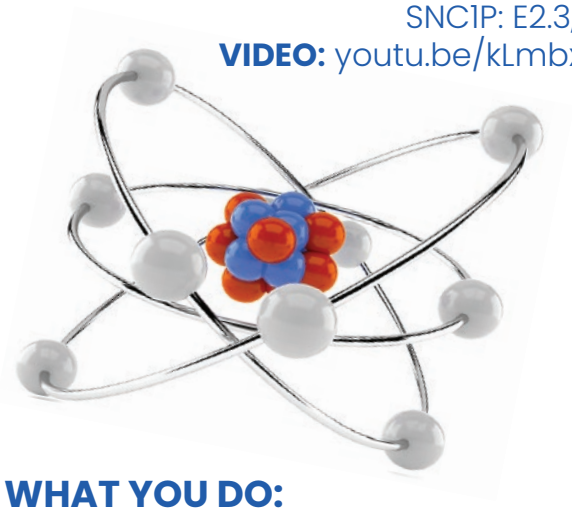
SCIENCE AT HOME

STATIC ELECTRICITY

GRADE: **9**

SNC1D, SNC1P
SUBJECT: SCIENCE
STRAND: PHYSICS
TOPIC: CHARGING THROUGH FRICTION, ELECTROSTATIC FORCES
EXPECTATIONS: SNC1D: E1.1, E2.2, E2.3, E2.4, E3.2
SNC1P: E2.3, E3.1, E3.2
VIDEO: youtu.be/kLmbxVbdb2A



INTRODUCTION:

Static electricity is an electric "charge" that builds up on the surface of an object when it's rubbed against something made of a different material. The rubbing transfers electrons, and an imbalance of electrons is what creates the charge. It stays there until the object is "discharged" — by touching either another object or the ground.

ACTIVITY: Experiment using charges created through friction

TIME: 30 minutes

SAFETY: Resist the temptation to shock unsuspecting people in your home!

WHAT YOU NEED:

- empty aluminum pop can
- balloon
- table or other flat surface
- tap with running water
- mirror
- metal spoon
- lightswitch
- a very dark room
- Different kinds of fabric, plastics and objects that you can find around the house – be creative!

WHAT YOU DO:

- Place an empty pop can on the table. Can you get it to move without touching it, blowing on it or doing something to the table? Consider using the balloon. Fill it with air, rub it against your hair and use the attractive electrostatic force to move the can.

- Next, take two objects made from the same material and rub them both against a third object — made of a different material. Can you feel how the first two now repel each other?

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WHAT YOU DO (continued):

- Now it's time to bend some water. Turn on the tap, so that a small stream of water is running into the sink. Charge an object and hold it near the stream. Can you see the electrostatic force bending the stream? How does the bending change when you vary the distance between the charged object and the water?

- Look around for other materials that generate a static charge when you rub them together. Try different textiles and plastics. Test these materials with the can and the stream of water.
- As you test, record your results, so that you can compare the different materials. Take notes, take pictures or take video — whatever works for you.
- Stand next to the sink and rub your hair with that balloon again. All charged up? Now watch your hair in the mirror as you touch the tap. What happens? Why?
- Next, you need a very dark room, preferably one without windows. Charge your hair with the balloon yet again, but this time while holding a metal spoon. Bring the spoon close to one of the metal screws on the light switch. What do you see? (Don't worry, those screws are never energized — they're "grounded," directly connected to the ground, a.k.a. planet Earth. And holding the spoon keeps you from feeling the spark.)
- If you have carpets in your house, why not charge yourself by shuffling around with cotton socks? Then try to find another grounded object to discharge yourself on.

WHY THIS MATTERS:

Electrostatic forces are used in all sorts of ways. When you photocopy something, for instance, electrostatic forces help the toner ink stick to the paper. When a car gets painted, manufacturers use a negatively charged spray gun, so that paint particles are attracted to the grounded metal of the car. Even protective masks — like N95s — rely on electrostatic forces — to attract and trap microscopic particles, while still letting air get through.

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TAKING IT FURTHER: Build your own electroscope

By now you've explored how different materials attracted the can or bent the stream of water. But wouldn't it be cool if you could measure the strength of those electric charges? For that, you need an electroscope.

