

Laboratory #12

Electrostatics

Part A: Scotch Tape Extravaganza

Concepts

Electric Charge; Conduction; Induction; Repulsion; Attraction

Introduction

There are three forces in the universe. Gravitational, Nuclear, and electrostatic. You are already familiar with gravitational (it is the weakest), Nuclear has to do with forces in the nucleus of an atom, everything else in the universe is caused by electrostatics. This includes things like elmers glue, hair spray, and scotch tape.

Procedure

- Rapidly pull two long (about 18") pieces of tape off of the roll being careful not to touch it to anything else.
- Holding only one end of the tape try to touch the pieces of tape together
- Stick the sticky side of one to the sticky side of the other, and rapidly pull them apart.
- Holding only one end of the tape try to touch the pieces of tape together
- Stick the sticky side of one to the non-sticky side of the other, and rapidly pull them apart.
- Holding only one end of the tape try to touch the pieces of tape together
- Stick the two pieces of scotch tape to the table
- Rapidly pull them off being careful not to touch them to anything else
- Holding only one end of the tape try to touch the pieces of tape together

Part B: Plastic vs. Glass

Concepts

Electric Charge; Conduction; Induction; Repulsion; Attraction

Introduction

More fun with electrostatics!

Procedure

- Charge the plastic rod with the rabbit fur.
- Meanwhile also charge the glass rod with the piece of plastic.
- Hold one rod close to the electroscope without touching them together.
- Pull it away and recharge it.
- Hold the other rod close to the electroscope without touching them together.
- Pull it away and recharge it.
- Touch one rod to the electroscope.
- Pull it away.
- Touch the other rod to the electroscope.
- Pull it away
- Touch the electroscope with your hand.

Part C: Utterly Shocking

Concepts

Electric Charge; Conduction; Induction; Repulsion; Attraction

Introduction

The Van de Graaff generator is a very fun piece of equipment! With the massive amounts of charge that it builds up you can witness first hand how electric charge interacts with its surroundings. Be careful though, it can give you a shocking surprise!

Procedure

Part 1

- Stand on an insulator.
- Put your hand on the globe of the Van de Graaff generator.
- Turn on the generator, but don't touch anything else, and don't take your hand off of the globe.
- Shake your hair occasionally and wait until all your hair is standing on end. Then turn the generator off.

Part 2

- Stack three or four aluminum pie pans on top of the globe.
- Turn the generator on.
- After the pie pans have scattered themselves, turn off the generator.

Part 3

- Turn the generator on and turn the lights off.
- Hold one end of the florescent light close to the globe.
- Hold the middle of the light close to the globe.
- Turn the generator off, and the lights back on.

Part 4

- Turn the generator on.
- Find a way to make the bell ringer ring. Turn the generator off.
- Place a Styrofoam peanut on top of the generator.
- Hold your hand 4" - 6" above the peanut. Turn the generator on.

After you have made the peanut bounce back and forth a number of times, turn off the generator.

Part B: Plastic vs. Glass

- **What is the charge of the plastic rod after you have charged it?**
- **What is the charge of the glass rod after you have charged it?**
- **Why do the leaves of the electroscope separate when a charged rod is close, but does not touch the scope? (you might find a picture helpful)**
- **The method of charging you just described is called charging by _____.**
- **Think of at least one new fun experiment that demonstrates the concepts learned today. Show me and I'll check you off (if it is a good one).**

Part C: Utterly Shocking

Part 1

- **Explain why your hair would want to stand on end.**
- **What would happen if you touched someone else?**

Part 2

- **Explain why the pans were repelled by each other.**
- **What force did they have to overcome in order to fly off the globe.**

Part 3

- **Why does the light bulb glow when you hold one end close to the globe but not when the middle is next to the globe?**

Part 4

- **Why does the peanut (or bell ringer) dance? Explain every step of the process.**