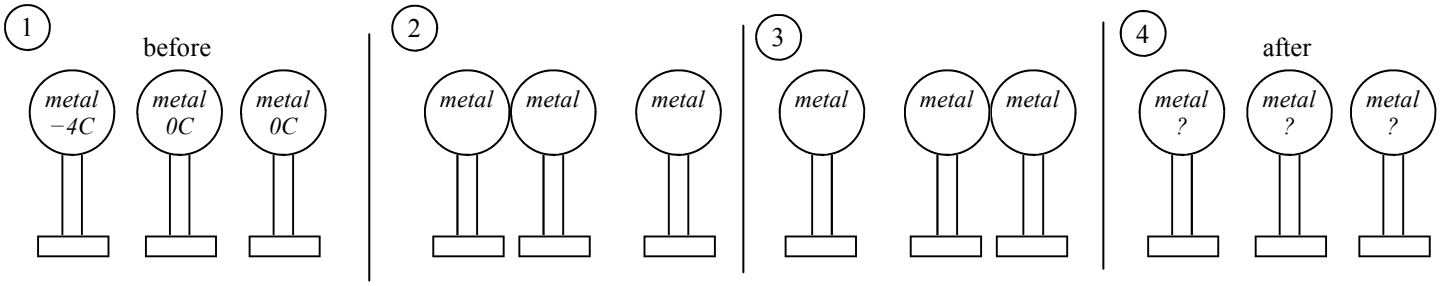
# PreAP Electrostatics 2

1. The left metal sphere is touched to the middle, neutral metal sphere. The middle sphere is then pulled away from the left sphere and touched to the right, neutral metal sphere. Afterwards:
   A. The charge of the left metal sphere is: B. and the charge of the right metal sphere is:

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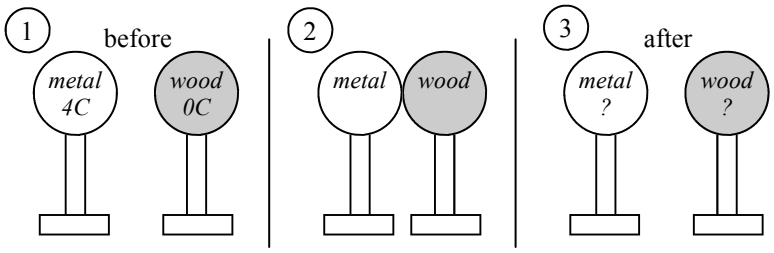
2. This time the metal sphere is touched to a neutral wood sphere.
   A. What is the final charge of the metal sphere?

   B. What is the final charge of the wood sphere?

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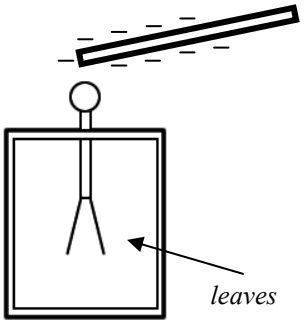
3. A piece of plastic pipe was rubbed with a piece of fur. *From our electrostatic demos*. (*Videos on website.) Refer to notes.
   A. * Is the plastic positive or negative?
      *The plastic is suspended and another charged piece of plastic is brought close.*
   B. Does the suspended plastic pipe move away or come towards the second pipe?
   C. * What will the suspended pipe do when the fur is brought close?
   D. Which is greater: the amount of electrons lost by the fur or gained by the pipe?
      *Then a piece of glass is rubbed with silk. The suspended plastic pipe attracts to the glass rod.*
   E. * So the glass rod is positive or negative?

4. The following is a diagram of an electroscope questions. The ball, leaves, and what connects them are all metal.

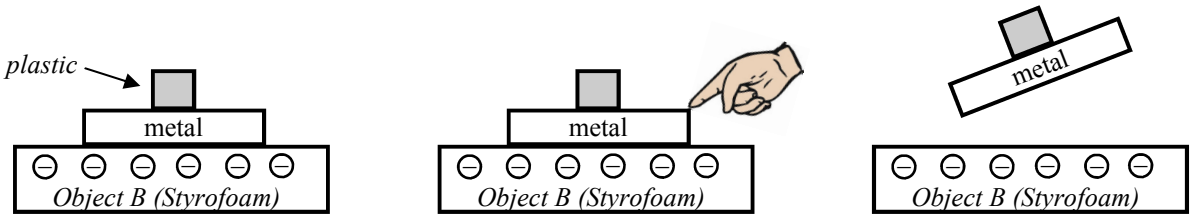



   A. * As the rod approaches the ball, the leaves move out. Why?

   B. * What is the net charge of the electroscope?
      *This is called polarization. The net charge is still neutral, just shifted.*

      *I then rub the electrons onto the electroscope, remove the rod, and the leaves stay out.*
   C. * Why?

   D. * What is the charge of the electroscope now?
      *This is called charging by contact.*




5. On the diagram above, Object B has been made negative by rubbing it with fur (*by contact*). Object A is a metal pie plate.

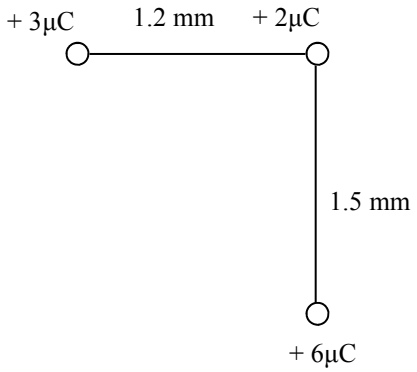
   *A.* In the first picture (left) draw where the negatives, trying to get away, move on Object A.
   *Object A has been charged by polarization and is still neutral. I then touch Object A while it is still touching Object B, giving an escape route to the electrons.*

   B. Where do the negatives go?

   C. * After I have touched Object A (3rd picture) what is Object A's charge?
   *Object A has been charged by induction. Notice that induction produces a charge opposite to the first charge. Also, this way of charging is known as "Electrophorus".*

$F_e = k_c \frac{|q_1 q_2|}{r^2}$ and $k_c = 9\times10^9$

6. Use the diagram at the left to answer the following. (*Notice the equation at the left.*)




   A. * Calculate the magnitude of the force on the 2μC charge due to the 3μC charge. Write the magnitude on the diagram and include and arrow to show if the 2μC is attracted or repelled by the 3μC charge.

   B. * Calculate the magnitude of the force on the 2μC charge due to the 6μC charge. Again, label the diagram.

   C. In which quadrant will the net force point?

   D. You now have two vectors that are perpendicular to each other. Calculate the net electric force acting on the 2μC charge. As a vector it requires both magnitude and direction.

3A) negative 3C) attract 3E) positive because it lost e's.
4A) e's have been forced down to the leaves. Since both leaves are neg, they repel each other.
4B) neutral: the e's shifted down, but they are still there.
4C) Extra electrons are on the electroscope from the rod, so leaves repel.
4D) negative
5C) positive—some of the electrons are in my hand. I'll give them back later.
6A) $3.75\times10^4$ N to the right (repelled) [more help at the right →]
6B) $4.8\times10^4$ N up (repelled)

$F = \frac{(9E9)(2E-6)(3E-6)}{(1.2E-3)^2} = 3.75 \times 10^4$ N R →