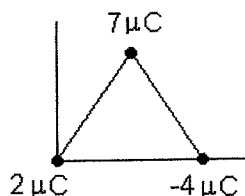
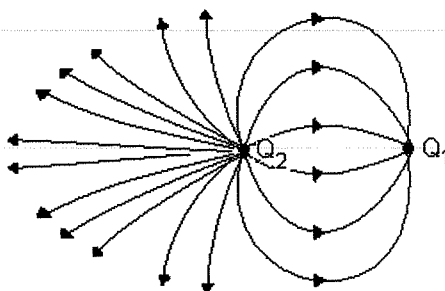


Physics 111 Homework Set #5

- 1) Calculate the number of electrons in a small electrically neutral silver pin with a mass of 10 g. Silver has 47 electrons per atom. The atomic weight of silver is 107.87 g/mole. (b) If electrons are added until the net charge is 1mC, How many electrons must be added for every billion electrons already present.
- 2) What is the magnitude of the charge that must be placed on the earth and moon in order to make the magnitude of the electric force equal to the magnitude of the gravitational force between them? What would be the electric field on the moon due to the earth's field?
- 3) Four identical point charges ($q=10\mu\text{C}$) are located on the corners of a rectangle of width 60.0cm and height 15cm. Calculate the electric force on the charge on the lower left hand corner.
- 4) An airplane is flying through a thundercloud at a height of 2000m. If there is a charge concentration of +40C at a height of 3000m within the cloud and a -40C charge at a height of 1000m, what is the electric field at the plane?
- 5) What are the magnitude and direction of the electric field that will balance the weight of (a) an electron, and (b) a proton?
- 6) Three charges are located on the corners of an equilateral triangle of side 0.5 m as shown. Calculate the electric field at the $2\mu\text{C}$ charge.



- 7) A charge $-q_1$ is located at the origin and a charge $-q_2$ is located at the point $y=d$. At what point along the y-axis is the electric field zero.
- 8) Consider an infinite number of identical electric charges q , placed along the x-axis at distance $a, 2a, 3a, \dots$. What is the electric field at $x=0$?
- 9) The electric field along the axis of a uniformly charged disk of radius R and total charge Q was calculated in class. Show that the E-field at a distance $x \gg R$ approaches that of a point charge with a charge $Q = \sigma\pi R^2$.
- 10) A uniformly charged insulating rod of length 14cm is bent into a semicircle. If the rod has a total charge of $-7.5\mu\text{C}$, find the magnitude and direction of the E-field at the center of the semicircle.
- 11) From the field line plot given below determine (a) the ratio of Q_1/Q_2 and the signs of both charges.



- 12) The electrons in a particle beam each have a kinetic energy of $1.6 \times 10^{-17} \text{ J}$. What are the magnitude and direction of the E-field that will stop these electrons in 10cm?
- 13) A small 2g plastic ball is suspended by a 20 cm long string in a uniform electric field that points to the right with a strength of 1000N/C. If the string makes an angle of 15° with respect to the vertical, what is the charge on the ball?
- 14) Three point charges q , $-2q$ and q are located along the x-axis as shown. Calculate the E-field on a point on the y-axis and show that if $y \gg a$ then $E = -\frac{3kqa^2}{y^4} \hat{j}$.

