

Physics 200

Chapter 34: Electromagnetic Waves (Lecture Examples)

- Ex:1 Derive speed of light using Maxwell's equations.
 $E = E_{\max} \cos(kx - \omega t)$
 $B = B_{\max} \cos(kx - \omega t)$
 $E = c B$
- Ex:1 Calculate E_{\max} and B_{\max} at a distance, a , from a light bulb with power, W . Assume the light bulb is a point source.
- Ex:2 A radio transmitter broadcasts isotropically. The transmitter has power, P . Calculate E_{\max} a distance, a , from the transmitter.
- Ex:3 A resistor, R , is connected to a battery, V . What is the magnitude of E_{\max} and B_{\max} at the resistor's surface. Assume the resistor has a radius, a , and a length, L .
- Ex:4 A laser with power, W , has a beam with a radius, a . What is the average energy density of the laser beam?
- Ex:5 Calculate the average electric field energy density a distance, a , from a light bulb with power, W .
- Ex:6 A coin has mass, m , and area, A , is perfectly reflecting and is being levitated by a laser beam. What is the power of the laser? (Assume the cross-sectional area of the laser beam is the same as the coin.)
- Ex:7 A black piece of cardboard has area, A , and is a distance, x , from a light bulb with power, W . What radiation force acts on it? (Assume complete absorption.)
- Ex:8 A laser is used to power a space ship with mass, m , at an acceleration of 1 "g" . What is the laser power required if the laser is pointed out the back of the ship?
- Ex:9 A mirror reflects 80% of the sunlight that strikes it and absorbs the rest. If the intensity of the light is, I , and the mirror has area, A , what force is exerted on it by the normally incident sunlight?