NATIONAL UNIVERSITY - MANILA

CCPHYS2L: College Physics 2 Lab

ACTIVITY NO. ***1***

SCORE:

THE VAN DE GRAAFF GENERATOR

(TITLE OF EXPERIMENT)

(SURNAME, GIVEN NAME, MI)	*SIGNATURE*
De Vera, Brian Carlo	
(SURNAME, GIVEN NAME, MI)	*SIGNATURE*
Garcia, Aliamae Danna S.	
(SURNAME, GIVEN NAME, MI)	*SIGNATURE*
Monjardin, Hans	
(SURNAME, GIVEN NAME, MI)	*SIGNATURE*
Poserio, Jed Nathan	
(SURNAME, GIVEN NAME, MI)	*SIGNATURE*
Talosig, Jay Arre	
(SURNAME, GIVEN NAME, MI)	*SIGNATURE*
Valencerina, Custer Jeremiah	

CCPHYS2L - COM231

(SUBJECT CODE AND SECTION)

APRIL 5, 2025

(DATE OF PERFORMANCE)

3

(GROUP NO.)

MR. RAUL B. BORLUNGAY

(NAME OF INSTRUCTOR)

COLLEGE PHYSICS 2 LABORATORY	ACTIVITY 1

ACTIVITY 1: The Van de Graaff Generator

1.1 Program Outcomes (POs) Addressed by the Activity

a. Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science and domain knowledge appropriate for the computing models from defined problems and requirements.
b. Identify, analyze, formulate, research literature, and solve computing problems and requirements reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

1.2 Activity's Intended Learning Outcomes (AILOs)

At the end of this activity, the student shall be able to:

a. Illustrate different electrostatic phenomena.
b. Explain and discuss different electrostatic phenomena.
c. Scientifically report experimental data

1.3 Objectives of the Activity

The objectives of the activity are:

a. Identify and explain the effects of the Van de Graaff generator on different materials.

1.4 Principle of the Activity

The Van de Graaff generator is made up of terminals, brushes, a pulley, a spray comb, a motor, and a narrow conveyor belt. This generator is used to create high-potential differences. It employs electrostatic generator principles such as using a moving belt that accumulates charge on a hollow metal structure. It ionized the fluid around the conductor which in this activity is the air around it.

The Van de Graaff generator was invented by Robert J. Van de Graaff, an American physicist born on December 20, 1901. This device is widely used not only in atomic research but also in the medical industry.

1.5 Materials/Equipment

1	set Tissue paper
1	set Ordinary metallic foil confetti.
1	set Aluminum foil (cut into small pieces)
1	Rubber suction cap
1	Needle
1	Candle
2	Test tube
2	Cork stopper (with metal conductor)
1	3-inch masking tape
1	Lighter (or match)
1	Fluorescent lamp

1.6 Procedure/s

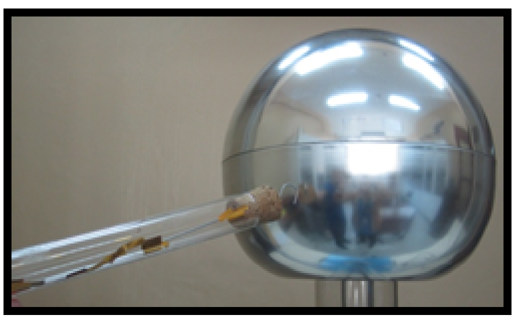

FIGURE 1.1

Metallic Foil Strips Inside the Test Tube

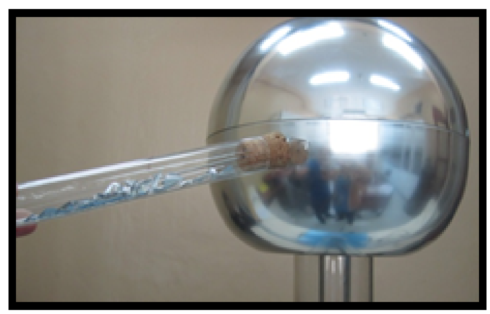

FIGURE 1.2

Aluminum Foil Strips Inside the Test Tube

FIGURE 1.3

Rubber Suction Cap with a Needle

FIGURE 1.4.

Tissue Paper Attached with a Masking Tape

1.6.1 Foil Confetti Inside the Test Tube

a. Cut the ordinary metallic foil into pieces like confetti. Do the same procedure as the aluminum foil.
b. Put inside the first test tube the finished confetti of metallic foil and inside the second test tube the aluminum foil.
c. Insert the cork stopper with the metal conductor in the test tube and place the confetti near (but not touching) the metal conductor.
d. Turn on the Van de Graaff generator. Hold the bottom part of the test tube and place the end of the metal conductor very near the dome of the generator. See the Figure 3.1
e. Observe the movement of the confetti inside the test tube. Also, observe the end of the metal conductor that is placed near the dome.
f. Record your observation. Compare the results between the ordinary metallic foil and the aluminum foil.

Remark: *Turn off the Van de Graaff generator after use to eliminate the remaining charge of electricity.*

1.6.2 Aluminum Confetti on Top of the Dome

a. Cut pieces of aluminum foil, about 2 millimeters in width and one inch in length.
b. Turn on the Van de Graaff generator.
c. After a few minutes (about 2-3 minutes), drop above the dome of the Van de Graaff generator the cut pieces of aluminum foil and observe the effects on the aluminum foil.
d. Turn off the Van de Graaff generator. Record your observations.

