



# ELECTROSCOPE

## ACTIVITY GUIDE

Cat. No. ELGL01, ELFL01

UNITED SCIENTIFIC SUPPLIES, INC.  
4175 Grove Ave • Gurnee, IL 60031 • Phone: 847-336-7556 • Fax: 847-336-7571 • www.unitedsci.com

### Electroscope

#### Materials needed:

Electroscope, glass rod, Lucite rod, hard rubber rod, swatches of silk, fur, and wool, 25 cm electrical wire, pair of wire strippers.

#### Observing the electroscope:

Place the **electroscope** on the table so that the clear glass is facing you.

Notice the apparatus on the side of the electroscope box. This is the connection area for your electrical ground wire. Pick up the 25 cm of electrical wire. Using the wire strippers remove 1 cm of insulation from one end of the wire and 5 cm of insulation from the other end. **Safety First:** Strip the insulation away from your face and down toward the table. Turn the black knob on the side of the electroscope counterclockwise to loosen it enough so that you see the small opening in the metal part. Insert the 1 cm end of the wire into the opening. Hold the wire while turning the knob clockwise to tighten it. Wrap the other end around a metal table leg.

Now notice that the **electroscope** has a metal knob on top attached to a metal rod that is inside the casing. This metal rod has a stationary leaf on the end and a flexible gold leaf attached that can be moved when charged.

Observe the charge detector scale located inside the casing. It will indicate the amount of charge on an object that is brought near the knob.

### Activity 1

Pick up the hard rubber rod. Briskly rub the hard rubber rod with the wool swatch. Bring the rod near the metal knob. Does anything occur? To what degree does the gold leaf move over the detector instrument? Take the rod away. What happens?

Repeat the previous steps using the glass rod with the silk swatch. Slowly move the glass rod near the metal knob. Does the gold leaf deflect away from the permanent leaf? Again notice the degree of movement of the gold leaf above the detector. Remove the rod. Do you know why the gold leaf flares away from the permanent leaf and then returns to it after taking the glass rod away from the knob?

Repeat the activity using the Lucite rod with the swatch of fur. What is the behavior of the gold leaf this time?

### Activity 2

Pick up the hard rubber rod and rub it briskly with the fur. Bring the rubber rod to the knob of the electroscope and touch it to the rubber rod. Hold it on the knob for a few seconds. Remove the rod. Observe the gold leaf. Was there movement of the gold leaf? Does it remain separated from the permanent leaf

or does it move towards the permanent leaf. Record the number on the detector that indicates the amount of movement of the gold leaf.

Rub the glass rod briskly with the silk swatch. Place the glass rod on the knob of the electroscope. Does anything happen to the gold leaf? Record the number on the detector to indicate any movement. Do you know why this happens?

### Activity 3

Place your hand on the knob of the **electroscope** for a few seconds.

Pick up your Lucite rod and rub it briskly with the fur. Place the Lucite rod on the knob. What happens to the gold leaf? Remove the Lucite rod.

Observe the gold leaf. How far has the leaf moved? Record the number that appears on the detector. Does the gold leaf remain in place or does it return toward the permanent leaf?

Charge up your rod again by briskly rubbing it with the fur. Touch the knob again. Does the gold leaf move further away? Record the number again. Does the **electroscope** have a greater charge on it now?

### Analysis

The **electroscope** is a special scientific instrument that can be used to detect invisible electrical charges. When the gold leaf is hanging down and near the permanent leaf the charge on the electroscope is neutral.

When a charged rod is brought near the knob, the gold leaf temporarily moves away from the permanent leaf. The gold leaf falls when the charged rod is removed from the knob.

If the charged rod is placed on the knob, the gold leaf will remain away from the permanent leaf. The number on the detector will indicate the amount of net charge placed on the gold leaf. The greater the deflection of the gold leaf indicates a greater charge placed on the **electroscope**.

Because the charge on both leaves is identical, the leaves will remain apart. They have repelled each other. The gold leaf of the **electroscope** can move apart when a positive or negative charge is brought near the knob or placed on the knob.

When a negatively charged rod is brought near or touched to the knob, the electrons are repelled. If a glass rod is brought near the knob or is touched to the knob, the electrons are attracted to the glass with the gold leaf acquiring a positive charge.

Static electricity requires a transfer of **electrons** from one object to another object. **Electrons** can be transferred by **friction**, **conduction**, or **induction**. Can you determine the difference in meaning of the three words?