General Physics 204, Section ... Monday, Feb 02, 2015
Quiz #1′ Coulomb's Law & Electric Field

Name:

1) CLASS(2)
Francis Hauksbee is wondering about the force between a point charge, Q, and a dipole. A dipole is a system made with two opposite charges, one positive $+q$ and one negative $-q$, sitting at a distance δ from each other. Consider a coordinate system where the charge Q is at the center. Use these numerical values,
$Q = +10\ \mu\text{C}, q = 2.0\ \mu\text{C}, r = 0.10\ \text{m}, \delta = 0.0010\ \text{m}$.

a) We put the dipole on the x-axis, so $-q$ is at r and $+q$ is at $r + \delta$. What is the total force applied to the dipole from charge Q? Remember that force is a vector. **[3 pts]**
b) Now consider the dipole sitting on the y-axis, at a same distance r and with the same orientation, i.e. $-q$ at $(-\delta/2, r)$ and $+q$ at $(+\delta/2, r)$. Again find the total force applied on the dipole. Remember that force is a vector. **[3 pts]**

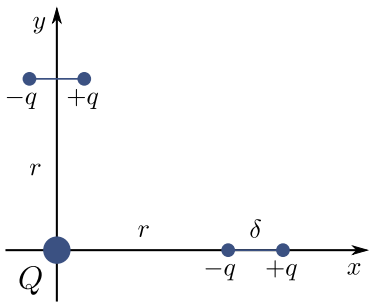

Figure 1: The interaction between a dipole and a point charge.

2) CLASS(2)
An electron starts moving inside a parallel plate capacitor with an electric field $\mathbf{E} = -\hat{\mathbf{x}}1.0 \times 10^4$ N/m. See fig. 2. Initially the electron is at rest. The distance between the plates are $d = 2.0$ cm. Take the mass of the electron to be $m_e = 9.1 \times 10^{-31}$ kg and its charge to be 1.6×10^{-19} C.

a) How long it takes for the electron to reach the positive plate? **[2 pts]**
b) How fast the electron moving when reaches the positive plate? **[2 pts]**

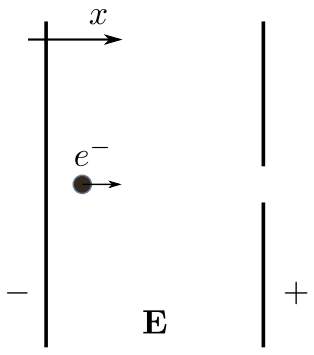

Figure 2: Electron accelerating by electric field.