Brief review of the atom from Chemistry:

- The nucleus contains MOST OF THE MASS (protons and neutrons are much, much, more massive than electrons)
- Electrons are located outside the nucleus.
- Protons are positive, electrons are negative, and neutrons are neutral (no charge)
- Protons and neutrons are nearly the same size
- Protons and electrons have the same magnitude of charge; they are just opposite in sign
- A proton has a charge of $+1.6 \times 10^{-19}$ C whereas an electron has a charge of -1.6×10^{-19} C
- Neutral atoms contain the same # of protons and electrons
- Since protons are TIGHTLY BOUND in the nucleus, they are VERY DIFFICULT to remove.
- Since electrons are LOOSELY BOUND outside the nucleus, they are much easier to remove.
- Atoms become negatively charged by gaining electrons (since electrons are negative)
- Atoms become positively charged by losing electrons (since they will now have more protons than electrons)
- If an object has more negative charges than positive charges, it will be negatively charged, etc.
- Conductors: An object in which charge flows easily and can therefore conduct electricity. Example: metal
- Insulators: An object in which charges are nearly "static" meaning they don't move very well. Since charges can't flow, insulators cannot conduct electricity. Example: rubber

NOW COMPLETE SUBLEVEL 1 FROM THE STATIC ELECTRICITY MODULE

Review your note-taking guide from the online video on Static Electricity (episode 801) and then **COMPLETE SUBLEVELS 3 & 4 FROM THE STATIC ELECTRICITY MODULE**

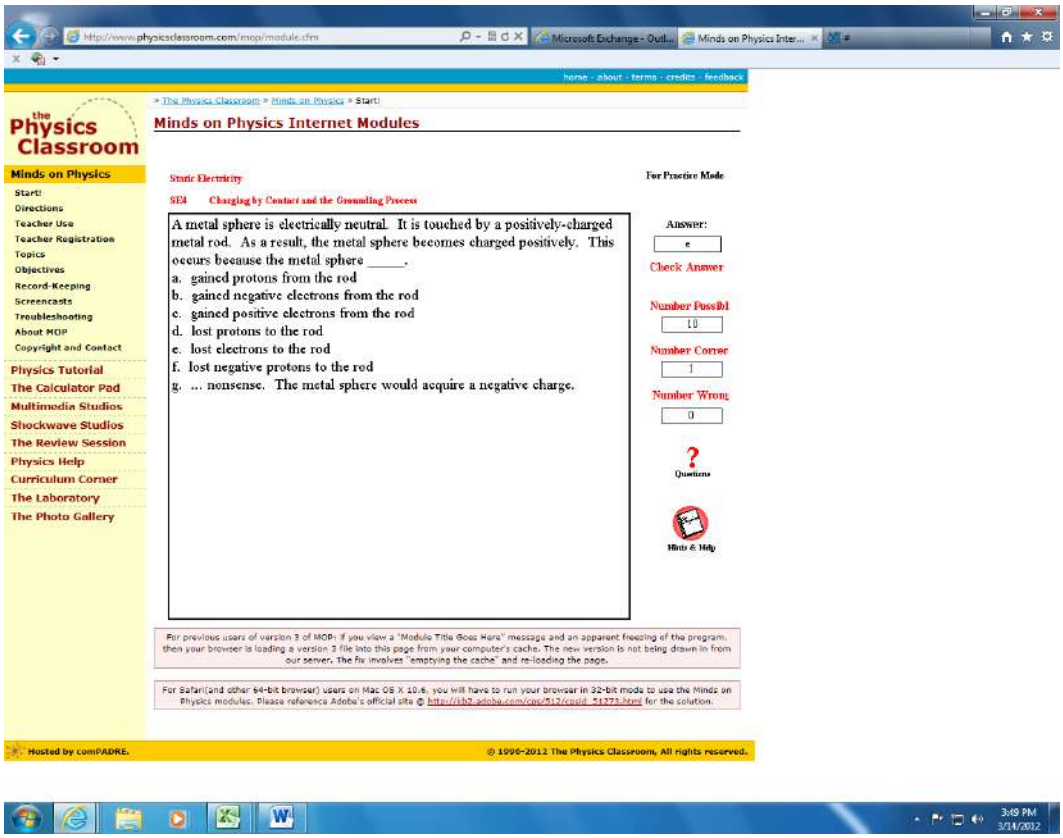
Here are the highlights from the video:

