Statics Review

1. Which of the following are true of static charges? Choose all that apply.

A. Like charges repel.
B. Like charges attract.
C. Opposite charges repel.
D. Opposite charges attract.
E. A positively charged object has lost electrons.
F. A positively charged object has gained protons.
G. A negatively charged object has lost protons.
H. A negatively charged object has gained electrons.

Answer: ADEH

A and D are true; they are the simple statement of our essential charge interactions, best remembered by the jingle: "opposites attract, likes repel."

B and C are false for these same reasons; they violate the basic statement of charge interactions.

E and H are true. For an object to become charged, it must either gain or lose electrons. Losing electrons results in more positive charge than negative charge, making the object charged positively. Gaining electrons results in more negative charge than positive charge, making the object charged negatively. Protons are tightly bound in the nucleus of atoms and can never be added nor removed from atoms by ordinary electrostatic methods. The same reasoning leads one to reject choice F and G as possible true statements; the suggest that protons can be added or removed.

2. A neutral plastic strip is rubbed with cotton and acquires a positive charge. Which of the following statements are true of the positively-charged strip?

A. It lost some electrons to the cotton during the charging process.
B. It lost all of its electrons to the cotton during the charging process.
C. It has the opposite charge as the cotton.
D. It would now be repelled by the piece of cotton which was used to charge it.
E. It gained protons during the rubbing process.
F. As a material, plastic has a greater affinity for electrons than cotton.

Answer: ACHI
a. During charging by friction, electrons are transferred from one object to the other object. The object which acquires a + charge is the object which loses the electrons.
b. While some electrons are lost, not all electrons lost.
c. Charging by friction results in two objects with the opposite type of charge.
d. If the two rubbed objects are brought near, then they will attract (rather than repel) since they are charged oppositely.
e. Protons are never gained or lost during ordinary electrostatic experiments. They are tightly bound in the nuclei of atoms; it would require an atom-smasher to induce protons to move.
f. The object which has the greater electron affinity is the one which acquires the - charge during the friction charging process.

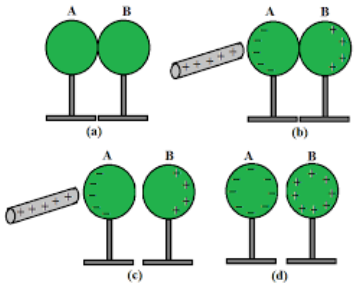
3. If you comb your hair and the comb becomes positively charged, then your hair becomes ___negatively charged____.

A. positively charged
B. negatively charged
C. Uncharged

4. Describe charging by friction

The **frictional charging** process results in a transfer of electrons between the two objects that are rubbed together. Rubber has a much greater attraction for electrons than animal fur. As a result, the atoms of rubber pull electrons from the atoms of animal fur, leaving both objects with an imbalance of **charge**

Charging by induction- Induction charging is a method used to charge an object without actually touching the object to any other charged object.



5. Briefly describe how lightning works

Heavier, negatively charged particles sink to the bottom of the cloud. When the positive and negative charges grow large enough, a giant spark - **lightning** - occurs between the two charges within the cloud. This is like a static electricity sparks you see, but much bigger.

6. Be sure to know how charges attract/repel (opposites attract and like repels like)

7. What is the unit for a charge

the practical meter-kilogram-second unit of electric charge equal to the quantity of electricity transferred by a current of one ampere in one second

https://www.youtube.com/watch?v=kiYPIZrVAOM

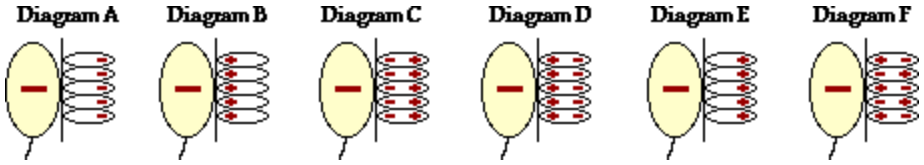
8. Familiarize yourself with the balloon to wall demo--

Electric polarization

•When a negatively charged sock is put close to the wall, the wall's positive charges shift toward the sock, and the wall's negative charges shift away from it. This is called Electric polarization .

•Opposite charges are nearer and attract strongly. Like charges are farther and repel less strongly.
Therefore the charged sock clings to the polarized wall.

9. A negatively charged balloon will be attracted to a neutral wooden cabinet due to polarization. Which one of the following diagrams best depict why this occurs?



D- the electrons will rearrange to get away from the negative balloon leaving the protons closer/attracted to the balloon

Triboelectric series

If you rub wood and wool together, what will happen to each one? (Assume that both started out as neutral.)

The wood will gain electrons, making the wood become negatively charged. The wool will lose electrons, making the wool become positively charged. What will happen if you rub the following items together? Assume that all items are neutral before rubbing them! Use your Triboelectric Series sheet to help you complete the following problems.

1. **PVC and wool: EX:**
a. The PVC will _____**gain**_____ electrons, making it become ____**negatively**__ charged.
b. The wool will _____**lose**_____ electrons, making it become _____**positively** charged.

2. **brass and nylon:**
a. The brass will _____**gain**_____ electrons, making it become _____**negative**____ charged.
b. The Nylon will ____**give**_____ electrons, making it become _____**positive**____ charged.
3. **Rabbit fur and silicon:**
a. The rabbit fur will _____**give**_____ electrons, making it become __**positive**___charged.
b. The silicon will _____**take**___ electrons, making it become _____**negative**___ charged.
4.**: Aluminum and Polyester:**
a. The aluminum will ____**give**_____ electrons, making it become ___**positive**___ charged.
b. The polyester will ___**take**_____ electrons, making it become ___**negative**_____

Coulomb's law

1.What is coulomb's law? Coulomb's Law is a formula that allows us to calculate the electric force generated between two electrical charges
This equation takes into account the strength of two charged pieces of matter (called "charges") and the distance that separates them

2. What is the formula?

$$F = \frac{k \cdot Q_1 \cdot Q_2}{d^2}$$

3. What happens to the force as the distance is increased?
Coulomb's law states that the electrical force between two charged objects is directly proportional to the product of the quantity of charge on the objects and inversely proportional to the square of the separation distance between the two objects. - (farther the distance, the force decreases)

4. What happens to the force as the charge of the objects gets larger?
Coulomb's law states that the electrical force between two charged objects is directly proportional to the product of the quantity of charge on the objects and inversely proportional to the square of the separation distance between the two objects. (Increase the charges, the force gets larger)