1.

a.

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

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

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

Direction of propogation
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 $\vec{k} = \hat{n}(\lambda) = n(\lambda) - i \kappa(\lambda)$

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

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

$= \vec{E_o} e^{-i \frac{2\pi}{\lambda} x n} e^{\frac{2\pi}{\lambda} x \kappa} e^{i\omega t}$

2.

a. $\mu_{total} = \underbrace{\mathcal{E}_A C_A}_{\mu_a} + \underbrace{\mathcal{E}_B C_B}_{\mu_b}$ $\mu_{total} = 0.5 cm^{-1}$

$C_b = \frac{6.5}{12} mM$
after

$0.5 cm^{-1} = \mu_a + 0.0575327$

$\mu_a = 0.44246733$

b.

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

3.a.

Scattering efficiency $= 3.605$

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

Scattering coefficient $= 1.052 \times 10^{-11}$

b. Matlab code attached

4.

a

b. Matlab code attached

c.