

What is Static Electricity?

Chapter 13 Lesson 1
Part 1

ByDesign Science, Level 6
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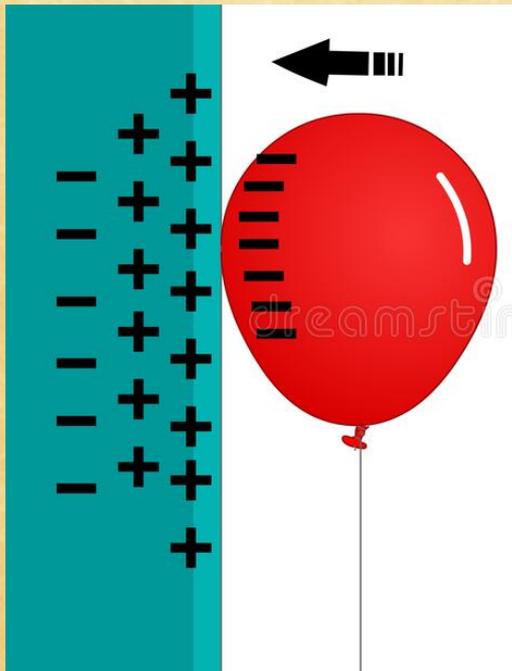
Electric Charges and Forces

- ◆ Have you ever walked across a carpet and reached for the doorknob, only to be “zapped” by an unexpected electric shock?
- ◆ What caused the spark?
- ◆ Why does hair mysteriously stand on end after pulling off a wool cap on a winter day?
- ◆ Have your clothes ever made strange crackling noises and clung together when you pulled them out of the dryer?



Electric Charges and Forces

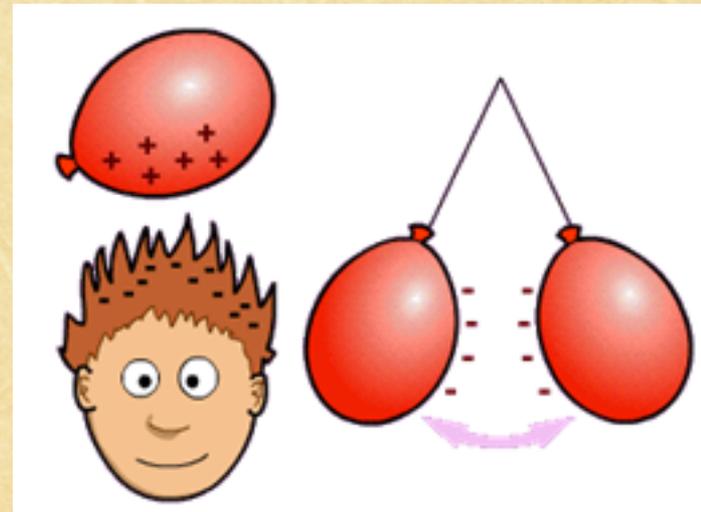
- ◆ These seemingly unrelated events are each caused by *static electricity*, the buildup of electric charges on the surface of objects.



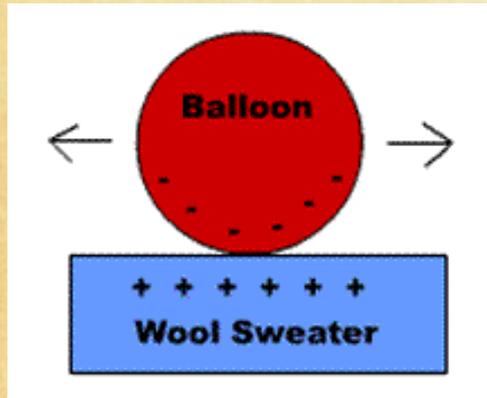
- ◆ Recall that protons and neutrons are located at the center of an atom and electrons orbit the nucleus.
- ◆ Neutrons do not carry a charge. Protons have a positive charge and electrons carry a negative charge.

Electric Charges and Forces

- ◆ Normally, atoms have a neutral charge because they have equal numbers of protons and electrons.
- ◆ The outer electrons in some atoms are held together very loosely.
- ◆ These electrons can move from one atom to another.



Electric Charges and Forces



- ◆ When electrons jump from material to another, the atoms gain or lose electrons.
- ◆ The electric charges are no longer neutral.
- ◆ When an object loses electrons, it gains a positive charge.
- ◆ When an object gains electrons, it gains a negative charge.
- ◆ Rubbing is one way to transfer electrons.

