

PHYS 212 Homework Assignment

Chapter 5.1

Problem 1 Four lightweight conductors (A, B, C and D) are suspended by threads. Conductor A is charged with a negative charge and then brought close to the other conductors allowing the following observations to be made:

- Conductors B, C, and D are all attracted to A.
- Conductors B and D have no effect on each other.
- Conductor B is attracted to C.

What are the charge states of conductors B, C, and D. Explain.

Problem 2 A negatively charged ball with charge $-q$ hangs from a string.

- Suppose you bring a negatively charged rod with charge $-q$ close to the ball, but not touching. How will the ball respond?
- How will the ball respond if you bring a positively charged rod with charge $+q$ close, but not touching?
- If you touch the positive rod to the negative ball, what will happen? How will they respond if they are then brought near to each other?

Problem 3 While walking around your apartment in socks you shuffle your feet across the floor and realize that you've accumulated a positive charge of $+9 \text{ nC}$ ($9 \times 10^{-9} \text{ C}$)!

- Have electrons been removed from you, or have protons been added?
- How many electrons have been removed or protons added?

Problem 4 Two point charges q and $4q$ are at $x = 0$ and $x = L$, respectively, and are free to move. A third charge is placed so that the entire three-charge system is in static equilibrium. What are the magnitude, sign, and x -coordinate of the third charge?

Problem 5 What are the electrostatic forces on a test charge with $q = -5 \text{ nC}$ at points 1, 2 and 3 in the figure below? Give your answers in component form.

