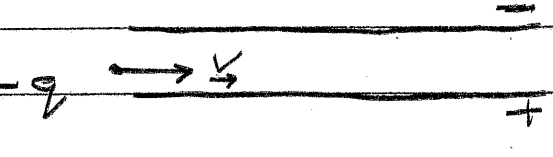
More Test questions

1. A deuteron ($q = 1.6\times10^{-19}$C, mass $= 3.2\times10^{-27}$kg) with a velocity of 100 km/s $\hat{j}$ is introduced in a region where it encounters a field of $\vec{B} = 0.5\,\mathrm{T}\,\hat{z}$. Show
   (i) that the deuteron moves on a circular orbit
   (ii) what is the plane of the orbit?
   (iii) what is the radius of the orbit?
   (iv) what is the angular velocity (vector)?
   (v) If you double the initial velocity of the deutron what happens to the angular velocity? why?

2. Repeat problem 1 for an electron [$q = -1.6\times10^{-19}$C, $m_e = 9\times10^{-31}$kg]

3. Two parallel plates have a uniform $\vec{E} = E\hat{y}$ between them, as shown. Introduce a particle of charge $-q$ travelling at $\vec{v} = v\hat{x}$. What $\vec{B}$ field would you apply so that the charge goes through the plates undeflected? Why?



4 Prob 8-11

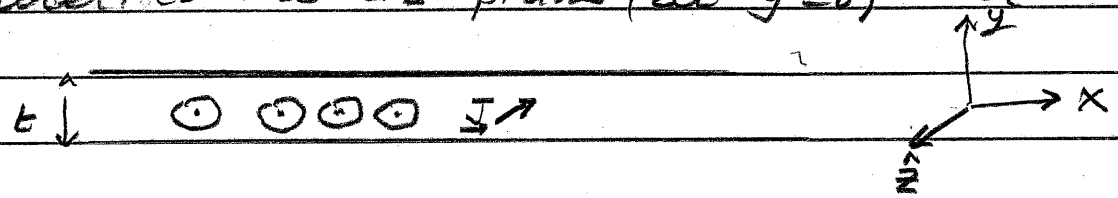
5. Prob 8-13

6. Prob 8-8

7 Prob 8-12

8 State Ampere's law in your own words.

9. Shown is the end face of a wide sheet of conductor of thickness t. The sheet is parallel to the xz-plane (at $y=0$) and



carries a uniform current density $\vec{J} = -J\hat{z}$. Show that the $\vec{B}$-field is $-\frac{\mu_0 J t}{2}\hat{x}$ at $y<0$

and $+\frac{\mu_0 J t}{2}\hat{x}$ at $y>0$.

10 Currents $I_1 = 2$ amp and $I_2 = -5$ amp flow through long straight wires. Which $\vec{B}$ field will be larger (i) at $r = 4$m away from I_1 or (ii) at $r = 10$m away from I_2? Why?