

Basic Electrostatic methods**Charging By Friction**

When you rub two *insulators* together, often electrons move from one insulator to another. Typically, some insulators want to hold onto electrons more than others, and those sometimes will take electrons away.

**Electrostatic Discharge**

Electrons, trying to get away from each other, jump through the air from an insulator to a conductor, making a *shock*.

**Charging by Induction**

One item has a charge, and it creates a charge in a nearby object without touching or any electrons being exchanged.

This happens because it causes electrons to move to the back of the nearby object.

Method	Do two things touch?	Are electrons exchanged?
<b>Charging by friction</b>	YES	YES
<b>Electrostatic Discharge</b>	NO	YES
<b>Charging by Induction</b>	NO	NO

For **A.25 – A.31** answer true or false.

**A.25** Friction happens whenever things rub together.

**A.26** Often, when there is friction, electrons move between objects.

**A.27** Charging by friction happens when you rub together *conductors*.

**A.28** Charging by friction happens when you rub together *insulators*.

**A.29** In electrostatic discharge, electrons jump onto another *insulator*.

**A.30** In electrostatic discharge, electrons jump onto a *conductor*.

**A.31** Electrostatic discharge happens because electrons repel each other.

**Part B: Rabbit Fur Lab**

Step 1: Rub the rabbit fur and PVC pipe together:

**How electrons move**

When you rub the fur and the pipe,  
Electrons move from the fur to the pipe!

**How electrons move in this lab (more advanced)**

The PVC pipe and rabbit fur are both insulators. However, the PVC pipe, because of the way its molecules are put together, desires electrons *more* than the rabbit fur. Thus, when you rub them together, the electrons jump from the rabbit fur to the PVC pipe. Once they get there, they cannot leave easily, because the PVC pipe is an insulator.

**B.1** What do you feel and hear when the electrons are rubbed against the PVC pipe?

**B.2** Draw the rabbit fur being rubbed against the PVC pipe. Draw the electrons jumping from one to the other:

**B.3** What is the name of this process?

A. electrostatic discharge

B. charging by friction

C. charging by induction

**B.3.** When you feel tingles while rubbing the fur against the PVC pipe, what do you think you are feeling?

**B.5** After you charge the PVC pipe, hold your hand near the pipe and move it up and down. What does your hand feel like? What do you think it is?

**B.6: Step 2:** Put the *charged* PVC pipe near the rabbit fur, what happens? Explain and draw what happens:

**B.7** (Explaining **B.6**) When they are rubbed together, the PVC pipe has collected electrons from the rabbit fur.

**B.7a** What is the charge of the PVC pipe?

**B.7b** What is the charge of the rabbit fur?

**B.7c** Should the rabbit fur and PVC pipe attract or repel? Why?

**B.7d.** Is this what happens in real life?

**B.7e.** Draw the rabbit fur near the PVC pipe. Make sure to draw and label *charges*.

**Step 3: Electrostatic Discharge:**

The PVC pipe is full of electrons. They want to get away! So, if they are brought near a *conductor*, which would allow them to move away from each other very fast, they will jump through the air to reach that conductor.

**B.8** What process is described in the box above? (It's a vocabulary word on page 3).

**B.9** What happens when you move the charged PVC pipe near a doorknob? Try with the lights off and very slowly and carefully.

**B.10** Draw the electrons jumping off of the PVC pipe to reach the doorknob.

**Step 4: Charging by Induction**

**B.11** Charge the PVC pipe and then bring it close to your hair. What happens? [It works best if you have longer hair and are very patient.]

**Charging by Induction**

1. The PVC pipe is negatively charged. It's full of electrons.
2. The PVC pipe goes near your hair. It *repels* the electrons inside your hair. They run away.
3. Your hair is now positively charged. (by induction!)
4. The PVC pipe and your hair are attracted.

**B.12**

Draw what happens when the negatively charged PVC pipe is brought near your neutrally charged hair. Label what happens to the electrons inside the hair, and what the hair does afterwards?