Reading 2/18

(1) (a) $\vec{S} = \dfrac{\vec{E} \times \vec{B}}{\mu_0}$

$\vec{E}$: $+\hat{y}$; $\vec{S}$: $+\hat{z}$

$$(+\hat{y}) \times (\,?\,) = (+\hat{z})$$

$$(\,?\,) = -\hat{x}$$

Mag field points in $-\hat{x}$ direction

(b) $|\vec{B}| = \dfrac{|\vec{E}|}{c} = \dfrac{20.0\ V/m}{3 \times 10^8\ m/s} = \boxed{6.67 \times 10^{-8}\ T}$

(c) $I = S_{avg} = \dfrac{1}{2c\mu_0} E_0^2 = \dfrac{(20.0)^2}{2(3.00 \times 10^8)(4\pi \times 10^{-7})} \dfrac{W}{m^2} = \boxed{0.531\ W/m^2}$

(d) $\vec{E}(z,t) = E_0 \cos[(kz) - \omega t]\,(+\hat{y})$

$E_0 = 20.0\ V/m$

$k = \dfrac{2\pi}{\lambda} = \dfrac{2\pi}{650 \times 10^{-9}\ m} = 9.7 \times 10^6\ rad/m$

$\omega = ck = (3 \times 10^8\ m/s)(9.7 \times 10^6\ rad/m) = 2.9 \times 10^{15}\ rad/s$

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(2) After the first polarizer, the intensity drops to $\frac{1}{2} I_0$

* If the 2^{nd} polarizer is parallel to the first, $\theta = 0$, so there is no reduction in intensity

* If the 2^{nd} polarizer is perp. to the first, $\theta = \frac{\pi}{2}$, so $I_{trans} = 0$

$\Rightarrow I_{max} = \frac{1}{2} I_0$ & $I_{min} = 0$