1.6.3 Lighted Candle

a. Insert the needle at the center of the rubber suction cap.
b. Place the rubber suction cap on the dome of the Van de Graaff generator. See Figure 3.3.
c. Using a match or a lighter, light the candle. Be careful in holding the candle to avoid burns.
d. Turn on the Van de Graaff generator.
e. Place the tip of the lighted candle in the end of the needle and observe the movement of the flame.
f. Turn off the Van de Graaff generator. Record your observations.

1.6.4 Tissue Paper

a. Cut the tissue paper vertically. See Figure 3.4.
b. Attach the tissue paper on top of the dome using masking tape.
c. Turn on the Van de Graaff generator.
d. Observe the movement of the tissue paper and record your observations.

e. Place your finger near the ends of the tissue paper and observe its effect. Repeat as desired. Turn off the Van de Graaff generator.

1.6.5 Fluorescent Lamp

a. Turn on the Van de Graaff generator and place the end of the fluorescent lamp near the dome.
b. Generator Observe the effects of the Van de Graaff generator on the lamp and record your observations. Turn off the Van de Graaff.

1.6.6 Human Hair

a. Turn on the Van de Graaff generator.
b. Fold your fingers and place them near the dome. Feel the effects given by the generator on your hand.
c. Place your palm on top of the dome for several minutes.
d. Observe what happens to your hair.
e. Ask one of your classmates to touch you then observe what happens to your classmate.
f. Turn off the generator then ask your group mates to fall in line, placing their hands on the shoulder of the person before them. Everyone should stand in a chair when they do this.
g. Turn on again the generator then observe what happens to the group. Turn off the Van de Graaff generator and list down your observations.

1.7 Data

Table 3.1.

MATERIALS	OBSERVATIONS
Foil confetti inside the test tube	When the generator is turned on, both metallic and aluminum foil confetti move or jump due to static charges. The aluminum foil reacts more noticeably, showing stronger motion because it is lighter and more conductive. Sparks may be seen near the conductor tip.
Aluminum confetti on top of the dome	The aluminum confetti placed on the dome flies off quickly due to electrostatic repulsion. All pieces gain the same charge from the dome and repel each other, scattering in different directions.
Lighted candle	The candle flame bends or flickers when placed near the charged needle. This is caused by the electric field pushing the

	ionized particles in the flame, creating a visible "electric wind."
Tissue paper	The tissue paper strips rise and spread out when the generator is turned on, due to like-charge repulsion. When a finger is brought near, the strips are attracted to it.
Fluorescent lamp	The tissue paper strips rise and spread out when the generator is turned on, due to like-charge repulsion. When a finger is brought near, the strips are attracted to it.
Human hair	Hair stands up when a person touches the dome, due to all strands getting the same charge. Touching another person may cause a small static shock. A chain of people may all feel the effect when the generator is turned on.

1.8 Calculations

The experiment requires NO calculation mainly because it is an OBSERVATION BASED experiment

1.9 Questions

a. Explain the concept of why hair stands on end when the person holds the Van de Graaff generator.

When a person touches the dome of the Van de Graaff generator, electrons (charges) build up on their body. Since like charges repel, the hairs on the person's head all get the same type of charge and push away from each other. This causes the hair to stand up and spread out, because each strand is repelling the others due to the static charge

b. Why are there charged particles on the dome of the Van de Graaff?

The Van de Graaff generator has a moving belt inside that transfers electric charge (usually positive) to the dome. As the belt rubs against rollers, it builds up charge through friction (triboelectric effect). The dome is a conductor, so the charges spread evenly over its surface, creating a strong electric field around it.

c. What happens when a strip of polyethylene is rubbed with a cloth? What about if the strip of polyethylene is placed near another piece of polyethylene?

When a strip of polyethylene is rubbed with a cloth, it gains electrons and becomes negatively charged due to friction (triboelectric effect). If this charged strip is placed near another polyethylene strip that has also been rubbed the same way, both strips will have the same negative charge. As a result, they will repel each other, because like charges repel.

1.10 Discussion

This experiment demonstrated the effects of static electricity using a Van de Graaff generator. Various materials, such as aluminum foil, tissue paper, and hair, responded to the buildup of electric charge by moving, standing up, or repelling each other. These effects occur because the generator transfers electric charge to objects, creating strong electric fields. Materials like aluminum and polyethylene showed clear responses due to their conductivity and ability to hold charge. The experiment also showed how static electricity can cause sparks, light up a lamp, and even make a flame bend due to ionized air movement.

1.11 Conclusion

The Van de Graaff generator experiment clearly illustrates how electrostatic forces can influence different materials and objects. By generating and transferring electric charge, the generator allows us to observe real-world effects of static electricity—such as the repulsion of hair strands, the lifting of tissue paper, and the scattering of aluminum confetti. These responses confirm the principle that like charges repel and opposite charges attract. Furthermore, the experiment highlights how different materials, such as conductors and insulators, react uniquely to electric fields. Overall, this activity reinforces key concepts in electrostatics and shows how invisible electric forces can produce visible and sometimes surprising effects in everyday objects.

1.12 References

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