Magnetic field and Magnetic force

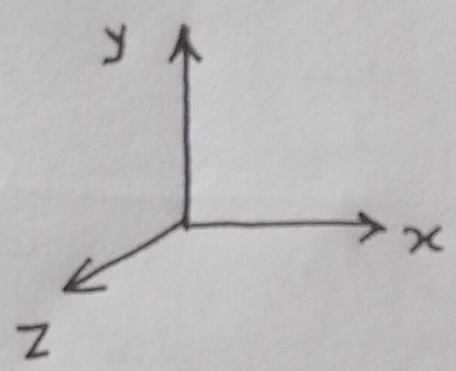
① ^7Li charge $+3e$; ^1p charge $+1e$

$$\frac{mv^2}{r} = qvB \qquad \underline{p = mv = qBr}$$

Now consider, $p_{Li} = p_p$; $q_{Li} = +3q$; $q_p = +1q$

$$p_{Li} = q_{Li} B r_{Li} \quad ; \quad p_p = q_p B r_p$$

②



$v_x = 0.446 \times 10^6$ m/s

$B_z = 1.75$ T

$\vec{F}_y = q\vec{v}_x \times \vec{B}_z \qquad \vec{F}_y =$

③ $B = 0.28$T ; $E = 0.46 \times 10^6$ V/m

(i) Undeflected, $v = E/B$ then $KE = \frac{1}{2}mv^2$

④ $\frac{mv^2}{r} = qvB \rightarrow \underline{\frac{mv}{r} = qB} \rightarrow \frac{m(2\pi r/T)}{r} = qB \rightarrow \underline{\frac{2\pi m}{T} = qB}$

⑤ use ④

⑥ use ④

⑦ $\vec{F} = i\vec{L} \times \vec{B}$ earth $\vec{B}$ from <u>north to south</u> now find the conditions.

⑧ $\underline{\vec{\tau} = \vec{\mu} \times \vec{B}}$; $\underline{\vec{\mu} = ni\vec{A}}$ for counterclockwise current, $\vec{\mu}$ is upward.

Sources of magnetic field

① use, $F = ilB$ $\quad B = 65\mu T$

② $\vec{F} = i\vec{L} \times \vec{B}$ $\quad \vec{L} = 2.7\,(0.03\,\hat{i} + 0.04m\,\hat{j})$

$\vec{B} = 1.3\,T\,\hat{i}$

③ $F = ilB$; $F = mg$ now $ilB = mg$ find i.

④ $\vec{\tau} = \vec{\mu} \times \vec{B}$ $\quad \vec{\mu} = ni\vec{A}$

$|\tau| = \mu B \sin\theta$ maximum at $\theta = 90^\circ$

⑤ Find $l = 2\pi r$; $B = 0.12T$; $i = 1.5A$ $\quad F = ilB$; $\tau = \mu B$

⑥ $F = ilB$

⑦ $F = \dfrac{\mu_0 L i_1 i_2}{2\pi d}$ follow lecture slide

⑧ $B = \mu_0 n i$

⑨ as ⑧

Inductor, Inductance, LR, LC

① use current grow, $i(t) = i_0(1 - e^{-t/\tau_L})$

$\tau_L = L/R$, $U_L = \frac{1}{2} L i^2$

② LC circuit energy, $U_E = \frac{1}{2}\frac{q^2}{C}$; $U_B = \frac{1}{2} L i^2$

③ Frequency. $f = \frac{1}{2\pi\sqrt{LC}}$ and $f = \frac{1}{\text{Time period}}$

④ Again, $\omega = \frac{1}{\sqrt{LC}}$

⑤ $u_B = \frac{1}{2}\frac{B^2}{\mu_0}$ $u_E = \frac{1}{2}\epsilon_0 E^2$

⑥ $\vec{c} = \frac{\vec{E}}{\vec{B}}$ and $\vec{c}, \vec{E}$ & $\vec{B}$ are orthogonal to each other.

⑦ $c = v = \omega k$

⑧ $\vec{c}, \vec{E}$ & $\vec{B}$ ~~follow~~ orthogonal. Follow cartesian.