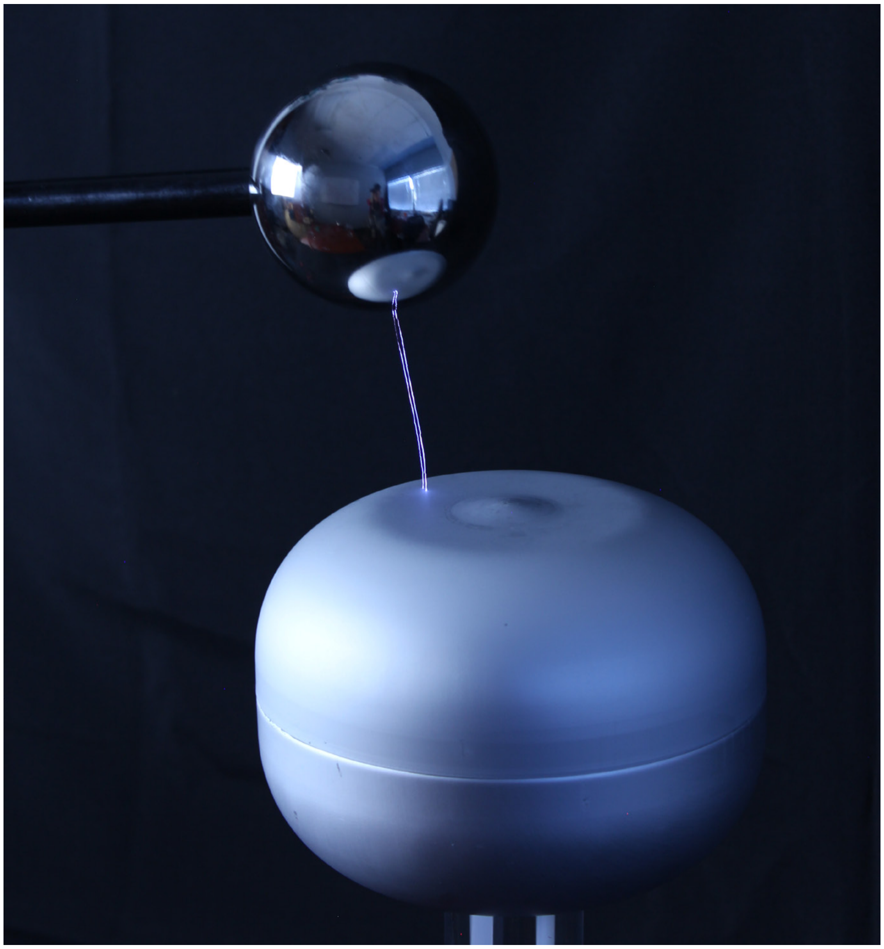


VAN DE GRAAFF GENERATOR

Lightning Leaper Accessory Package
Demonstration Guide

SAFETY

Warning:
Individuals with cardiac pacemakers or other electronic medical implants or devices should never operate or come in contact with the generator. Discharge of static electricity could cause the device to be damaged or malfunction.

Caution:
This device is designed to emit high-voltage electrical energy. Do not operate this unit near any electrical devices, including, but not limited to, cell phones, stereos, tablets, and computers. Science First is not responsible for damage due to improper use.

- Adult supervision is required. This generator is safe when used properly.
- Only plug the generator into a grounded (3-prong) 110 volt 60 Hz outlet (motor-operated models).
- Do not operate outdoors or in wet locations.

ABOUT THIS GUIDE

This guide is intended to be an expansion to the standard Van de Graaff demonstration guide, which can be found at ScienceFirst.com/docs.

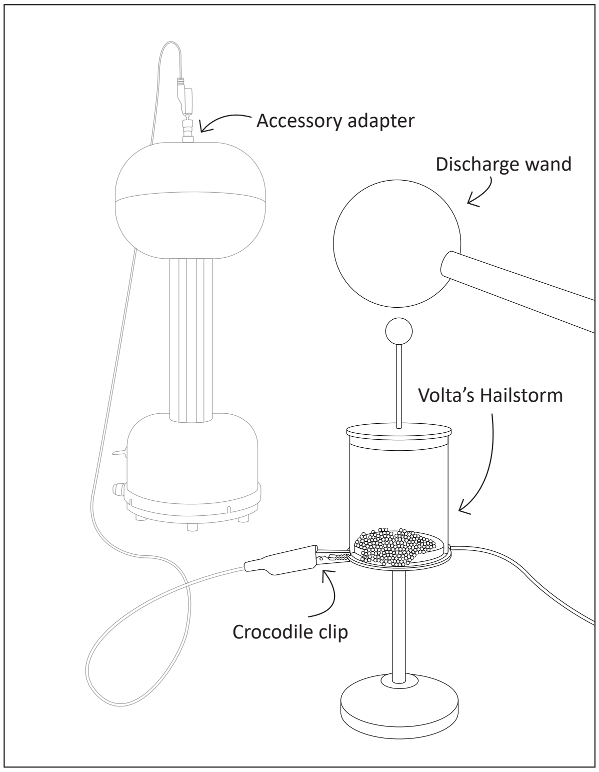
VOLTA'S HAILSTORM

Objective

To demonstrate the principle of electrostatic repulsion

Required Materials

- Van de Graaff generator and discharge wand
- Volta's Hailstorm accessory
- Alligator/banana plug wire
- Accessory adapter



Procedure

1. Plug the discharge wand into the ground port at the base of the Van de Graaff generator.
2. Remove the lid of the Volta's Hailstorm accessory.
3. Open the packet of polystyrene balls and pour about ¾ of its contents into the chamber. Replace the lid.
4. Attach the alligator/banana-plug wire to dome Van de Graaff generator and clipping the alligator clip end to the floor of the Hailstorm (see diagram).
5. Turn the Van de Graaff generator on.
6. Bring the discharge wand near the upper ball terminal of Volta's Hailstorm and observe the polystyerene balls.
7. Turn the generator off and discharge the dome.