- Objects that have a high affinity (affinity means "attraction") for electrons rip electrons off of objects that have a lower affinity for electrons.
- Electrons are ***transferred*** from one object to another. Remember, electrons cannot be created nor destroyed!! And it's electrons that are being transferred; NOT PROTONS!
- This is the list of objects and their affinity for electrons that you saw in the video. Objects at the TOP of the list have a HIGH AFFINITY FOR ELECTRONS. Objects *rip electrons off* of other objects that are *below it* in the list and *they give electrons to* objects that are *above it* in the list.

PVC
Rubber
Cotton
Paper
Silk
Fur
Wool
Nylon
Hair
Acetate
Glass

As can be seen from the above list, PVC pipe will rip electrons off of any object below it in the list and become negatively charged forcing the other object to become positively charged. If you rub a glass rod with fur, fur will rip electrons off of the glass (since it is above glass in the list). The *fur will become negatively charged* while the glass becomes positively charged. If you rub a PVC pipe with fur, however, the fur will become positively charged, because the PVC pipe rips electrons off of the fur since it is above fur in the list.

- When you put a charge on an **insulator** by rubbing it with another object (i.e. rubbing a balloon on your hair), the charge stays put on the insulator (on the section of the balloon that was rubbed for instance) and does not move around the entire surface of the insulator
- When you put a charge on a conductor, the charge instantly moves all around the surface of the conductor
- To remove the charge from an object and make it become neutral again, you must "ground it" through **electron transfer**. Positively charged objects must *gain* enough electrons to become neutral whereas negative electrons must *lose* enough electrons to become neutral.
- When you ground a negatively charged object by touching it, electrons flow from the object through your hand, through your body, to the earth.
- When you ground a positively charged object by touching it, electrons flow from the earth, through your body, through your hand, to the object.
- The earth is an endless supply of electrons!
- Objects can be **charged by contact**. This is called "**charging by conduction**". See the example below from Sublevel 4.



