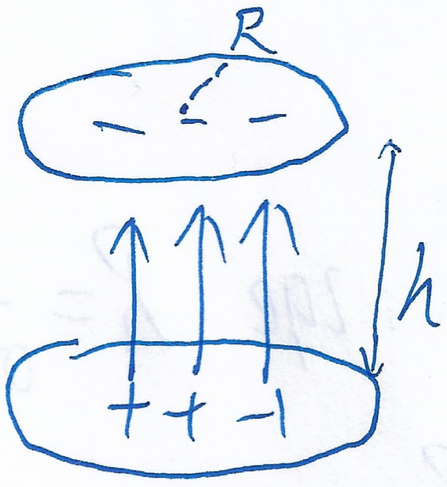
ДЗ 14

1. Дано: $R=0.5m$, $\varepsilon=4$, $E_m=200\ В/м$, $t=60s$

$$\langle S\rangle = \frac{1}{2}\sqrt{\frac{\varepsilon\varepsilon_0}{\mu_0}}E_m^2$$

$$W = 4\pi R^2 \cdot \frac{1}{2}\sqrt{\frac{\varepsilon\varepsilon_0}{\mu_0}}E_m^2 \cdot t = 2\times10^4\ Дж$$

2. Дано:



~~$I = \frac{dw}{dt}$~~

$$\oint \vec{S_w}\,d\vec{S} = \frac{dw}{dt}$$

$$\varphi = S_w \cdot S = 2EH\pi Rh \quad ①$$

$$\oint H\,dl = \left(I + \frac{dD}{dt}\right)\cdot S$$

$$2H\pi R = \frac{dD}{dt}\cdot S$$

$$H = \frac{\varepsilon\varepsilon_0 dE}{dt}\cdot\frac{S}{2\pi R} \quad ②$$

① и ② получаем: $\Phi = \oint S_w dS = \frac{\varepsilon\varepsilon_0 E dE}{dt}\frac{S}{2\pi R}\cdot 2\pi R^2\cdot h$

$$= \frac{1}{2}\varepsilon\varepsilon_0 V\frac{dE^2}{dt} \quad ③$$

$$W = \frac{\varepsilon\varepsilon_0}{2}E^2V \Rightarrow \frac{dw}{dt} = \frac{\varepsilon\varepsilon_0 V}{2}\frac{dE^2}{dt} \quad ④$$

③ = ④