

Static Electricity Lab (Computer Simulations)

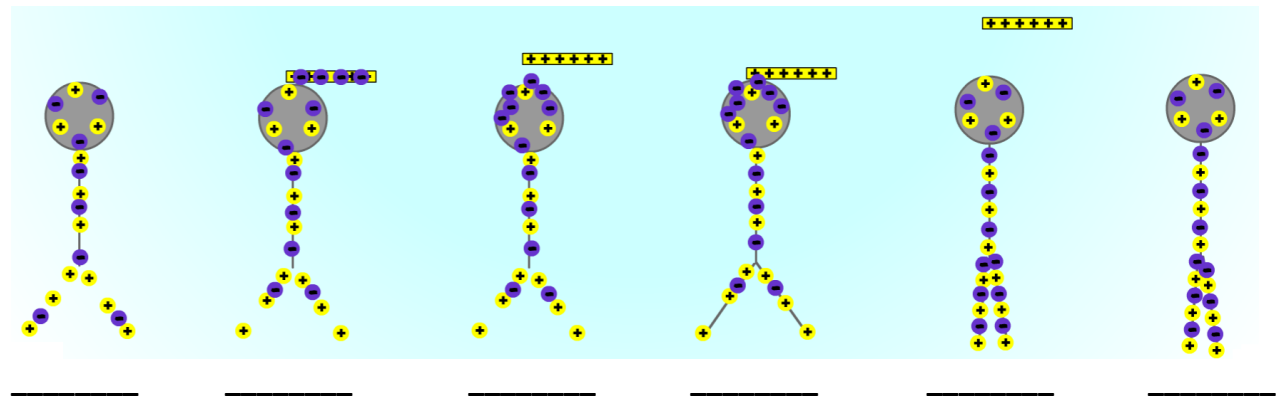
UOIT - Charging an Electroscope via Conduction and Induction

Link: http://education.uoit.ca/lordec/ID_LORDEC/electroscope/

Instructions: Flash needs to be enabled. Follow the tutorial's for each section.

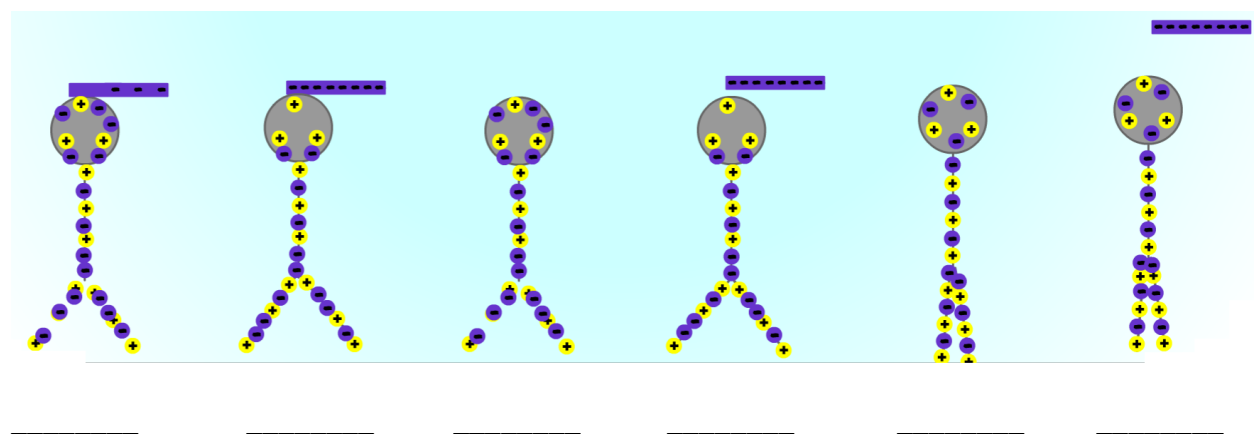
Charging by Conduction → Charging positively by conduction

You Try It! Place the scopes in the order required to charge it positively by conduction. Label them in order of number 1 to 6.



