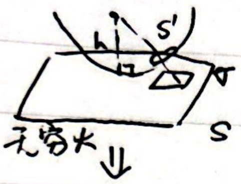
$\boxed{库仑定律:\ F=\frac{kQq}{r^2}}$

$E=\frac{kQ}{R^2}$



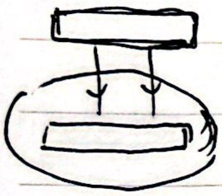
$\frac{\Delta S'}{h^2}=\frac{\Delta S}{R^2+h^2}$

$\Delta E=\frac{k\sigma\Delta S}{R^2+h^2}=\frac{k\sigma\Delta S'}{h^2}$

半球 $\int E=\int\frac{k\sigma\Delta S'}{h^2}=\frac{2\pi h^2}{h^2}k\sigma=2\pi k\sigma$

高斯定律:

$$\boxed{\oint E\cdot dS=\sum\frac{q_i}{\varepsilon_0}=\frac{1}{\varepsilon_0}\iiint\rho\,dV}$$



$\sigma=\frac{Q}{S}$

$E\cdot 2S=\frac{\sigma S}{\varepsilon_0}$

$E_{单}=\frac{\sigma}{2\varepsilon_0}=2\pi k\sigma$

∵ 对称性

$\varepsilon_0=\frac{1}{4\pi k}$

∴ $E_c=4\pi k\sigma=$

$U=E_c\cdot d=4\pi k\sigma\cdot d=\frac{Q}{C}=\frac{\sigma S}{C}$

∴ $C=\frac{S}{4\pi kd}=\frac{\varepsilon_0 S}{d}$

$W_E=\int Q\,dU=\int CU\,dU=\frac{1}{2}CU^2$

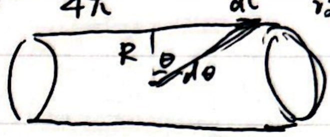
$W_E=\frac{1}{2}CU^2=\frac{\varepsilon_0 S}{2d}(Ed)^2=\frac{\varepsilon_0 S}{2}\cdot d\cdot\left(\frac{\sigma}{\varepsilon_0}\right)^2=\frac{Sd\sigma^2}{2\varepsilon_0}$

$w_E\cdot S\cdot d=W_E$

∴ $w_E=\frac{\sigma^2}{2\varepsilon_0}=\left(\frac{\sigma}{\varepsilon_0}\right)^2\cdot\frac{1}{2}\varepsilon_0=\frac{1}{2}\varepsilon_0E^2$

$\boxed{d\vec{B}=k\frac{I\,d\vec{l}}{r^2}\times\frac{\vec{r}}{r}}$　　$H=\frac{B}{\mu_0}$

$k=\frac{\mu_0}{4\pi}$　　设I数密度n



$dl=\frac{R}{\cos\theta}d\tan\theta=\frac{R\,d\theta}{\cos\theta}$

$d\vec{B}=k\cdot\frac{nI\,d\vec{l}}{R^2}\cos^2\theta$

$=\frac{\mu_0}{4\pi}\cdot\frac{nI}{R}\cos\theta\,d\theta$

∴ $\vec{B}_{一条}=\int d\vec{B}=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\frac{\mu_0}{4\pi}\cdot\frac{nI}{R}\cos\theta\cdot d\theta$

$=\frac{\mu_0}{4\pi}\cdot\frac{nI}{R}\cdot 2=\frac{\mu_0 nI}{2\pi R}$

∴ $\vec{B}_{螺}=2\pi R\cdot\vec{B}_{一条}=2\pi R\cdot\frac{\mu_0 nI}{2\pi R}=\mu_0 nI$

$$\boxed{\oint B\,dl=\mu_0\sum_{i=1}^{n}I_i}$$

$\Psi=N\cdot B\cdot S=nl\cdot\mu_0 nI\cdot S$

$\frac{\Delta\Psi}{\Delta t}=L\frac{\Delta I}{\Delta t}$　∴ $L=\frac{nl\mu_0 n\,dI\,S}{dt}\Big/\frac{dI}{dt}=nl\mu_0$

∴ $\boxed{L=\frac{\Psi}{I}}$!!!

$W_m=\int UI\,dt=\int L\frac{dI}{dt}\cdot I\,dt=\int LI\,dI=\frac{1}{2}LI^2$

∵ $L=n^2l\mu_0 S$

$W_m=\frac{1}{2}n^2l\mu_0 S\cdot I^2=w_m\cdot S\cdot l$

∴ $w_m=\frac{1}{2}\mu_0 I^2n^2$

∵ $B=\mu_0 nI$

∴ $w_m=\frac{1}{2}\frac{B^2}{\mu_0}$