0.1 Gaussian and SI

Gaussian ("CGS") cm, gram, second		SI m, kg, second	
$\vec{\nabla} \times \vec{E} = -\frac{1}{c}\frac{\partial \vec{B}}{\partial t}$	$\vec{\nabla} \times \vec{H} = \frac{1}{c}\frac{\partial \vec{D}}{\partial t} + \frac{4\pi}{c}\vec{J}$	$\vec{\nabla} \times \vec{E} = -\frac{1}{c}\frac{\partial \vec{B}}{\partial t}$	$\vec{\nabla} \times \vec{H} = \frac{\partial \vec{D}}{\partial t} + \vec{J}$
$\vec{\nabla} \cdot \vec{D} = 4\pi\rho$	$\vec{\nabla} \cdot \vec{B} = 0$	$\vec{\nabla} \cdot \vec{D} = \rho$	$\vec{\nabla} \cdot \vec{B} = 0$
$\vec{F} = q\left(\vec{E} + \frac{1}{c}\vec{v} \times \vec{B}\right)$		$\vec{F} = q\left(\vec{E} + \vec{v} \times \vec{B}\right)$	
$\vec{D} \equiv \vec{E} + 4\pi\vec{P}$	$\vec{H} \equiv \vec{B} - 4\pi\vec{\mu}$	$\vec{D} \equiv \epsilon_0 \ \vec{E} + \vec{P}$	$\vec{H} = \frac{1}{\mu_0}\vec{B} - \vec{\mu}$

Conversion factors between Gaussian, SI. Usage: $X_{Gaussian} = k_X X_{SI}$

$k_{\vec{D}} = \sqrt{4\pi/\epsilon_0}$ $\quad k_{\vec{H}} = \sqrt{4\pi\mu_0}$ $\quad k_\rho = k_{\vec{J}} = k_{\vec{P}} = 1/\sqrt{4\pi\epsilon_0}$

$k_{\vec{E}} = \sqrt{4\pi\epsilon_0}$ $\quad k_{\vec{B}} = \sqrt{4\pi/\mu_0}$ $\quad k_\mu = \sqrt{\mu_0/(4\pi)}$

For dimensions, $k_{length} = 100$. $k_{mass} = 1000$.

$$\epsilon_0\mu_0 = \frac{1}{c^2} \tag{1}$$

$$\mu_0 = 4\pi \cdot 10^{-7} \tag{2}$$

0.2 basics

$$E = h\ f = \frac{h\ c}{\lambda} \tag{3}$$

$$F = -G\frac{m_1\ m_2}{r^2} \tag{4}$$

Explain the following momentum relation physically

$$p = \hbar k = mv \tag{5}$$

Explain the following relation between flux and velocity physically

$$\vec{J} = n\vec{v} \tag{6}$$

$$KE = \frac{1}{2}mv^2 \qquad PE = mgh \tag{7}$$