Sunday, October 8, 2023 9:37 PM

1.

a. For $\theta = 45°$ $\quad \vec{E} = \sin 45\hat{x} + \cos 45\hat{y}$

$= \frac{1}{\sqrt{2}}\hat{x} + \frac{1}{\sqrt{2}}\hat{y}$

$\vec{P} = -\frac{1}{\sqrt{2}}\hat{x} + \frac{1}{\sqrt{2}}\hat{y}$

Direction of propagation is $\vec{E} \times \vec{B} = 0\hat{x} + 0\hat{y} + 1\hat{z}$

Prop is in the $+\hat{z}$ dir.

b. For mag of wave vec $|\vec{k}| = \frac{2\pi}{\lambda} = \frac{2\pi}{785\,nm} = 0.008004\,nm^{-1}$

c. complex RI $= \hat{n}(\lambda) = n(\lambda) - i\kappa(\lambda)$

input wave $= \vec{E}_0 e^{-i\frac{2\pi}{\lambda}\cdot\hat{n}(\lambda)\cdot x + i\omega t}$

$= \vec{E}_0 e^{-i\frac{2\pi}{\lambda}\cdot\hat{n}(\lambda)\cdot x} e^{i\omega t}$

$= \vec{E}_0 e^{-i\frac{2\pi}{\lambda}\times n r} e^{\frac{2\pi}{\lambda}\times k} e^{i\omega t}$

2.

a. $\mu_{total} = \underbrace{\varepsilon_A C_A}_{\mu_a} + \underbrace{\varepsilon_B C_B}_{\mu_b}$ $\quad \mu_{total} = 0.5\,cm^{-1}$

$C_{b\,after} = \frac{6.5}{12}\,M$

$0.5\,cm^{-1} = \mu_a + 0.057532\,67$

$\mu_a = 0.44246733$

b. For Full acceptance $\sin(30°) = \boxed{0.5}$ for 10mW

for 5mW $\sin(15°) = \boxed{0.258819}$

3. a.

Scattering efficiency = 3.605

cross section = $\pi(1mm)^2 = \pi mm^2$

Scattering coefficient = 1.052×10^{-11}

b. Matlab code attached

4. a

b. Matlab code attached

c.