比奥萨法尔定律

$$dB=rac{\mu_0 Id\stackrel{
ightarrow}{l} imes\stackrel{
ightarrow}{r}}{4\pi r^3}$$

有限长直导线

$$B=rac{\mu_0 I}{4\pi r_0}(\cos heta_1-\cos heta_2)$$

张角 α 的圆弧电流中心

$$B = \frac{\mu_0 I}{4\pi R} \alpha = \frac{\mu_0 I}{2R} \frac{\alpha}{2\pi}$$

$$B = \frac{\mu_0 I R^2}{2(R^2 + r_0^2)^{\frac{3}{2}}}$$

$$A = I(\Phi_f - \Phi_i)$$

$$\Phi=rac{\mu_0Il}{2\pi}{
m ln}rac{d_2}{d_1}$$

$$\overrightarrow{M} = \overrightarrow{m} imes \overrightarrow{B} \ \overrightarrow{m} = IS\overrightarrow{e_n}$$

$$\overrightarrow{m} = IS\overline{e_a}$$

$$\oint_{\ l} \overrightarrow{E} \cdot d\overrightarrow{l} = -\iint rac{\partial \overrightarrow{B}}{\partial t} \cdot d\overrightarrow{S}$$

$$U_{MA}=\epsilon_{AM}-Ir$$

能量密度

点电荷:

$$W_e=rac{1}{2}\int Vdq$$

$$w_e=rac{1}{2}\epsilon_0 E^2$$

$$W_e=\iiint_\Omega w_e d au$$

电感

$$\Psi = LI$$

静电场	稳恒电场
电荷周边,对电荷有作用力	稳恒电场,电流,磁针有作用力
$F=rac{1}{4\pi\epsilon_0}rac{qq_0}{r^2}$	$dF_{12} = rac{\mu_0}{4\pi} rac{I_1 I_2 dl_2 imes (dl_1 imes e_{12})}{r_1 2^2}$
$E = rac{F}{q}$	$B = \frac{F}{IL}$
$E=\int rac{\lambda dl}{4\pi\epsilon_0 r^2}$	$dB=rac{\mu_0}{4\pi}rac{Id\stackrel{ ightarrow}{l} imes e_r^{ ightarrow}}{r^2}$

	电场
点电荷	$E=rac{1}{4\pi\epsilon}rac{q}{r^2}e_r$
偶极子	$egin{align} E &= rac{ql}{4\pi\epsilon_0ig(r^2 + rac{l^2}{4}ig)^{rac{3}{2}}} \ E_{mid} &= rac{ql}{4\pi\epsilon_0 r^2} = -rac{p}{4\pi\epsilon_0 r^3} \ E_{ext} &= rac{2ql}{4\pi\epsilon_0 r^2} = -rac{2p}{4\pi\epsilon_0 r^3} \ \end{cases}$
导线	$egin{aligned} E &= rac{\lambda}{2\pi\epsilon_0 d} \ E_x &= rac{\lambda}{4\pi\epsilon_0 d} (\sin heta_2 - \sin heta_1) \ E_y &= rac{\lambda}{4\pi\epsilon_0 d} (\cos heta_2 - \cos heta_1) \ E &= rac{\sigma}{2\epsilon_0} n \end{aligned}$

	磁场
导线	$egin{align} B &= rac{\mu_0 I}{4\pi a}(\cos heta_1 - \cos heta_2) \ B_{mid} &= rac{\mu_0 I}{2\pi a}\cos heta \ B_{\infty} &= rac{\mu_0 I}{2\pi a} \ B_{rac{\infty}{2}} &= rac{B_{\infty}}{2} \ B_{ext} &= 0 \ \end{matrix}$
圆环	$egin{align} B &= rac{\mu_0 I R^2}{2(R^2 + z^2)^{rac{3}{2}}} \ B &pprox rac{\mu_0 I}{2R} e_n \ \end{dcases}$
螺线管	$egin{align} B &= rac{\mu_0 n I}{2} (\coseta_2 - \coseta_1) \ B_\infty &= \mu_0 n I \ B_rac{\infty}{2} &= rac{B_\infty}{2} \ \end{pmatrix}$

高斯定理	稳恒电场
$egin{aligned} \Phi_E = & \ E \cdot dS = rac{1}{\epsilon_0} \sum q \ & \ \oint_L E \cdot dl = 0 \end{aligned}$	$egin{aligned} \Phi_B = & ext{ } eta \cdot dS = 0 \ & \oint_L B \cdot dl = \mu_0 \sum I \end{aligned}$

