Chemistry 620
Analytical Spectroscopy
PROBLEM SET 0: Not collected

1. Consider a linearly polarized plane electromagnetic wave traveling in the +x direction in a dielectric that has refractive index equal to 1.77 and the xy plane as its plane of vibration. Given that its frequency is 614.3 THz and its amplitude is $E_0 = 0.25$ V/m,
    a. find the period and wavelength of the wave,
    b. write an expression for E(t) ,
    c. find the irradiance of the wave falling on a detector outside the dielectric

2. In photoluminescence spectrometry, the signal is usually proportional to the excitation source intensity. If a lamp's intensity is proportional to the fourth power of its temperature, to what degree must the RSD of the lamp temp be controlled to insure that the RSD of the luminescence signal is less than 1%?

3. An extended source is spherical, with a radius of 2.00 cm. It emits 9.43 W between 399.5 nm and 400.5 nm. Calculate the spectral radiance of the source at 400 nm.

4. The spectral radiance of an extended source is 2.00 W cm^{-2} sr^{-1} nm^{-1} at 300 nm. Calculate the radiant power over 10.0 nm centered at 300 nm incident on a 1.00 cm^2 receiver that is 1.00 m away if a 5.00 mm diameter aperture is placed at the source. Assume constant source radiance over the 10.0 nm range around 300 nm.

5. Consider a linearly polarized plane electromagnetic wave traveling in the +x direction in free space and having as its plane of vibration the xy plane. Given that its frequency is 12 THz and its amplitude is $E_0 = 0.25$ V/m,

    a) find the period and wavelength of the wave,
    b) write an expression for E(t) ,
    c) find the irradiance of the wave falling on a detector.