

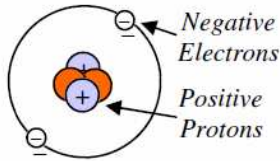
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**Electricity and Why it Moves**

**Electricity**

Electricity is moving electrons; Protons can't move.

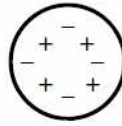
Electrons can move, but protons are held together in the nucleus by the strong nuclear force, the strongest force in nature.



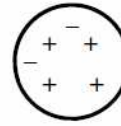
Electricity comes from electrons moving between atoms.

**Charge**

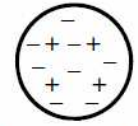
Objects can be positive, negative, or neutral. The unit of charge is the *coulomb* (C).



A neutral object has an equal amount of protons and electrons.



A positive object has lost electrons, so it has more protons than electrons.

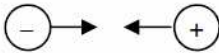


A negative object has gained electrons, so it has more electrons than protons.

**Electric Force**

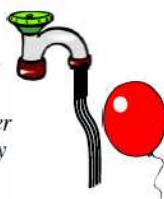
Any two charges feel a force between them. Electric force depends on the types of charges, the distance between the charges, and the amounts of the two charges.

Attracting Force



Opposites attract

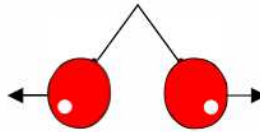
Positive hydrogen atoms in water are attracted to the negatively charged balloon, causing the water stream to bend slightly toward the balloon.



Repelling Force

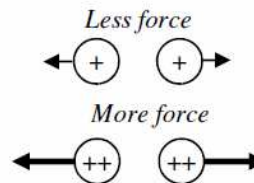
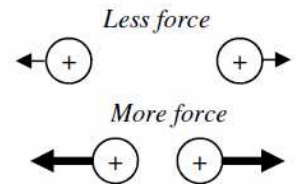


Likes repel



Two charged balloons repel each other, so they must be the same charge (negative).

Just like gravity, electric force increases as distance decreases. Closer charges: more force.

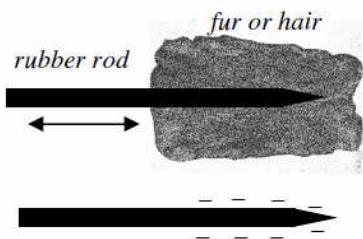


Electric force increases if either of the charges increases. More charge: more force.

**Separating Charges**

Naturally, objects are neutral. Work must be done to separate charges. Separating charges cause a charge difference and the electric force tries to move the charges back to neutral.

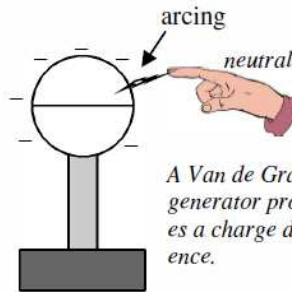
When two insulators rub, charges move between them, causing a separation of charge (static electricity) and an electric force.



Afterwards the rod is charged and it can exert an electric force.

If there is a difference of charge electricity can move between objects. A big enough difference can cause electricity to arc (jump a gap). Bigger differences of charge allow bigger arcs.

No difference in charge—electricity can not move.



A Van de Graaff generator produces a charge difference.



A big charge difference can push thru big gaps, like lightning arcing all the way to the ground.

**Batteries**

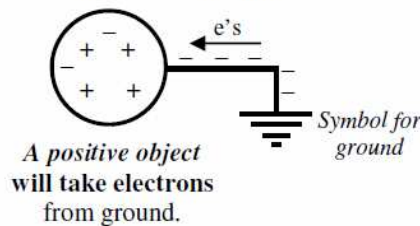


Batteries cause electrons to move by separating charges in chemicals. When connected by wires the charge can flow, eventually neutralizing the battery.

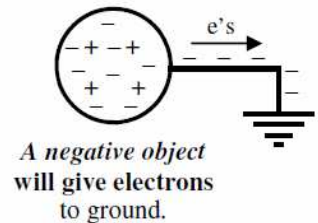
**Ground**

Ground (the earth) can take or give an infinite number of electrons. Ground is electrically neutral. Both positive and negative charges will neutralize when grounded.








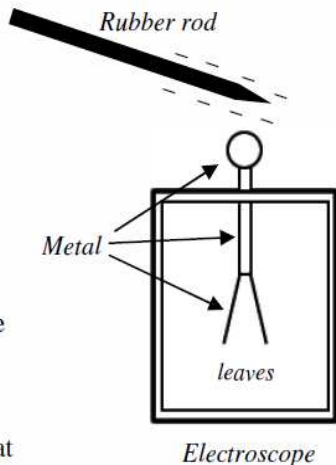

To ground something you can often touch it to a pipe. Metal pipes are good electrical conductors and usually connected to ground somewhere in the building.



A positive object will take electrons from ground.



A negative object will give electrons to ground.

1. Positive 2. Negative 3. Neutral 4. Coulombs 5. Electric force 6. Strong Nuclear Force	A. A push or pull caused by charges.  B. The units for charge. C. When an object has more protons than electrons. D. When an object has an equal number of electrons and protons. E. What keeps protons bound in the nucleus of an atom. F. When an object has more electrons than protons.	1. Ground 2. Arcing 3. Charge Difference 4. Van de Graff 5. Electricity 6. 	A. The symbol for ground.  B. Moving electrons. C. When a spark jumps between two objects. D. Can accept or give an infinite amount of electrons. Will neutralize charge. E. A machine that separates charge. F. Causes an electric force and charges to move.
<i>Attract or Repel?</i> 		<i>What Charge: Positive (+), Negative (-), or Neutral (0)?</i>	
___ Two positive charges.      ___ ___ A positive and negative charge.      ___ ___ Two balloons on a string pushing apart.      ___ ___ A 3 C charge and a -4C charge.      ___	___ ___ ___ ___	___ 2 protons and 4 electrons ___ 18 protons and 16 electrons ___ A piece of rubber after rubbing it with fur. 	
What are the charges of the second objects? 		A balloon is rubbed against hair. Afterwards it sticks to a wall.  A) Is the balloon attracted or repelled by the wall? B) Are the balloon and wall oppositely charged or like charged?	
Does the Electric Force increase or decrease? ___ If the distance between the charges increases? ___ If one of the charges is bigger (increases)? ___ If both of the charges decrease (gets smaller)? ___ If the charges get closer?		You walk across a carpet. When you try to touch a door knob a spark jumps between you and the door knob. Why?	
A negatively charged rubber rod is brought close to the metal top of an electroscope. A) Will the electrons in the metal stay near the rod or move away from the rod? B) Why? C) On the diagram, draw where the electrons will go. D) What will the metal leaves at the bottom do?		Two objects are charged, but do not arc. Give two ways to make them arc.  An object has a charge of 4.5 C. A) Is the object positive or negative? B) Did it gain or lose electrons? C) If you touch it to ground, will it lose electrons to ground or gain electrons from ground? D) What will its charge be after it is grounded?	
		Using the object at the right answer the following questions.  A) Did it gain or lose electrons? B) When grounded, will it gain or lose electrons from ground? C) Draw a wire grounding it. D) What will its charge be after grounding?	