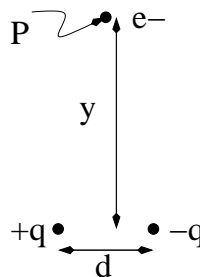


Exam # 1 – Physics 152

February 17, 2008

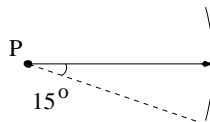
Be sure to include pictures, coordinate systems, etc. where reasonable. Be explicit about your arguments when determining a physical quantity, (e.g. \vec{E}).

1. Consider the charge distribution shown below. In this problem you will calculate the net force on the electron due to the charges $+q$ and $-q$.
 - (a) Draw a free body diagram for the electron.
 - (b) What is the strength of the force on $-e$ due to $+q$? What is the strength of the force on $-e$ due to $-q$?
 - (c) What is the net force on the electron? Be sure to give both the magnitude and direction of the force.



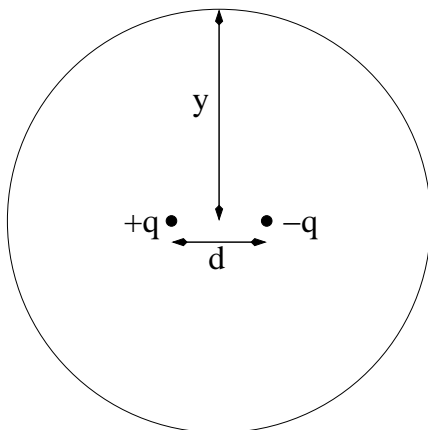
2. What is the electric field due to a 30° circular arc of radius 20cm at the center of that circle, i.e., point P in Figure 2? A charge of $+10\mu\text{C}$ is uniform spread along the arc's length.

If an electron is placed at point P what would be its acceleration, \vec{a} at the moment of release?



3. Consider the charges and spherical Gaussian surface in Fig. 3.

- What is the electric flux through the Gaussian surface?
- Give at least one reason why Gauss's law is not helpful in finding the electric field along the gaussian surface. Be sure to give a clear explanation of your reason. (Multiple reasons can result in extra credit.)



4. In class you showed that the electric field above an infinite sheet with uniform charge density σ is equal to $\vec{E} = \frac{\sigma}{2\epsilon_0} \hat{k}$.

- How do you find the electric field from the electric potential?
- Show that $V = -\frac{\sigma z}{2\epsilon_0}$ is an electric potential that will give rise to the electric field for an infinite uniformly charged sheet of charge.
- How much work would the electric field from the uniformly charged infinite plane do on an electron when the charge moves from the point $(0m, 3m, 5m)$ to $(5m, 7m, 2m)$ if $\sigma = 20C/m^2$?