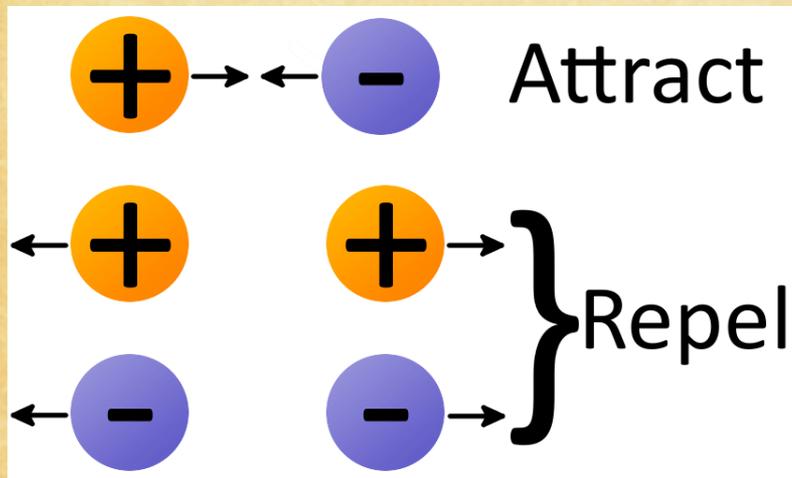
Electric Charges and Forces



Electric Charges and Forces

Electric Forces

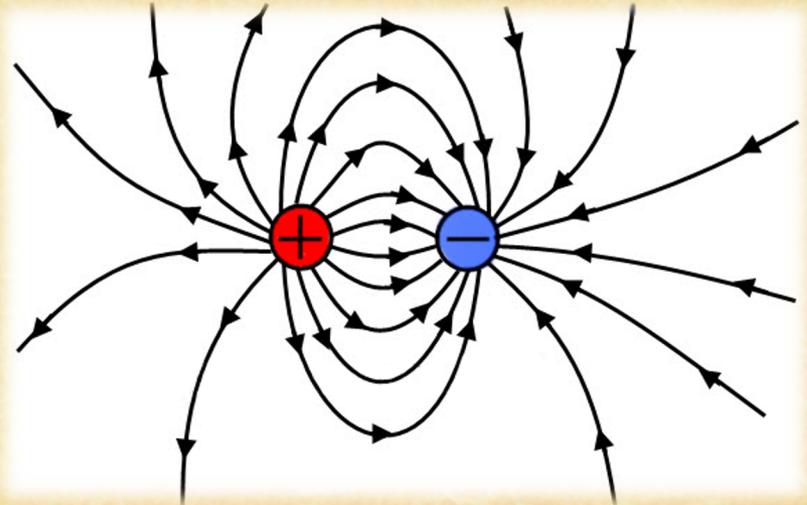
- ♦ What happens when charged objects are brought near each other?
- ♦ The charged objects exert forces on each other.



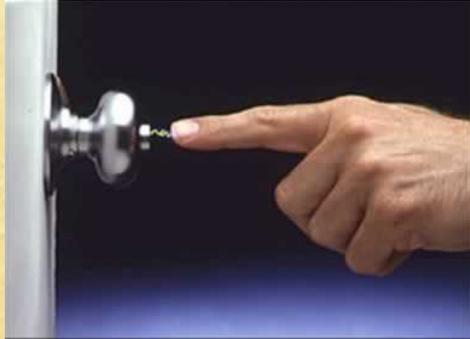
- ♦ This force can be attractive (pulling objects together) or repulsive (pushing them apart).

Electrostatic Discharge

- ◆ An electrostatic discharge is the sudden release of static electricity between two differently charged objects.
- ◆ The electric force is so great that electrons jump the gap between the objects.
- ◆ Often this discharge results in a spark and a popping or crackling sound.



Electrostatic Discharge



- ◆ When you touch a doorknob, an electrostatic discharge produces the spark that gives you a small electric shock.
- ◆ You can sometimes see, feel, and hear the spark when it jumps.
- ◆ These discharges can damage or even melt small parts inside fragile electronic equipment, such as computers.

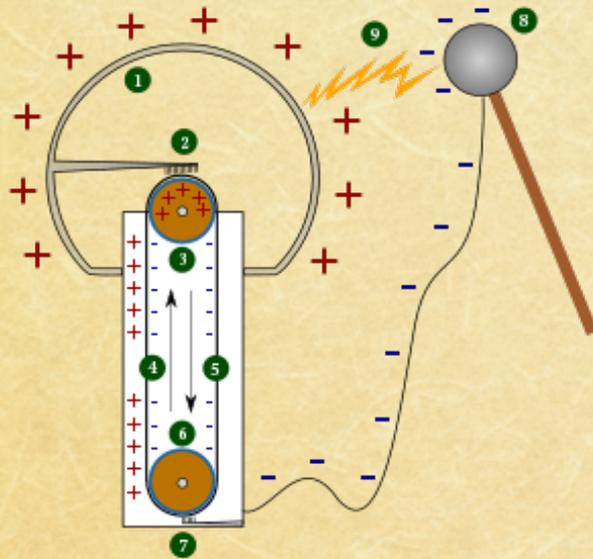
Electrostatic Discharge

- ◆ A Van de Graaff generator is a device that produces a static charge.
- ◆ Touching the aluminum globe causes all the strands of a person's hair to have the same electric charge.
- ◆ This causes the hairs to repel one another.



Electrostatic Discharge

Van de Graaff Generator



1. hollow metal sphere
2. upper electrode
3. upper roller (for example an acrylic glass)
4. side of the belt with positive charges
5. opposite side of belt, with negative charges

6. lower roller (metal)
7. lower electrode (ground)
8. spherical device with negative charges
9. spark produced by the difference of potentials

- ◆ In fact, the generator uses a moving rubber belt driven by a felt-covered pulley.
- ◆ This interaction results in the belt carrying away electrons from the felt.
- ◆ The electrons are drawn from the rubber belt to the globe at the top.

Electrostatic Discharge

