

Grade 7 Science
Week of January 18 – January 22

Electricity 2

Electric Charge

A quick recap...

An atom normally has **no charge** because the positive (protons) and negative (electrons) charges balance each other. However, when two objects rub together, some of the negatively charged electrons on the surface of one object get **transferred** to the other.

The object that the electrons **move from** is left positively charged.

The object they **move to** becomes negatively charged.

The **imbalance of charges** produces static electricity.

Electric charge affects the way that objects interact. If two objects carry opposite charges—that is, if one is positive and the other is negative—they **attract each other**. If two objects carry the same charge—that is, if both are positive or both are negative—they **repel each other**.

Is this why a plastic comb will attract paper? Take a look at the video below to find out. Make sure you follow along in your **Learning Guide!**



How Does a Plastic Comb Attract Paper?: <https://youtu.be/3aB6TyhaSsQ>

3 Ways to Create a Charge

- **Friction:** rub two objects that allow electrons to be transferred from one to the other. Some materials easily give up electrons, while some materials easily 'grab' electrons. Rub two opposing materials and you can expect electrons to move from one to the other.



- **Conduction:** touch a charged object to a neutral object, allowing the transfer of electrons. This creates a charge (spread out) over both objects.



- **Induction:** without touching, bring a charged object close to a neutral object. This forces the charges in the neutral object to become separated, creating opposing charges in different parts of the second object. While separated, conduction can happen, and electrons can be transferred to/from another object.



Charge by Friction

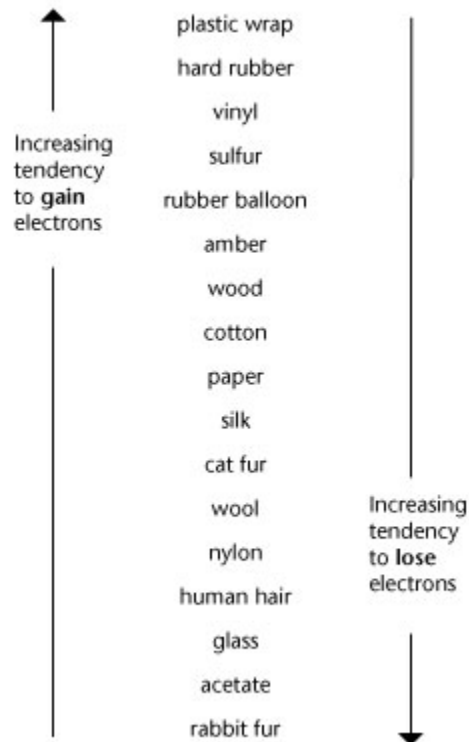
Charges may be placed on certain objects through friction. Essentially what is done is that charged particles are rubbed off one object and onto another. As protons are located in the nucleus of an atom they are unaffected by the rubbing, rather it is electrons in orbital clouds around the nucleus which are rubbed off due to friction. These electrons become transferred onto the other object involved in the rubbing. The object losing electrons will now have more protons than electron, and results in a positive charge. The object gaining the electrons will have a surplus, resulting in a negative charge of equal but opposite sign as the positively charged object.



Static Charge Transfer: <https://youtu.be/QHB9f66ip5s>

In the interactive video you will view, there are two piles of materials to rub together. Your task is to choose a material from one pile, rub it with a material from the other pile, and observe which way the electrons move—that is, if they move at all!

Refer to the chart below to help you with your predictions.



Friction and Charge?

Even though many people think that friction causes static charges to build up, this isn't really true. Rubbing materials together simply increases the contact between the two objects. A way to cause static charge to build up is to repeatedly touch and separate two materials; rubbing two objects together (creating a frictional force) is simply a more effective way of touching and separating two objects. This makes it easier for electrons to jump-from the material that holds them more loosely, to the material that holds them more tightly. Friction itself has nothing to do with the charge.

Charge by Conduction

Charge by conduction happens when a charged object comes in contact with a neutral object.

Conduction just means that the two objects will come into actual physical contact with each other (this is why it is sometimes called "charging by contact")



Take a look at the video below for a more in-depth explanation of this process:

https://youtu.be/OPVo0h_KAd0

Charge by Induction

Charging by induction is a process which involves the creation of a charge in an object without contact.

To understand this it is essential to understand the most basic rule of charges: **OPPOSITE CHARGES ATTRACT, SIMILAR CHARGES REPEL.**



Charging by Induction: <https://youtu.be/DmfPrTJnmSE>

Lightning

Lightning strikes the earth about 350 million times per year. So what exactly is it, and how does it happen? Well, lightning is really just static electricity!

Take a look at the video below to see how it works. Make sure you follow along in your **Learning Guide**.



How Does Lightning Work? https://youtu.be/Cz_uYBx1G5s

Friction and Lightning

Lightning is another example charging by friction. In large clouds, air and dust particles circulate quickly, bumping into each other and building up a negative charge in the clouds. This causes the electrons in the ground to be repelled from the surface. With the surface now positively charged, negative charges are attracted, and a "stream" of charges flows as a lightning bolt between the clouds and the Earth.

Experiments

To finish this book, take a look at the video below. It's a great demonstration of many of the concepts that you learned in the last few chapters. Make sure you follow along in your Learning Guide!



Science Max: <https://youtu.be/Vauyc57cMtM>

14. Watch the video to answer the following questions.

Video: How does a plastic comb attract paper?



- I. Initially, the plastic comb was:
 - a. Positively charged
 - b. Negatively charged
 - c. Electrically neutral
- II. Will a metallic comb attract pieces of paper like the plastic comb? Why or why not?

15. Rubbing a balloon on your head and having it stick to your head is an example of:

- a. Charge by friction
- b. Charge by conduction
- c. Charge by induction

16. What type of charge is produced without any contact?
- a. Charge by friction
 - b. Charge by conduction
 - c. Charge by induction

18. Watch the video to answer the following questions.

Video: How does lightning work?



- i. Lightening starts with _____ charges moving down to the ground, and _____ charges move up from the ground.
- ii. Does lightning travels from the cloud to the ground, or from the ground to the cloud?

19. Watch the video to answer the following questions.

Video: Science Max Season 2 Lightning



- i. **How is it possible to separate grains of pepper from salt?**

8. What type of energy is the following image showing?



- a. Tidal Power
- b. Hydropower
- c. Flow Power

9. What is energy poverty?

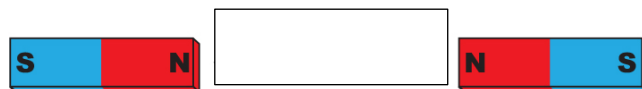
3.4 Magnetism

1. You put a magnet close to an iron nail. Will the magnet attract the nail? _____.

2. **True or False:** All metals are attracted to magnets.

- a. True
- b. False

3. For the following magnets, indicate whether they will Attract each other or Repel each other.



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4. Watch the video to answer the following questions.

Video 1: Bill Nye Magnetism



What would happen if you cut a magnet in half? Would you get a magnet that is only north ended and one that is only south ended?

14. What are electromagnets?

15. **True or False:** The stronger the magnet, the larger the magnetic field

- a. True
- b. False

Reflect:

What are 5 things you could do to reduce electricity consumption within your home?
