Workshop module 1 - Physics 114, Fall 2015

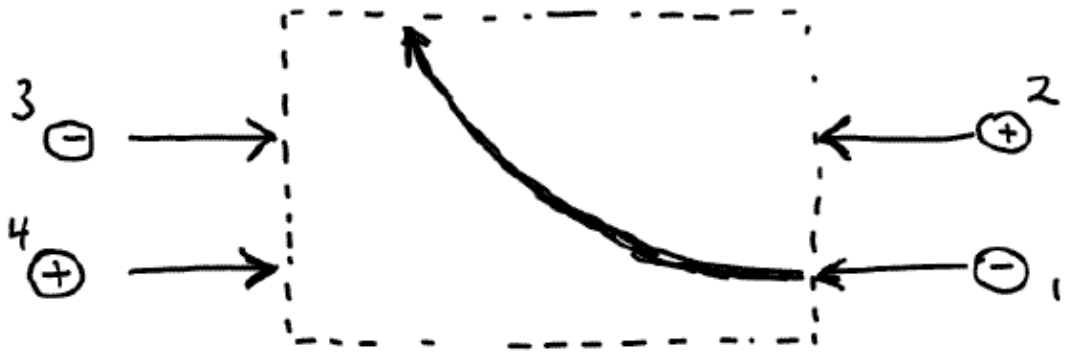
1. Monica and Bill share a fascination with electrostatics. Their time alone was spent running little experiments. Apparently, they were confused about the results of one experiment. I hope you can explain it.

- Monica rubbed a plastic cigar case with the skirt of her blue silk dress. This left a positive net charge on the plastic cigar case. (Note: single, fine cigars often come in metal or plastic containers, roughly shaped like the cigar.)
- Monica held the plastic case near a metal, conducting cigar case (held in the air by a nonconducting string) but did not touch the case.
- While the charged, plastic cigar case was in this position, Bill touched the metal cigar case and removed his hand.
- Monica removed the plastic case from the proximity of the metal one.
- Then she held the edge of her blue skirt near the metal cigar case (but not touching).
- What effect did the blue skirt have on the hanging metal cigar case? Please explain your reasoning.

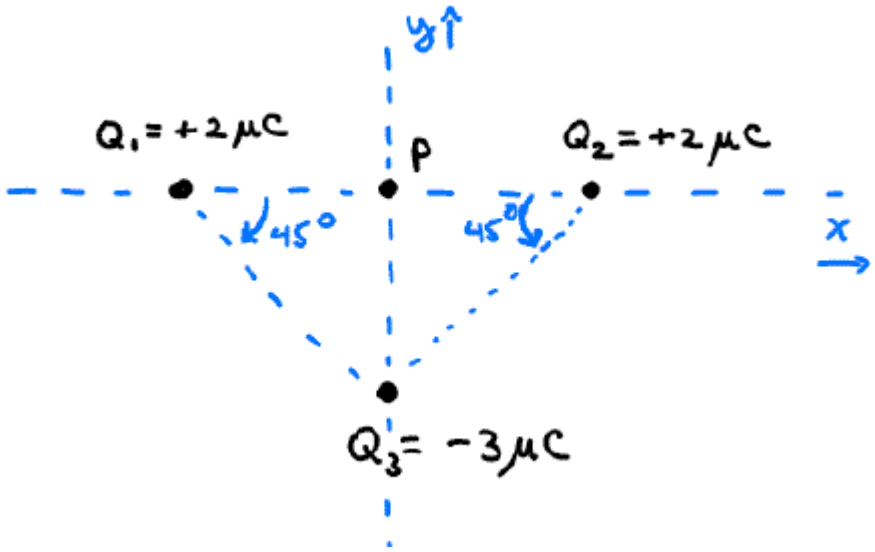
2. A charged insulator and an uncharged metal object
   (a) always repel one another
   (b) exert no electrostatic force on one another
   (c) always attract one another
   (d) may attract or repel, depending on the sign of the charge on the insulator

3. The figure below shows the path of a negatively charged particle (1) through a rectangular region of uniform electric field.

a) Indicate the direction of the electric field in the rectangular region on the drawing. Indicate to the right of the drawing why you have chosen the direction you chose for the electric field.
b) Roughly sketch the paths that would be taken by particles (2), (3) and (4) as they pass through the rectangular region.

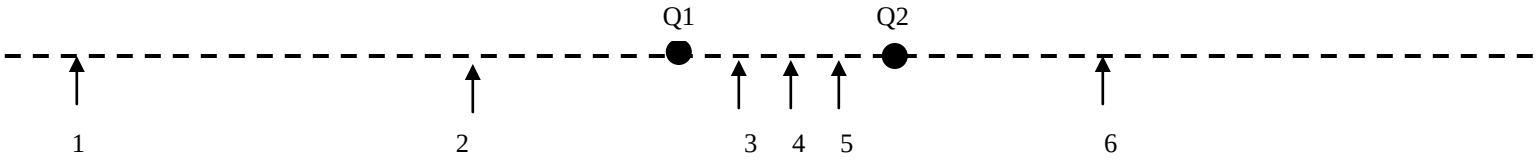


4. In the figure below, what electric charge can be placed at point P to insure that there is zero net electrostatic force on Q_3? Let the distance between Q_1 and Q_3 (as well as between Q_2 and Q_3) be 1.4 m. The distance between Q_3 and P is 1 m. ($1\ \mu C = 10^{-6}$ C, $k = 9 \times 10^9\ Nm^2/C^2$)



5. Charges $Q_1 = -q$ and $Q_2 = +4q$ are placed as shown. Of the six positions on the axis indicated by the numbered arrows, the one at which the electric field is zero is *(do not expect the positioning in the drawing to be perfect)*

a) 1
b) 2
c) 3
d) 4
e) 5
f) 6



6. A thin, non-conducting rod of length L carries a total charge positive Q distributed uniformly along it's length. Determine the electrostatic force of this rod of charge on a positive charge q located a distance d from one end of the rod along the central axis of the rod as shown in the sketch.