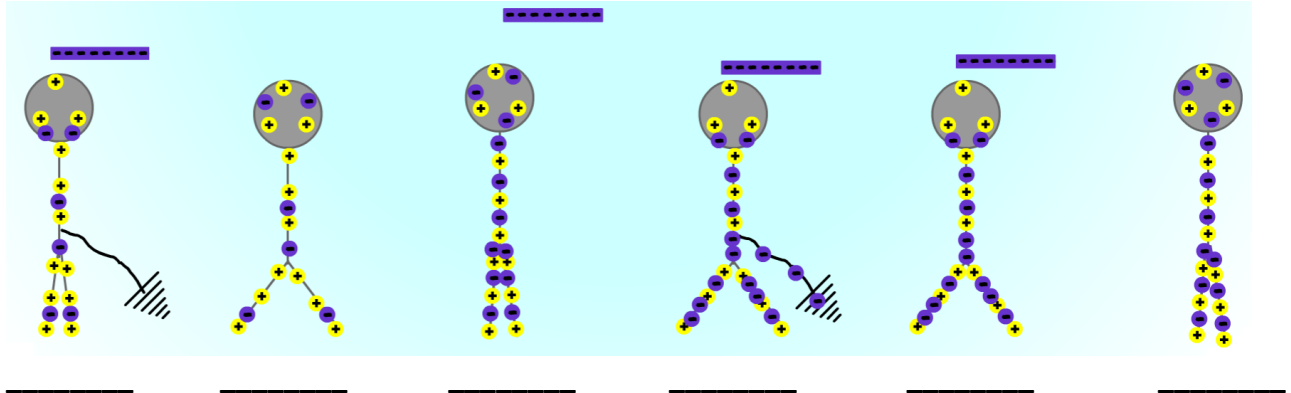
Charging by Conduction → Charging negatively by conduction

You Try It! Place the scopes in the order required to charge it negatively by conduction. Label them in order of number 1 to 6.



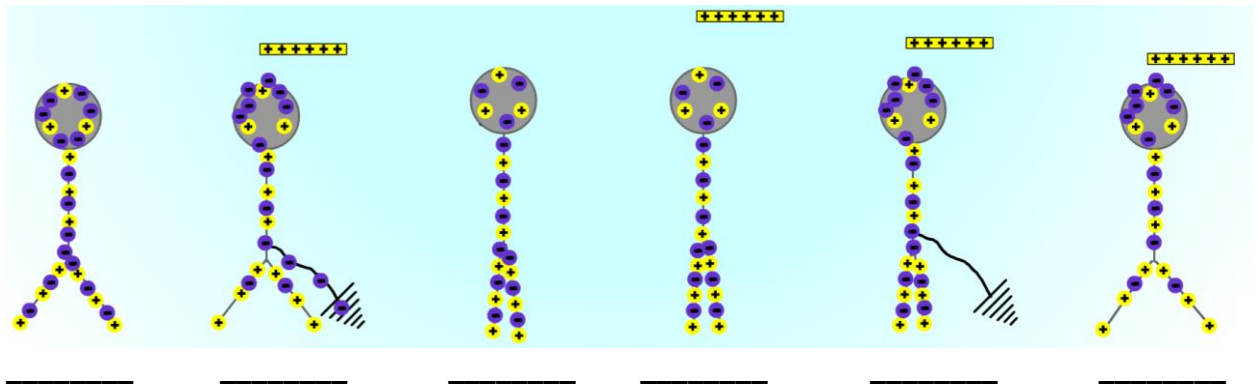
Charging by Induction → Charging positively by induction

You Try It! Place the scopes in the order required to charge it positively by induction. Label them in order of number 1 to 6.



Charging by Induction → Charging negatively by induction

You Try It! Place the scopes in the order required to charge it negatively by induction. Label them in order of number 1 to 6.



Practice Quiz

1. To charge an electroscope positively by induction, you use a positively charged rod and a ground wire.

True / False

2. To charge an electroscope negatively by conduction, you use a negatively charged rod.

True / False

3. Protons move towards a negatively charged rod. T / F

True / False

4. You use a ground wire to charge an electroscope by _____.

5. What kind of rod do you use to charge an electroscope positively by conduction? _____

6. What happens to the electrons on the electroscope when you bring a negatively charged rod close to it?

- A. Move towards the ball
- B. Move towards the leaves
- C. Do not move
- D. Move onto the rod

7. What order must you remove the ground and rod in order to have the electroscope charged?

- A. It does not matter
- B. At the same time
- C. First the ground, then the rod
- D. First the rod, then the ground

Metal Leaf Electroscope Simulation

Link: <https://mattcraig.org/sims-910-science/> → Click on Electroscope

Instructions: Flash needs to be enabled. [Instructions to use](#) & [Instructions on how to install](#)

The electroscope simulation can be used to show induced charge separation, charging by contact, charging by induction and grounding.

