Physics 2220
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George A. Williams

SIXTH MIDTERM

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SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

The magnetic field of light being emitted from a laser is described by

$$B = 3.50 \times 10^{-9}\ \text{T} \cos\left(1.32 \times 10^{7}\, x - 3.22 \times 10^{15}\, t\right).$$

+5 (a) Calculate the wavelength, in nm, of this light.
+5 (b) Find the frequency, f, of this light (in Hz).
+5 (c) What is the average value of the Poynting vector (use the true value of c).
+5 (d) Find the velocity of this wave calculated from the function above.
+5 (e) What is the peak value of the electric field in this wave? (Use the true value of c.)

a) $\lambda = \frac{2\pi}{k} = \frac{6.283}{0.00132} \simeq 476\ \text{nm}$.

if you use $\lambda = c/f$., (-3).

b) $f = \frac{\omega}{2\pi} = 5.12 \times 10^{14}\ \text{Hz}$.

c) $S = \frac{c \cdot B_0^2}{2\mu_0} = 1.46 \times 10^{-5}\ \text{w/m}^2$.

d) $c = \frac{\omega}{k} \simeq 2.000 \times 10^{8}\ \text{m/s}$

e) $E_0 = cB_0 = 1.05\ \text{V/m}$.

For a) if you calculate expressed by the unit (nm), but you give the correct result. (-1)

If you have more than three figures. (-1).