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## *Activity Procedure:*

1. Explain that a galvanometer is an instrument that measures electricity created by a change in a magnetic field. Electric current generated by changes in the magnetic field created by the aurora can cause destructive corrosion to metal objects such as the trans-Alaska pipeline. Point to the coiled wire (tube wrapped with wire) and explain that when a magnet moves through it, the coiled wire creates an electric current. Point to the dial and explain the dial will move when electricity is generated.
2. Ask students to note the position of the dial on the galvanometer. Insert the bar magnet into one of the coils, and move it back and forth. The dial will move. Explain that the CHANGE in magnetic field generates electricity.
3. Insert the magnet into one of the coils and leave it for a couple of seconds. The dial will stop moving. Explain when the magnetic field is not changing, no electric current is generated.
4. Pull the magnet back out and the dial will move again. Repeat that the CHANGE in magnetic field generates electricity.
5. Demonstrate the concept again by inserting the magnet into the larger coil of wire. Observe the movement of the galvanometer dial. Demonstrate again, but change the speed of inserting the magnet. Demonstrate again, but use a stronger magnet.
6. Hand out the STUDENT WORKSHEET: "Galvanometer Observations" and ask students to record observations in the following sequence on the data table:

   (a) Insert weak magnet into small coil.
   (b) Insert weak magnet into medium coil.
   (c) Insert weak magnet into large coil.
   (d) Insert strong magnet into small coil.
   (e) Insert strong magnet into medium coil.
   (f) Insert strong magnet into large coil.

***Teachers Note:*** *While doing the demonstration, review experimental controls and variables.*

*In demonstrations (a), (b) and (c) on the student worksheet, the control is the magnet, because it remains the same, and the coils are the variables, because they are different. In demonstrations (d), (e) and (f), the magnet continues to act as the control and the coils continue to be the variables.*

*However, when comparing demonstration (a) to (d), the control is the coil, because it is the same, and the magnets are the variables, because the strengths are different. The same holds true for the comparison of (b) to (e) and (c) to (f).*

## *Answers to Student Worksheet:*

*1. Yes 2. No*

 

Name:_____ **Student Worksheet**

# Galvanometer Observations

Record observations from the teacher demonstration on the data table using the following scale of 0 – 3.

**Scale:**

0 – no movement of needle

1 – slight movement of needle

2 – large movement of needle

3 – maximum movement of needle

**Example:**

When the magnet is inserted into the coil and the needle moves almost, but not completely, to the end of the dial, give it a ranking of **2** on the data table. If the needle barely moves, give it a ranking of **1**. If the needle does not move at all, give it a ranking of **0**.

**Demonstration:**

(a) Insert weak magnet into small coil.
(b) Insert weak magnet into medium coil.
(c) Insert weak magnet into large coil.
(d) Insert strong magnet into small coil.
(e) Insert strong magnet into medium coil.
(f) Insert strong magnet into large coil.

## Data Table for Galvanometer Demonstration

| Coil Size | Weak Magnet | Strong Magnet |
|---|---|---|
| Small Coil | a) | d) |
| Medium Coil | b) | e) |
| Large Coil | c) | f) |

### *Questions:*

1. Can a change in a magnetic field generate electricity?

2. If a magnetic field is not changing, will electricity be generated?

 