The good news is you can build your own. For instructions on how to make a simple foil leaf electroscope, check out these Wikihow instructions:

https://www.wikihow.com/Make-an-Electroscope

Here's a great video on static electricity from Bill Nye the Science Guy:

https://www.youtube.com/watch?v=iHGpJChYQ5o

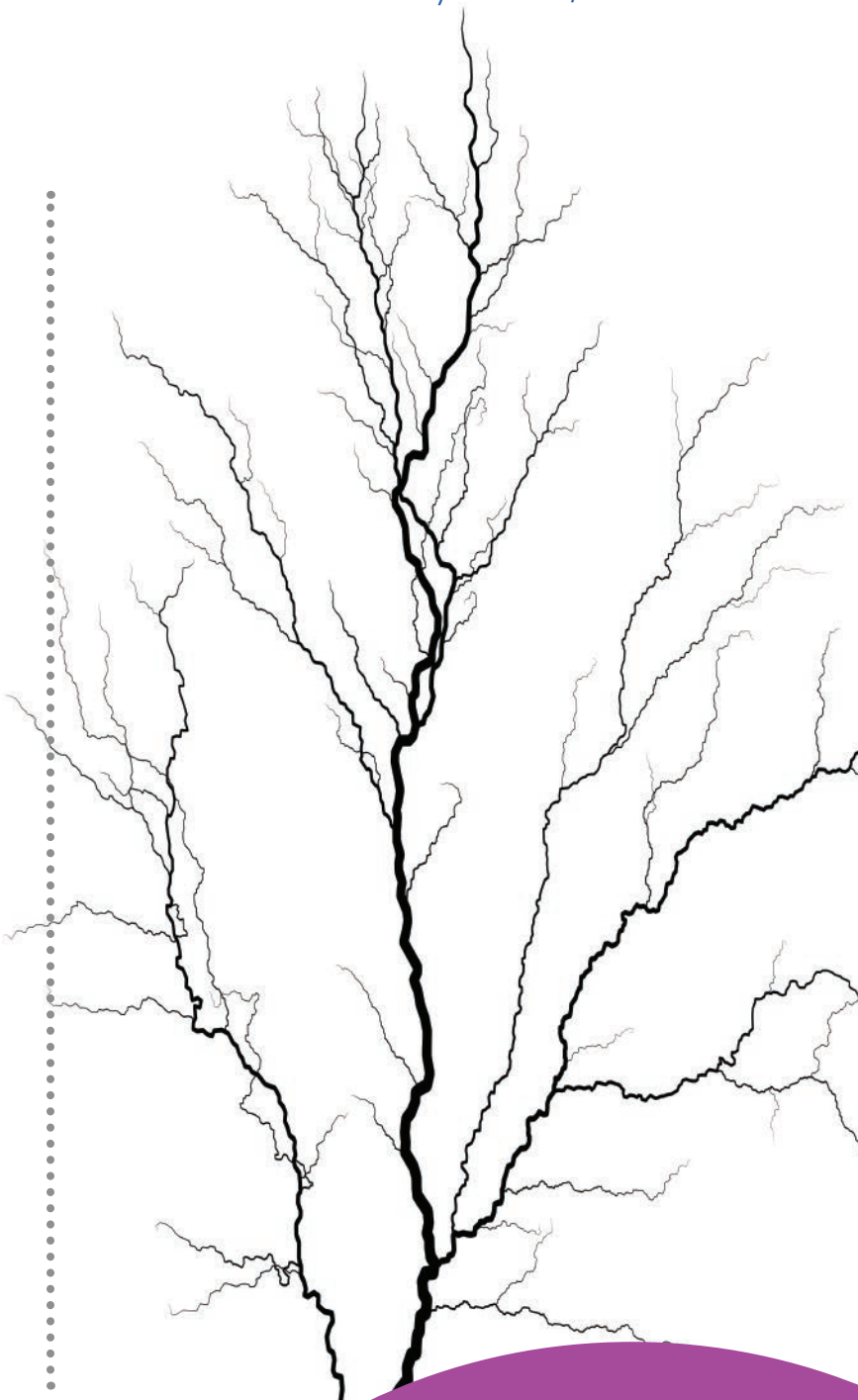
Advanced content for those who want to take their studies further:

https://www.youtube.com/watch?v=yc2-363MIQs

TIPS:

Experiments with static electricity work best in very dry conditions. If it's humid, it's more difficult to charge materials and discharge happens very quickly.

If you need help choosing the best materials, search online using the term "electrostatic series." You'll find lists of materials, ordered by their tendency to absorb or shed electrons. Materials at opposite ends of a list will create the strongest electrostatic charges.



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