Physics 111 Homework Solutions Collected on Monday 10/20

Wednesday, October 15, 2014

Chapter 19
Questions

19.2   Electromagnetic waves and waves on a string are similar in that they both are transverse waves that travel with a speed that is dependent on the material through which the waves pass. They are different in that electromagnetic waves do not need a material to propagate unlike waves on a string.

19.3   See class notes for the solution.

Multiple-Choice

19.1   D
19.2   D
19.3   C
19.4   D

Problems

19.1   The maximum electric and magnetic field amplitudes are related through

$$E_{max} = cB_{max} = 3 \times 10^8 \, \tfrac{m}{s} \times 2 \times 10^{-7} \, T = 60 \, \tfrac{N}{C}.$$

19.2.   Since $E_{max} = cB_{max}$ then $B_{max} = \dfrac{E_{max}}{c} = \dfrac{2 \times 10^{-4} \, \tfrac{N}{C}}{3 \times 10^8 \, \tfrac{m}{s}} = 6.67 \times 10^{-13} \, T$ in the z-direction.

19.3.   The intensity is given as $I = \dfrac{cB^2}{2\mu_0} = \dfrac{\left(3 \times 10^8 \, \tfrac{m}{s}\right)\left(5 \times 10^{-7} \, T\right)}{2\left(4\pi \times 10^{-7} \, \tfrac{Tm}{A}\right)} = 29.8 \, \tfrac{W}{m^2}.$

19.15   The frequency is given as $f = \dfrac{c}{\lambda} = \dfrac{3 \times 10^8 \, \tfrac{m}{s}}{5.5 \times 10^{-7} \, m} = 5.5 \times 10^{14} \, s^{-1}.$

Thursday, October 16, 2014

Chapter 19
Questions
- None

Multiple-Choice
- None

Problems
- None