静电场	感应电场
$ otin E \cdot dS = rac{q}{\epsilon_0} otin E \cdot dl = 0 $	$ otag egin{aligned} E_k \cdot dS &= 0 \ & \oint_L E_k \cdot dl &= -\iint_S rac{\partial B}{\partial t} dS \end{aligned}$

磁介质	电解质
$H=rac{B}{\mu_0}-M$	$D=\epsilon_0 E + P$
$B=\mu_r\mu_0 H$	$D=\chi_r\epsilon_0 E$
$egin{aligned} H_{1t}&=H_{2t}\ B_{1n}&=B_{2n} \end{aligned}$	$egin{aligned} D_{1n} &= D_{2n} \ E_{1t} &= E_{2t} \end{aligned}$
$w_m=rac{1}{2}BH=rac{1}{2}LI^2$	$w_e = rac{1}{2}DE = rac{1}{2}QU$

$$\notin {}_{S} \mathbf{D} \cdot d\mathbf{S} = 0$$

$$otin S = 0$$

$$\oint_{l} \mathbf{E} \cdot d\mathbf{l} = -\iint_{S} \frac{\partial \mathbf{B}}{\partial t} \cdot d\mathbf{S}$$

$$\oint_{l} \mathbf{H} \cdot d\mathbf{l} = \iint_{S} rac{\partial \mathbf{D}}{\partial t} \cdot d\mathbf{S}$$

$$\frac{\sin i_1}{\sin i_2} = \frac{n_2}{n_1}$$

马吕斯定律:

$$I_2 = I_1 \cos^2 \alpha = \frac{I_0}{2} \cos^2 \alpha$$

$$i_b = rctan\Bigl(rac{n_2}{n_1}\Bigr)$$

- $n_e > n_o$ 正晶体
- $n_e < n_o$ 负晶体

二分之一波片:

- 线偏振-线偏振
- 圆偏振-圆偏振

四分之一波片

- 线偏振光 入射角 $\alpha = \frac{\pi}{4}$ 圆偏振光
- 反之。

明
$$x_m=mrac{L}{d}\lambda$$

暗
$$x_m=(2m-1)rac{\lambda}{2}rac{L}{d}$$

$$\Delta x = rac{L}{d} \lambda$$

$$\Delta d = rac{\lambda}{2n}$$

$$\Delta l = rac{\lambda}{2n heta}$$

$$\delta = 2nd + rac{\lambda}{2} = \left\{egin{array}{ll} m\lambda & \oplus \ (2m+1)rac{\lambda}{2} & \oplus \end{array}
ight.$$

$$r^2=R^2-(R-d)^2pprox 2dR$$

$$\Delta \lambda = \frac{\lambda^2}{2\Delta D}$$

夫琅禾费单缝衍射

$$a\sin\theta = m\lambda$$

夫琅禾费圆孔衍射

艾里斑半径

$$R=1.22rac{\lambda}{D}f$$

最小分辨角

$$heta_0 = heta_1 pprox \sin heta_1 = 1.22 rac{\lambda}{D}$$

N缝 两明纹间有N-1条暗纹 N-2 个次极大

$$R = \frac{\lambda}{\Delta \lambda} = mN - 1 \approx mN$$

布拉格公式

$$2d\sin\varphi = m\lambda$$

斯土蕃定律

$$M_B = \sigma T^4$$

维恩位移定律

$$T\lambda_m = b$$

$$eU_a=rac{1}{2}mv_0^2$$

$$U_a=k(
u-
u_0)$$

$$h
u = W_0 + rac{1}{2} m v^2$$

$$L_n=n\hbar$$

$$E_n = rac{E_1}{n^2}, E_1 = -13.6 eV$$

德布罗意波

$$\lambda = \frac{h}{p}$$

$$\Delta x \Delta p_x \geq h$$

$$\Delta E \Delta t \geq h$$

归一化

$$P = \left|\Psi(r,t)\right|^2 dV$$

$$\rho = \frac{P}{dV}$$

$$\int_{\Omega} \Psi(r,t) \Psi^*(r,t) dV = 1$$

$$\hat{H}\Phi(r)=E\Phi(r)$$

$$\hat{H}=-rac{\hbar^2}{2m}rac{\partial^2}{\partial x^2}+U(x,t)$$

$$L^2=l(l+1)\hbar^2, l=0,1,2,\cdots,n-1$$

$$L_z=m_l\hbar, m_l=-l,-l+1,\cdots,l-1,l$$

自旋磁矩与自旋角动量

$$\mu_s=-rac{e}{m_e}\mathbf{S}=-rac{e}{m_e}m_soldsymbol{\hbar}, m_s=-rac{1}{2},rac{1}{2}$$