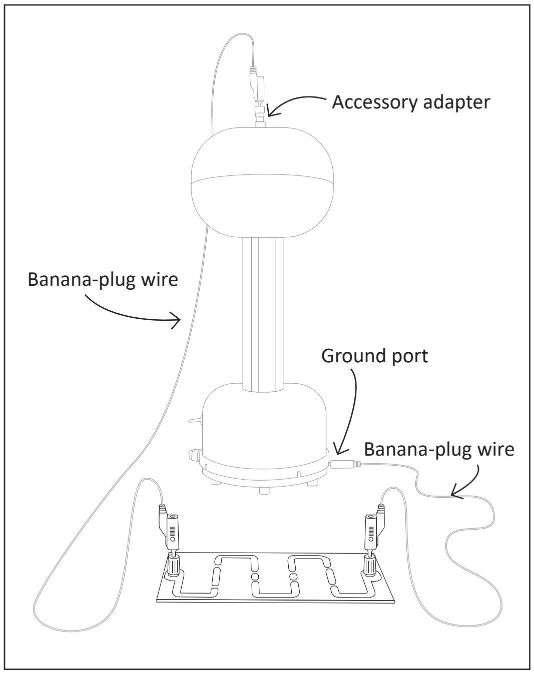
How it Works

When you turn the generator on, it draws electrons away from the bottom plate of Volta's Hailstorm through the connecting wire. This leaves the plate with a net positive charge.

Because they are on the bottom plate, the polystyrene balls also acquire a positive charge. Electrostatic repulsion causes them to rise up, yield their charge to the top plate, then fall back to the bottom. This creates the "Hailstorm" effect.

As you bring the discharge wand toward the ball terminal, the balls should move more quickly. This is because the discharge wand carries the opposite charge from the bottom plate, and the proximity of the wand charges the top plate of the Hailstorm. At this point, the same repulsion effect from the bottom plate occurs at the top plate, intensifying the movement of the balls.

LIGHTNING LEAPER



Objective

To demonstrate electrostatic discharge and the path of least resistance

Notes

- Do not use this plate with any other source of electricity other than a Van de Graaff generator, Wimshurst machine, or Tesla Coil.
- This experiment is best done in a darkened room.

Required Materials

- Van de Graaff generator and discharge wand
- Lightning Leaper accessory
- Accessory adaptor
- 2 Banana-plug wires
- Discharge wand

Procedure

1. Using your banana plug wires and accessory adapter, connect the Lightning Leaper to the dome and ground port of the generator (see diagram).
2. Set the discharge wand nearby.
3. Start the Van de Graaff generator and observe.
4. Turn off and discharge the Van de Graaff generator.

How it works

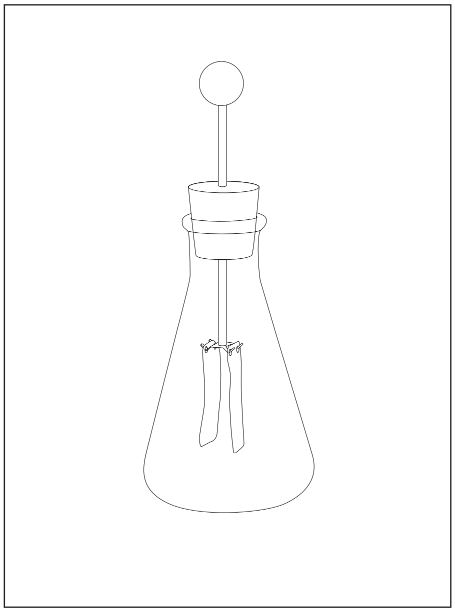
On the surface of the Lightning Leaper, a metallic path with eight small gaps is drawn in a zig-zag pattern. When connected to the Van de Graaff generator, electrons flow from one banana socket to the other through the metallic path. At the gaps, electrons build up on one end then “leap” across to the other side of the path, resulting in visible discharge.

This demonstration is significant because electrons always travel via the path of least resistance, which is typically a straight line between electrodes. Therefore, one might expect the discharge on the Lightning Leaper to leap through the air directly from one banana socket to the other. However, the metal has significantly less resistance than the air between the banana sockets, so the electrons take that path even though it is longer and has several turns and gaps.

ELECTROSCOPE KIT

Objective

To demonstrate the principle of electrostatic repulsion



Required Materials

- Van de Graaff generator and discharge wand
- A flask that accepts a #6 rubber stopper (not included)
- Electroscope kit

Procedure

1. Hang the two aluminum foil leaves (included) on the hooks of the brass hanger (see diagram).
2. Insert the assembly into the flask (see diagram).
3. Set the assembly near the Van de Graaff generator.
4. Plug the discharge wand into the ground port at the base of your Van de Graaff generator.
5. Start the generator.
6. Bring the discharge wand close to the ball terminal on top of the electroscope and observe the behavior of the aluminum leaves.
7. Turn off and discharge the generator and electroscope.

How it works

The aluminum leaves are connected to each other and to the ball terminal by means of the metal hanger, so they and the terminal will always have the same charge. In a neutral electroscope, both leaves hang straight down. When the discharge wand approaches the ball terminal, its charge is transferred down the rod and hanger into the leaves. The charged leaves will be repelled from each other due to electrostatic repulsion. The stronger the electric charge, the more forcefully the leaves will repel. Discharging the electroscope causes the leaves to return to neutral and hang straight down once more.