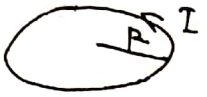
6.3. 11. $\vec{B}$



$BIdl = 2F\frac{d\theta}{2} = BIRd\theta$.

$F = BIR$.

(2). $F = 1\times 7\times 5\times 10^{-2} = 0.35N$.

6.4. (1). $F = BIl$. $\int F\cdot dt = \int m\cdot dV = mV = m\sqrt{2ah} = Blq$

$q = \frac{m\sqrt{2gh}}{Bl}$.

(2). $q = \frac{10^{-2}\times\sqrt{2\times 10\times 2}}{0.1\times 0.2} = \frac{2\sqrt{10}}{2} = \sqrt{10}\,C$.

6.6. $\vec{\mu_i} = I\cdot\vec{S} = \frac{2\pi r\cdot dr\cdot\sigma\omega}{2\pi}\cdot\pi r^2\cdot\hat{n} = \pi r^3\sigma\omega dr\cdot\hat{n}$.

$\vec{\tau_i} = \vec{\mu_i}\times\vec{B}$

$L = \Sigma\vec{\tau_i} = \int_0^R \pi r^3\sigma\omega B dr = \frac{\pi\sigma\omega BR^4}{4}$.

6.9.

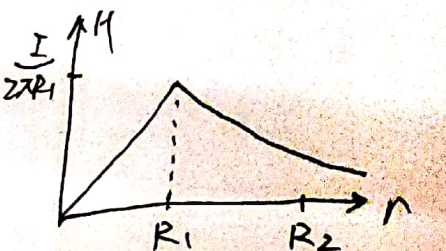
(1). $r<R_1$: $\oint H\cdot dr = 2\pi rH = \frac{\pi r^2}{\pi R_1^2}I$.

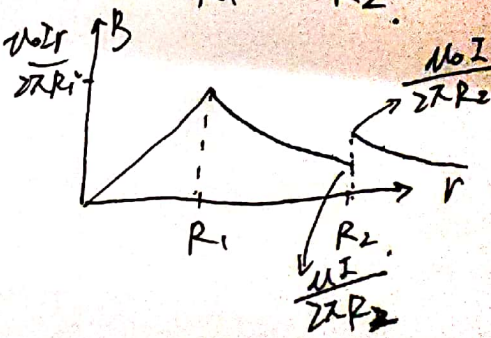
$H = \frac{rI}{2\pi R_1^2}$. $B = \frac{\mu_0 Ir}{2\pi R_1^2}$.

$R_1<r<R_2$: $2\pi rH = I$.

$H = \frac{I}{2\pi r}$. $B = \frac{\mu I}{2\pi r}$.

$r>R_2$: $H = \frac{I}{2\pi r}$. $B = \frac{\mu_0 I}{2\pi r}$.



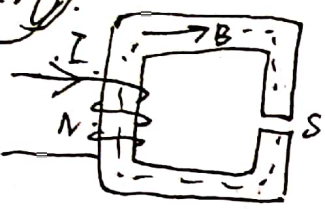


(2) $i_{内} = \vec{M} \times \hat{n} = (\chi_m \vec{H}) \times \hat{n} = (\frac{\vec{B}}{\mu_0} - \vec{H}) \times \hat{n}$

$= \frac{\mu I R_1}{\mu_0 2\pi R_1^2} - \frac{I}{2\pi R_1} = \frac{I}{2\pi R_1}(\frac{\mu - \mu_0}{\mu_0})$. 沿轴向，与电流方向同向.

$i_{外} = \vec{M} \times \hat{n} = \frac{\mu I}{2\pi R_2 \mu_0} - \frac{I}{2\pi R_2} = \frac{I}{2\pi R_2}(\frac{\mu - \mu_0}{\mu_0})$. 与电流反向

18.



$I = j \cdot S_0$.

$\xi_m = \phi R_m$

$\rightarrow NI = BS \cdot \oint \frac{dl}{\mu_0 S} = \frac{Bd}{\mu_0}$.

$Nj \cdot S_0 = \frac{Bd}{\mu_0}$

$V = N \cdot C_0 \cdot S_0 = N \cdot 6m S_0$.

$\rightarrow V = 6m \cdot \frac{Bd}{j\mu_0}$

质量: $M = V\rho = 6 \cdot \frac{1 \cdot 0.1}{10^7 \times 4\pi \times 10^{-7}} \times 8 \times 10^3 = \frac{4800}{4\pi} = \frac{1200}{\pi}$ kg $\approx 3.8 \times 10^2$ kg

功率: $P = I^2 R = (jS_0)^2 \cdot \rho \cdot \frac{N \cdot C_0}{S_0} = NS_0 j^2 \cdot \rho \cdot 6m$.

$= \frac{Bd}{\mu_0} j \cdot \rho \cdot 6m = \frac{1 \times 0.1 \times 10^7}{4\pi \times 10^{-7}} \cdot 2 \times 10^{-6} \cdot 6 \simeq 9.5 \times 10^4$ W.

引力: $F = H \cdot e_m = \frac{B}{\mu_0} \cdot B \cdot S = \frac{B^2}{\mu_0} S = \frac{1 \times 1 \times 1 \times 2}{4\pi \times 10^{-7}} \approx 1.6 \times 10^6$ N