

Electrostatics Stations

1 Section 16-1 and Charged Rods

1. Read the first two paragraphs in 16-1 about the experiment. Try to reproduce the results by using the rubbing the cloth on the plastic and glass rods.
 - (a) Rub the suspended piece of tubing and the white wand. Determine whether they attract or repel.
 - (b) Do the same for the grey vinyl wand.
 - (c) Can you draw any conclusions?
2. Read the rest of Section 16-1. What is *charge*?
3. What is the Law of *Conservation of Electric Charge*?

2 Section 16-2 and the Balloon PhET Lab

1. Go to <https://tinyurl.com/BalloonPhysics> (case sensitive). Looking at the lab, what are the two types of electric charges?
2. Try rubbing the balloon on the sweater so that the balloon and sweater have opposite net charges. Do they seem to attract or repel each other?
3. Reset and now choose two balloons. Rub each balloon equally on the sweater so they are equally negatively charged. Do the balloons seem to attract or repel one another?
4. Which type of charge can move?
5. Read Section 16-2 to explain why only this type of charge can move.

3 Section 16-3 and the Wimshurst Machine

1. Place the two rods and inch or two apart from each other and steadily turn the handle until sparks jump between the two rods. Why do you think this happens?
2. Use your book (Section 16-3) to explain the difference between conductors and insulators
3. Move the rods on the Wimshurst Machine further away and place the glass beaker between them. Do the same pair of pliers. (*note: Please do not use the pliers to grab the machine. You are just using the metal ends of the pliers.*) Based on your observations, which one is an insulator, which is a conductor, and why do you come to that conclusion?
4. Why is it helpful to hold the pliers from the rubber end?
5. According to the book, what is different about the atoms of insulators and conductors that make them have different conductive abilities?

4 Section 16-4 (first part)

1. Read the first part of Section 16-4 (stop when you get to the post-it note). What is charging by contact?
2. What does it mean if charge is induced in a conductor?
3. What is grounding and why is it important?
4. How can you use grounding to charge an object by induction?
5. Can charge separation be achieved in insulators? Explain.

5 Section 16-4 (second part) and the Electroscopes

1. Use a piece of cloth to charge the plastic rod. Then bring it close to the electroscope bulb. What happens?
2. Touch it to the bulb. What happens now?
3. Now, read 16-4 and explain why it's happening.
4. Try to recreate the effect shown in Figure 6-12. Charged glass rods are positive. Charged plastic rods are negative.

6 Van De Graff Generator

1. Have one person stand on the stool, and put their hands on the generator. The generator should make the person feel as if their hair is standing on end. Why do you think this is?
2. Have the person on the stool touch someone else in the group (warning, you will get a little shock). Why do you think the person who was touched was shocked even though the person constantly touching the Van De Graf is not continuously being shocked?

7 Section 16-5 (first part)

Use Section 16-5 to answer the following questions:

1. What is the Coulomb's law equation and what do each of the symbols stand for?
2. What is the unit for measuring charge?
3. What does e mean?
4. What does it mean to say electric charge is *quantized*?
5. What are similarities and differences between Coulomb's Law and the Law of Universal Gravitation?

8 Section 16-5 (second part)

1. What is *electrostatics*?
2. Read through Example 16-1 and try to understand it. Then work this problem:
Two charges of magnitude $5\text{ }\mu\text{C}$ and $-2\text{ }\mu\text{C}$ are placed 2 mm apart from each other. Calculate the magnitude of the force between them. Remember, $1\text{ }\mu\text{C} = 10^{-6}\text{ C}$ and $1\text{ mm} = 10^{-3}\text{ m}$. *Check your answer below.*

Answer: $22\,500\text{ N}$