Lab: Static Electricity.

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Introduction

Electrostatics focuses on the study of stationary electrical charges. The ability to predict the behavior of these charges can be essential in preventing sudden discharges, which if put through fragile components, such as computing hardware, could damage or destroy them. Within this lab we intend to explore the process of determining the electrostatic properties of an object, through a variety of means, by exploiting the fact that opposite charges are attracted towards each other.

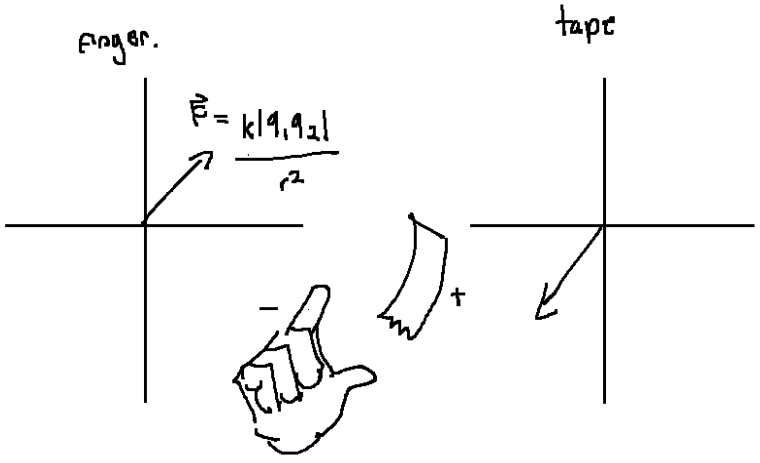
Problem #0

- Original Tape Charge Guess: +
- Original Plate Charge Guess: -

Problem #1

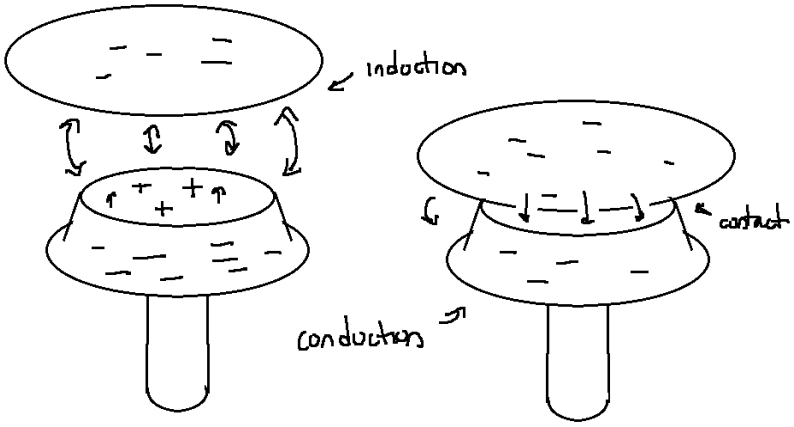
The 10cm of tape we used was attracted to our finger. This implies that a force was exerted on the tape, which, since our finger didn't touch it directly, must be the electrostatic charge. When the is flipped around, it is also attracted, although the force is so little it is hard to be certain.

With the second piece of tape, they were attracted to each other, but repealed slightly when one piece of tape was flipped. This seems contrary to when the tape was flipped and interacted with by our finger, but the tape used there seemed "weaker" after some time using it.



Problem #2

Conduction: When the plate was rubbed against polyester, it seemed to gather a negative charge. The electrophorus was then charged through conduction with the plate. After, the tinsel was attracted at a distance by the plate, implying it then held a different charge from the electrophorus. When charging by conduction, the electrophorus is charged with a different charge as the plate.



Induction: When charging by induction, the electrophorus is charged with the same charge as the plate (on the opposite side). As shown in the diagram, induction moves positive charge near the plate and negative charge away.

Problem #3

The electrophorus after being charged through conduction seems to be negatively charged, since the diode showed my finger grounding the circuit, as the positive terminal.

When the electrophorus is grounded by the diode, my finger was again the positive terminal, meaning the electrophorus was negatively charged where it was contacted. When the charge was depleted there, it left a net positive charge, which caused the tinsel to “float”.

Both experiments revealed that the electrophorus had a negative charge, which would imply the plate was also negatively charged. When moving tape towards the plate, we were able to determine the charge of the tape would have to be positive, due to its attraction.

Problem #4

Materials: Tin-foil ball, Electrophorus (Charged).

The aluminum ball gets placed between a finger and the electrophorus. At a certain distance, it starts bouncing between the finger and the electrophorus repeatedly. Hypothetically, this would be because the ball comes into contact with the electrophorus and gets charged by conduction, then it gets attracted to the relatively positive finger, and after it touches it the charge flows into the finger. Then after it goes back and touches the electrophorus again, the process repeats itself.

Conclusion

Through this lab, we verified the charge of the plates and electrophorus using a diode and demonstrated both induction and conduction electrostatics. The plate was found to be negative and the tape positive, as was our guess in problem #0. Electrostatics is an essential concept to electromagnetism as a whole, which has many applications in engineering and science.