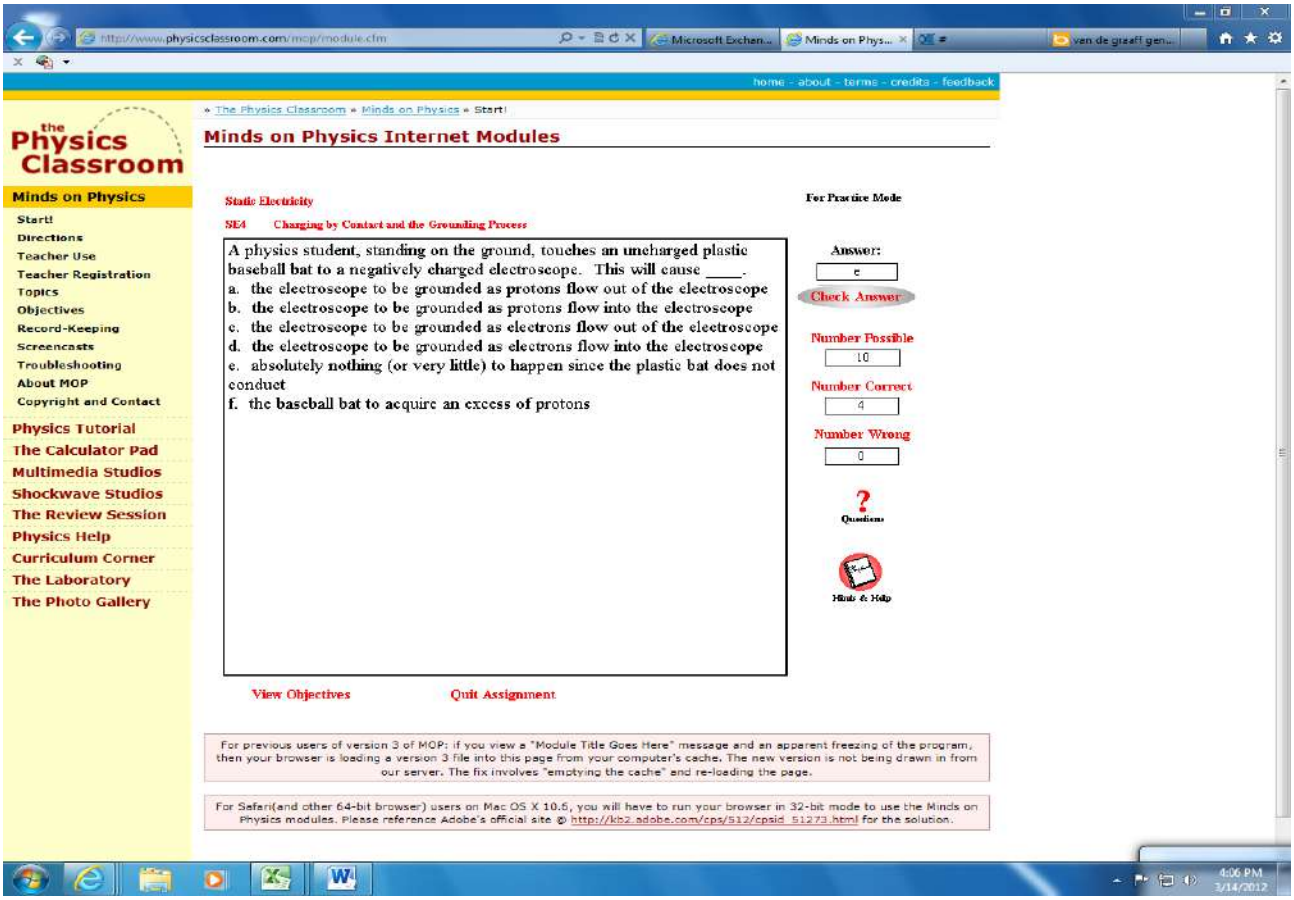
Since the rod was positively charged, the metal sphere "grounded the rod out" when it came into contact with it by giving the rod some of its electrons. Of course, when the metal sphere lost electrons it ended up becoming positively charged in the process. Isn't that nice?! ☺

Note: in sublevel 4, it will mention a "van de Graaff generator". Here is a picture of one:

The metal sphere is charged and electrons are constantly flowing through the student to attempt to ground it out. It is obvious that the student has electricity flowing through her as evidenced by her "fro". Pretty cool, huh? We have a van de graaff generator and will do this in class soon! ☺

IF PEOPLE WERE INSULATORS (i.e. charge couldn't flow through them), they would not be able to "ground" objects. PEOPLE ARE CONDUCTORS!!

- You saw an electroscope on the video. When it is given a charge, the leaves separate. You can ground out a charged electroscope and cause the leaves to fall back down by touching it with your hand or another conductor (like a metal rod). You would not be able to ground it out with an insulator such as a rubber balloon.
  See the example below from sublevel 4. The correct answer is "e" (it is difficult to distinguish if it is a "c" or "e" in the answer box).



YOU MUST DO SUBLEVELS 1, 3, & 4 BEFORE NEXT CLASS OR YOU WILL BE LOST!! THEREFORE, I WILL BE COLLECTING YOUR SUCCESS CODES THE BEGINNING OF NEXT CLASS!!