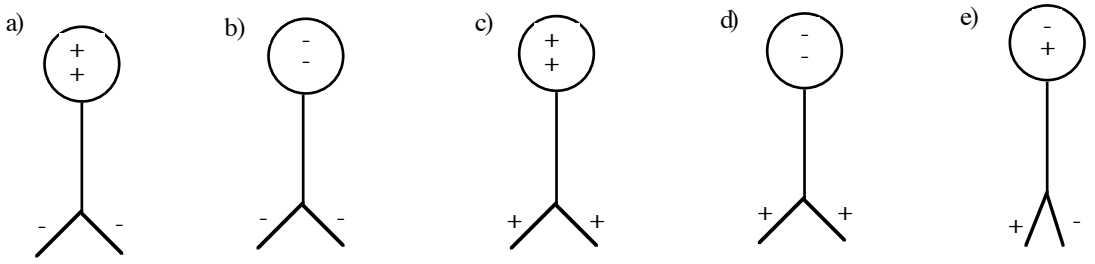
Mr. Forrest: A.P. Physics 1, 2019 Name _____
Modified from Merrill Physics Mods _____ Date _____

Electrostatics W.S. – Look at part of *The Physics Classroom: Electrostatics Lesson 2* for help, if needed

In the blanks below, place the letter of the diagram that best represents the charge on an electroscope during each of the procedures described. Answers may be used more than once or not at all.



1. _____ A positively-charged rod is brought near, but not touching an uncharged electroscope.

2. _____ A glass rod is charged positively by rubbing it with negatively charged silk. The silk is touched to a neutral electroscope.

3. _____ A positive rod is brought near a neutral electroscope, and the electroscope is polarized without touching

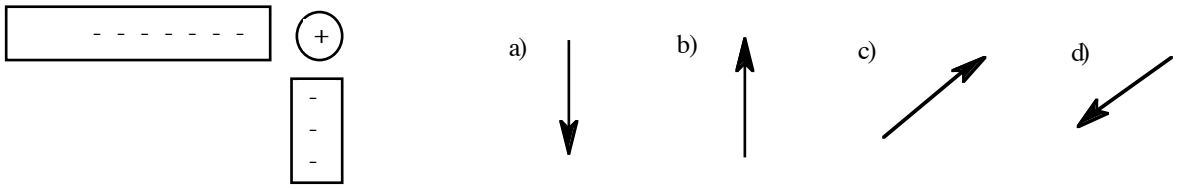
4. _____ An electroscope is charged by conduction by a positive rod.

5. _____ A negatively-charged rod is brought near a neutral electroscope.

In the space to the left, write the letter of the answer to the question. P = protons, N = neutrons, E = electrons.

_____ 6. Which atom pictured below is electrically neutral? [NOTE: N = neutrons, P = protons, E = electrons]

_____ 7. In which direction will the positively charged ball shown move if it is exposed to two negatively-charged rods?

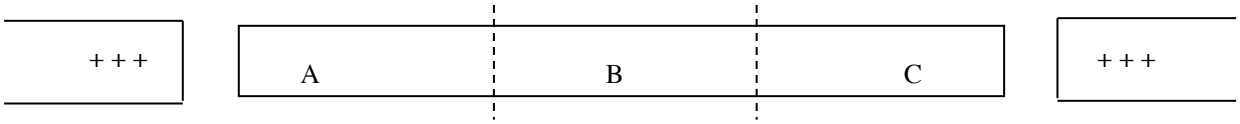


_____ 8. A negatively charged rod is brought near the left hand side of two neutral, metal spheres that are touching one another. The spheres are then separated with charges as shown below. Which pair of spheres shows the correct charges?

_____ 9. A coulomb is the charge on 6.25 x 10^{18} electrons or protons. Therefore, the charge on a single electron or proton is _____ coulombs.

a) 6.25 x 10^{18} b) 1.6 x 10^{-19} c) 1.6 x 10^{-18} d) 6.25 x 10^{-19}

The next two questions refer to the situation shown below. Three pieces of metal (A, B and C) are touching. Positively charged rods are brought near both ends of the metal as shown below.



_____ 10. The net charge on piece A is:

a) + b) - c) neutral

_____ 11. The net charge on piece B is

a) + b) - c) neutral

_____ 12. If a charge on each of two objects is doubled and the objects are moved three times closer than they were originally, the electric force changes by a factor of what?

a) 3/4 b) 12 c) 18 d) 36 e) ¥

Sample Problems from The Physics Classroom Calculator Pad problem set on electrostatics (show your work)

PC7. It happened during Wednesday's physics lesson on charging by friction. A small white object began to slowly emerge from beneath the sleeve of Mr. Forrest's shirt. It took several laughs and giggles from the class before the emerging sheet of fabric softener caught Mr. Forrest's attention. He turned the potentially embarrassing moment into a serendipitous moment. Pulling the sheet out from beneath the sweater, Mr. Forrest wrote the following problem on the board.

> "A sheet of cationic fabric softener having a surface charge of 3.6×10^{-12} C (positive) clings to a wool sweater with a negative charge of 6.8×10^{-9} C. Determine the force of electrical attraction if they can be treated as point objects with a separation distance of 0.019 cm."

PC 8) Two vinyl balloons with an identical charge are given a separation distance of 52 cm. The balloons experience a repulsive force of 2.74×10^{-3} N. Determine the magnitude of charge on each one of the balloons.

PC 9) Two different objects are given charges of +3.27 μC and -4.91 μC. What separation distance will cause the force of attraction between the two objects to be 0.358 N? (GIVEN: 1 μC = 10^{-6} C)

PC 10) What mass would a pair of electrons have in order for their gravitational force of attraction to be equal to the electrical force of repulsion? Assume the electrons are a distance *d* apart from each other (Use G=6.67x10^{-11} N•m^2/kg^2.)

PC 11) An electron has a mass of 9.11x10^{-31} kg. In the Bohr model of the hydrogen atom, the electron was viewed as orbiting the lone proton of the nucleus; the centripetal force requirement was met by the electrical attraction between the oppositely charged proton and electron.
The radius of orbit was 5.29x10^{-11} m. Use circular motion and electrostatic principles to determine the speed at which the electron moves as it orbits the proton.