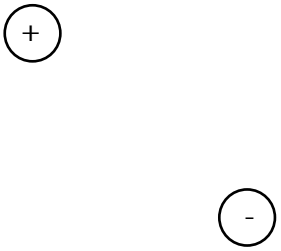
Physics 132
General Physics II
Grinnell College

Homework VI-VII

1. For each part, sketch the force (arrows indicating magnitude and direction) that a positive test charge would feel if placed near the shown two charged objects. Sketch the force directions in all points of space near the charges. Assume all charges are equal in magnitude. For the sake of the grader, don't let your force arrows cross the dividing line between part a and part b.

a.

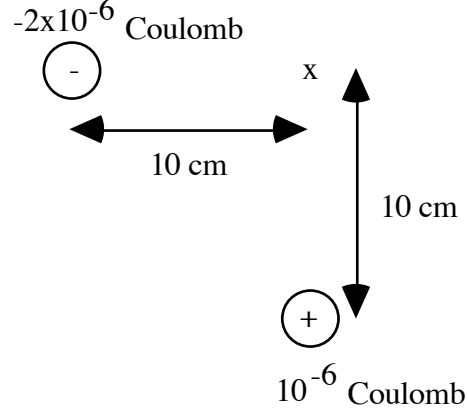


b.

2. We found typical charges inside a capacitor to be up to a mC. Typical dimensions of capacitors are about a cm. To get an idea of the rough size of the forces between plates in a capacitor, what is the force between a +1 mC and a -1 mC charge separated by 1 cm? How much mass (in kg) weighs the same as this force? Is this surprising? Why did our demonstration in class see forces that were more like a milliNewton (10^{-3} N)?

3. Three charges are arranged in a line as shown. The left charge is 1/4 the magnitude of the right charge. The force on the center charge, which is located 1 cm from the left charge, is zero. What is the location of the right charge; how far is it from the center charge?

4. Two charges are located as shown below--one immediately to the left and one immediately below the x. Calculate the electric field at the point marked with the x. Give this as a vector by components.



5. Look up the form of the gravitational force between two point objects (sometimes called Newton's Law of Universal Gravitation) in your General Physics I notes, or a physics book, or the handbook of Chemistry and Physics or someplace. Also look up the mass and charge of the proton. Then, calculate the ratio of the electric force to the gravitational force for two protons. Your result should very large, and should not depend on the spacing between the protons. (Why no distance dependence?)