Electric Fields Worksheet

1. What is the difference between charging an object by induction and charging by contact? [An object charged by contact must be touched by the source of the charge. An object charged by induction is not touched by the source object.]
2. Two protons in a molecule are separated by a distance of 3.8 x 10-10 m. Find the electrostatic force exerted by one proton on the other. [1.6 x 10-9 N.]
3. A 1.3 x 10-6 C charge is located on the x-axis at x = -0.5 m, a 3.2 x 10-6 C is located on the x-axis at x = 1.5 m, and a 2.5 x 10-6 C charge is located at the origin. Find the net force on the 2.5 x 10-6 C charge. All charges are positive. [0.085 N [away from the 1.3 x 10-6 C charge].]
4. Two positive charges are placed along the x-axis, 2.0 m apart. The first charge, q1, has a charge of 15 x 10-6 C, while the charge q2 at x = 2.0 m has a charge of 6.0 x 10-6 C. Where must the *negative*  charge q3 be placed on the x-axis such that the net force on it is zero? [In this configuration, the negative charge is 0.775 m from the smaller positive charge.]

5°

5°

1. Two identical small charged spheres, each having a mass of 3 x 10-2 kg, hang in equilibrium as shown. If the length of each string is 0.15 m and the angle between each string and the vertical is 5°, find the magnitude of the charge on each sphere, assuming the spheres have identical charges. [4.4 x 10-8 C. We do not have enough information to know if this is positive or negative.]
2. If the charged on the spheres in question 2 were negative, how many electrons had to be added to the spheres to give a net charge of -4.4 x 10-8 C? [2.7 x 1011 electrons on each sphere.]
3. A “free” electron and a “free” proton are placed one at a time in an identical electric field. Compare the electric forces on each particle. Compare their accelerations. [The electron and proton will experience forces equal in magnitude but opposite in direction. Although the forces will be identical in magnitude, the electron will have a greater acceleration since it has 1/1000th the mass of a proton.]
4. Find the electric force on a proton placed in an electric field of 2 x 104 N/C directed along the positive x-axis. [3.2 x 10-15 N along the positive x-axis.]
5. An airplane is flying through a thundercloud at a height of 2000 m. (This is a very dangerous thing to do because of updrafts, turbulence, and the possibility of electric discharge.) If there is a charge concentration of + 40 C at a height of 3000 m within the cloud and -40 C at a height of 1000 m, what is the electric field E at the aircraft? [7.2 x 105 N/C [down].]
6. A charge q1 = 7.0 x 10-6 C is located at the origin, and a second charge q2 = -5 x 10-6 C is located on the x-axis 0.3 m from the origin. Find the electric field at the point P with coordinates (0, 0.4 m). [2.7 x 105 N/C [N 23 degrees E].]

Textbook:

P.326 2, 3

P.334 9

P.335 4, 8, 10

P.347 2, 5, 6