$\varepsilon_0 = 8.85 * 10^{-12}\, C^2/N\, m$

$k = \frac{1}{4\pi\varepsilon_0} = 8.99 * 10^9\, Nm^2/C$

$e = 1.602 * 10^{-19}\, C$

$\mu_0 = 4\pi \times 10^{-7}\, Tm/A$

$h = 6.63 \cdot 10^{-34}\, Js$

$\mu_B = 9.27 \cdot 10^{-24}\, J/T$

$R = \frac{m e^4}{8\varepsilon_0 h^3 c} = 1.097373 \cdot 10^7\, m^{-1}$

<u>Magnetska polja od električne struje</u>

Amperèov zakon $\oint \vec{B} \cdot d\vec{s} = \frac{\mu_0}{i_{obuhv}}$

Biot-Savartov zakon $d\vec{B} = \frac{\mu_0}{4\pi} \frac{i\, d\vec{s} \times \hat{r}}{r^2}$

magnetsko polje duge ravne žice $B = \frac{\mu_0 i}{4\pi R}$

sila između paralelnih žica kojima teče struja $F_{ba} = i_b L B_a \sin\left(\frac{\pi}{2}\right) = \frac{\mu_0 L i_a i_b}{2\pi d}$

magnetsko polje solenoida $B = \mu_0 i n$

magnetsko polje toroida $B = \frac{\mu_0 i N}{2\pi} \frac{1}{r}$

magnetsko polje magnetkog dipola $\vec{B}(z) = \frac{\mu_0}{2\pi} \frac{\vec{\mu}}{z^3}$

<u>Indukcija</u>

magnetski tok $\Phi_B = \int \vec{B} \cdot d\vec{A}$

$\Phi_B = BA$

Faradayev zakon indukcije $\mathcal{E}=-\frac{d\Phi_B}{dt}$

$$\mathcal{E}=-N\frac{d\Phi_B}{dt}$$

elektromotorna sila i inducirano električno polje $\mathcal{E}=\oint\vec{E}\cdot d\vec{s}$

$\oint\vec{E}\cdot d\vec{s}=\frac{-\Phi_B}{dt}$

induktancija $L=\frac{N\Phi_B}{i}$, $\frac{L}{l}=\mu_0 n^2 A$

samoindukcija $\mathcal{E}_L=-L\frac{di}{dt}$

magnetska energija $U_B=\frac{1}{2}Li^2$

$$u_B=\frac{B^2}{2\mu_0}$$

uzajamna indukcija $\mathcal{E}_2=-M\frac{di_1}{dt}$, $\mathcal{E}_1=-M\frac{di_2}{dt}$

<u>Gaussov zakon za magnetsko polje</u> $\Phi_B=\int\vec{B}\cdot d\vec{A}=0$

<u>Maxwell-Amperèov zakon</u> $\oint\vec{B}\cdot d\vec{s}=\mu_0\varepsilon_0\frac{d\Phi_E}{dt}+\mu_0 i_{obuhv}$

struja pomaka $i_d=\varepsilon_0\frac{d\Phi_E}{dt}$

spinski dipolni magnetski moment $\vec{\mu}_S=-\frac{e}{m}\vec{S}$

$$S_z=m_S\frac{h}{2\pi} \quad , \quad m_S=\pm\frac{1}{2}$$

$$\mu_{S,z}=\pm\frac{eh}{4\pi m}=\pm\mu_B$$

$$U=-\vec{\mu}_S\cdot\vec{B}_{ext}=-\mu_{S,z}B_{ext}$$

orbitalni magnetski dipolni moment $\vec{\mu}_{orb}=-\frac{e}{2m}\vec{L}_{orb}$

$$L_{orb,z}=m_l\frac{h}{2\pi} \quad , \quad m_l=0,\pm1,\pm2,\ldots,\pm(konacni\,broj)$$

$$\mu_{orb,z}=-m_l\frac{eh}{4\pi m}=m_l\mu_B$$

Curiev zakon $M = C\frac{B_{ext}}{T}$

<u>Elektromagnetski valovi</u> $E = E_m \sin(kx - \omega t)$, $B = B_m \sin(kx - \omega t)$, $c = \frac{E}{B} = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

Poyntingov vektor $\vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B}$

tlak zračenja pri totalnoj apsorpciji $p_r = \frac{S}{c}$

tlak zračenja pri totalnoj refleksiji $p_r = \frac{2S}{c}$

<u>Interferencija</u>

položaji interferentnih pruga u Youngovom eksperimentu s dvije pukotine:

$$d \sin(\theta) = m\lambda \quad , \quad m = 0,1,2,\ldots$$

$$d \sin(\theta) = (m + \frac{1}{2})\lambda \quad , \quad m = 0,1,2,\ldots$$

<u>Fotoni</u>

$E = hf$, $p = \frac{hf}{c} = \frac{h}{\lambda}$

fotoelektrični efekt $hf = K_{max} + \Phi$

Comptonov pomak $\Delta\lambda = \frac{h}{mc}(1 - \cos(\varphi))$

<u>Valovi materije</u>

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

valna funkcija $\Psi(x, y, z, t) = \psi(x, y, z) \cdot e^{-i\omega t}$

Schrödigerova jednadžba u jednoj dimenziji $\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2}[E - U(x)]\psi = 0$

Heisenbergove relacije neodređenosti $\Delta x \cdot \Delta p_x \geq \frac{h}{2\pi}$

$$\Delta y \cdot \Delta p_y \geq \frac{h}{2\pi}$$

$$\Delta z \cdot \Delta p_z \geq \frac{h}{2\pi}$$

tuneliranje $T \approx e^{-2bL}$

$$b = \sqrt{\frac{8\pi^2 m(U_b - E)}{h^2}}$$

elektron u beskonačnoj potencijalnoj jami $E_n = \left(\frac{h^2}{8mL^2}\right) n^2$, $n = 1,2,3,\ldots$

$$\Delta E = E_{visoka} - E_{niska}$$

$$hf = \Delta E = E_{visoka} - E_{niska}$$

$$\psi_n(x) = A \sin\left(\frac{n\pi}{L} x\right) \quad , \quad n = 1,2,3,\ldots$$

vodikov atom $E_n = -\frac{me^4}{8\varepsilon_0 h^2} \frac{1}{n^2} = -\frac{13.60\, eV}{n^2}$, $n = 1,2,3,\ldots$

$$\frac{1}{\lambda} = R\left(\frac{1}{n_{niza}^2} - \frac{1}{n_{visa}^2}\right)$$