UCA Department of Physics and Astronomy

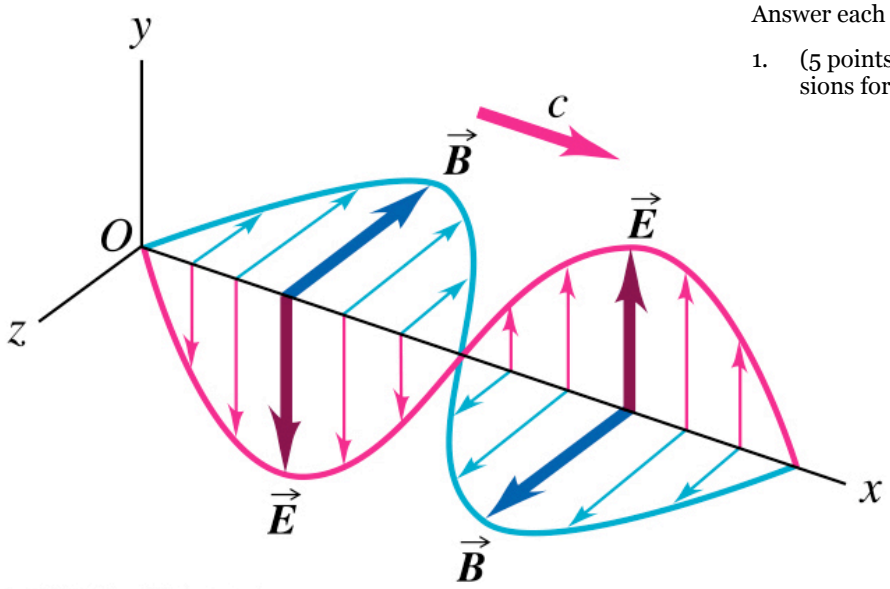
PHYS 3345: OPTICS

Quiz 03: Chapter 03

Spring 2008

Answer each of the questions below, showing your work.

1. (5 points) Using the wave shown, write the expressions for **E** and **B**.



$$\vec{E} = \left(E_o \hat{\mathrm{j}}\right)\sin\left(kx - \omega t + \pi\right)$$

$$\vec{B} = \left(B_o \hat{\mathrm{k}}\right)\sin\left(kx - \omega t + \pi\right)$$

2. (5 points) Show that $\vec{k} \times \vec{E} = \omega \vec{B}$

$$\vec{k} = \left(\frac{2\pi}{\lambda}\right)\hat{\mathrm{i}}$$

$$\vec{k} \times \vec{E} = \left[\left(\frac{2\pi}{\lambda}\right)\hat{\mathrm{i}}\right] \times \left[\left(E_o \hat{\mathrm{j}}\right)\sin\left(kx - \omega t + \pi\right)\right]$$

$$\vec{k} \times \vec{E} = \left(\frac{2\pi}{\lambda}\right)\left[E_o \sin\left(kx - \omega t + \pi\right)\right]\left[\hat{\mathrm{i}} \times \hat{\mathrm{j}}\right]$$

$$\vec{k} \times \vec{E} = \left(\frac{2\pi}{\lambda}\right)\left[\left(cB_o\right)\sin\left(kx - \omega t + \pi\right)\right]\hat{\mathrm{k}}$$

$$\vec{k} \times \vec{E} = \left(2\pi\upsilon\right)\left[B_o \sin\left(kx - \omega t + \pi\right)\right]\hat{\mathrm{k}}$$

$$\vec{k} \times \vec{E} = \omega \vec{B}$$