- Adjusting the slider-bar on the left allows you to give the rod different magnitudes of positive and negative charge.
- Once charged, move the rod from its resting place and see how it effects the electrons in the electroscope and ground.
- Induced charge separation is shown by moving the rod closer to the electroscope.
- The electroscope can be charged positively or negatively by conduction by touching the rod to the center of the electroscope.
- Replace the charging rod to its resting place and it will no longer affect the other electrons so you can see the new equilibrium of the electroscope.
- The ground can be dragged and connected to the right side of the electroscope to remove any excess charge.
- The electroscope can also be charged by induction by moving the charged rod close and connecting the ground.
- Hitting the reset icon in the top right is suggested after each experiment, to reset the electrons to their original configuration.
- When charging by conduction/induction the charge should be at least +90/-90 for it to have a noticeable effect on the leaves.
- Dragging elsewhere on the screen will translate the view and a slider bar in the bottom right allows zooming in and out. Hitting reset will revert to the original camera position and zoom.
- On the top left is a button that will switch the electroscope between transparent view (see the electrons) and regular view (how it looks in real life).

Metal Leaf Electroscope Questions

Part A: Charging by Contact

1. Bring a **positively charged** rod near the **neutral metal leaf electroscope** and **TOUCH** the ball with the rod. The **metal leaf electroscope** now has a **positive** charge.
2. Bring a **positively charged** rod near the **charged metal leaf electroscope**, and **DO NOT TOUCH IT** to the ball.
3. Record your observations in the table below by describing the movements of the **metal leaf electroscope**.
4. Repeat steps 2-3 with a **negatively charged** rod.
5. Bring a **negatively charged** rod near the **neutral metal leaf electroscope** and **TOUCH** the ball with the rod. The **metal leaf electroscope** now has a **negatively** charge.
6. Bring a **negatively charged** rod near the **charged metal leaf electroscope**, and **DO NOT TOUCH IT** to the ball.
7. Record your observations in the table below by describing the movements of the **metal leaf electroscope**.
8. Repeat steps 6-7 with a **positively charged** rod.

Observations

Electroscope	Charge on electroscope	Charge on rod	Observations Describe how the metal leaves moved
metal leaf	positive	positive	
metal leaf	positive	negative	
metal leaf	negative	negative	
metal leaf	negative	positive	

Part B: Charging by Induction**Procedure**

1. Charge a **positive** rod.
2. Hold the positive rod **near** the metal leaf electroscope and **DO NOT TOUCH** the sphere with the rod.
3. Record your observations in the table below by stating what happens to the leaves.
4. While the rod is **still near** the electroscope, ground the electroscope. Keep the charged rod near the sphere and keep it grounded at the same time.
5. Record your observations below by stating what happens to the leaves as you ground it.
6. Remove the ground and the rod **at quick as possible at the same time**.
7. Record your observations in the table below by stating what happens to the leaves as you remove the rod and the ground.
8. Now **ground** the sphere of the electroscope and observe what happens to the leaves. Record your observations in the table below. This is grounding the electroscope or making it neutral again.

Observations

Procedure	Observations Describe how the metal leaves moved
Step 3: holding the positive rod near the electroscope	
Step 5: holding the positive rod near the electroscope when it is grounded	
Step 7: removing the rod and the ground	
Step 8: grounding the electroscope	

Questions

1. Is there a charge on the electroscope after you removed the ground and the rod in step 6? How can you tell?

2. Is there a charge on the electroscope after step 8? What is the charge, positive or negative?

Other fun websites to learn with

1. PhET Simulation: Balloon & Static Electricity

Link: https://phet.colorado.edu/sims/html/balloons-and-static-electricity/latest/balloons-and-static-electricity_en.html

2. PhET Simulation John Travoltage

Link: https://phet.colorado.edu/sims/html/john-travoltage/latest/john-travoltage_en.html

3. eduMedia Static Electricity

Link: <https://www.edumedia-sciences.com/en/media/48-static-electricity>

4. eduMedia Electroscope

Link: <https://www.edumedia-sciences.com/en/media/742-electroscope>

5. eduMedia Grounding – Earthing

Link: <https://www.edumedia-sciences.com/en/media/486-grounding-earthing>