Name:_____

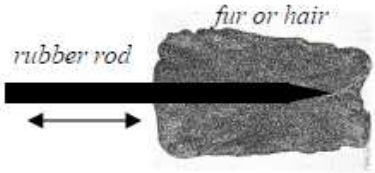
Separating Charge

2

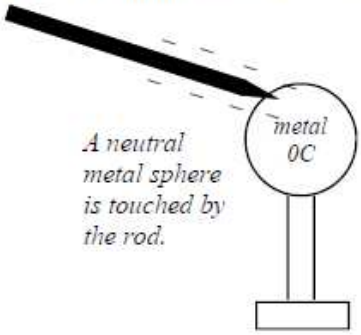
Charges (electrons or protons) can never be destroyed, but they can be separated so that there is a difference of charge. When objects are positive or negative, it is because charges (usually electrons) have been moved.

By Contact

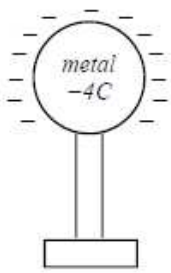
If you drag your feet across a carpet you will gain static electricity, but you don't have to drag your feet. Any contact between certain materials will separate charge. Dragging or rubbing just speeds up the process. Both conductors and insulators can be charged thru contact.



Rubbing only transfers electrons from the fur to the rod faster.



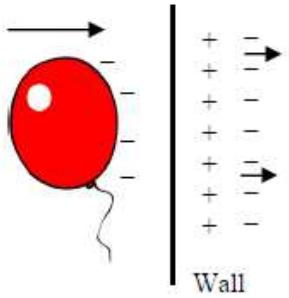
A neutral metal sphere is touched by the rod.

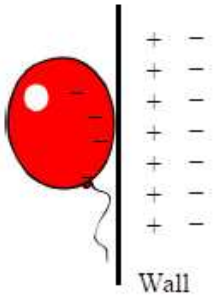


After it is touched the metal sphere has a negative charge because it gained electrons from the rubber rod. It has been charged by contact (touching). Being a conductor, the electrons spread out across the sphere.

By Polarization

Insulators and conductors can seem to have a charge by polarization. In polarization electrons shift position, but remain on the object. A polarized object still has a net charge of zero.

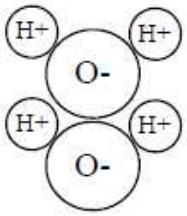




When a balloon is charged by contact (rubbed with fur) it gains electrons, becoming negative. The electrons in the wall are repelled, shifting slightly away from the balloon, leaving a net positive charge on the wall's surface. The balloon then is attracted to the wall and sticks.

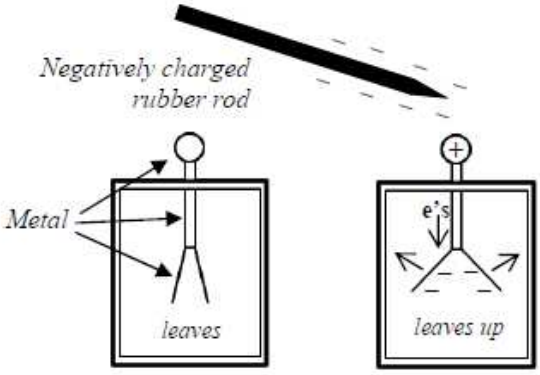
Water molecules are also polarized.

Oxygen has more protons than Hydrogen. So Hydrogen's electron is more attracted to Oxygen's protons and spend more time around Oxygen, making it more negative. Water's polarization allows it to chain thru cohesion (important for plants) and makes it a nearly universal solvent, since it can dissolve many substances.



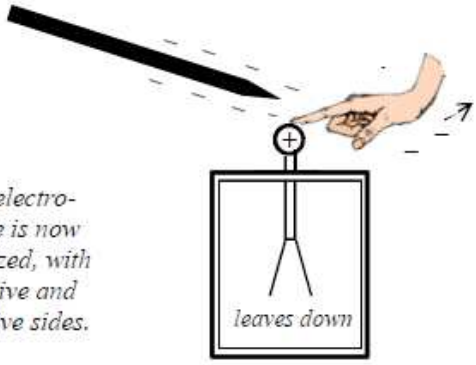
By Induction

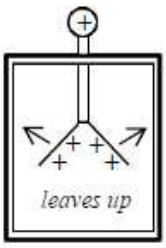
Induction forces a charge on an object by giving an alternate path for charges to flow. Induction only works for conductors (like metals) and always induces a charge opposite to the first charged object.



Electroscope

The electroscope is now polarized, with positive and negative sides.





When a negatively charged object comes close, free electrons move away, down the metal of the electroscope to the thin metal leaves. Since both are negative, the leaves and repel each other, flying apart.

By touching the electroscope, the electrons can move farther away from the negative object, to your body. Since electrons have been lost, the electroscope now has an net positive charge and the leaves again fly apart.

Electrostatics Lab

Part I

1. Go to our class website, www.mrneddo.weebly.com
2. Open "Balloons and Static Electricity"
3. Check "Show all Charges." Nothing else should be checked.
4. Rub the balloon on the shirt
5. What overall charge does the balloon now have? _____
6. What overall charge does the shirt now have? _____
7. What happens when you drag the balloon away from the shirt and let it go? _____
8. Why? _____
9. Reset
10. Check "Wall"
11. Rub the balloon on the shirt again.
12. What happens to the negative charges in the wall when you move the balloon near it?
_____
13. What happens to the positive charges in the wall when you move the balloon near it?
_____
14. Why don't all the positive charges move toward the balloon? _____
15. Hold the balloon in between the wall and shirt and release it

Why doesn't the balloon just stay in the middle? _____
_____

Part II

1. Go back to our website and open "John Travoltage"
2. Experiment with rubbing Travolta's foot against the carpet and touching his finger to the door handle.
3. Now try building up charge while his finger is on the door.
4. What happens? _____
5. Move his finger away again and build up another charge
6. When Travolta's finger is near the door knob, what happens to the electrons currently in the metal door knob?

_____

7. Why are shocks worse when you touch conductors rather than insulators_____

_____

8. If you take your hat off on a dry winter day, sometimes your hair will stand up. Explain this phenomenon.

_____