

## Remote Sensing Homework

Spring 2005

*Always answer in complete, coherent sentences and show all work!*

### Shortwave and Longwave Radiative Transfer Due Wednesday, 9 February 2005

1. Fill in the empty cells in the following table by converting among wavelengths, frequencies, and wave numbers as needed (note specified units). Identify the region of the electromagnetic spectrum in which that energy belongs (e.g., infrared, microwave, etc.):

Wavelength ( $\mu\text{m}$ )	Frequency (GHz)	Wavenumber ( $\text{cm}^{-1}$ )	Region of EM Spectrum
11			
	30		
		$1 \times 10^{-3}$	
	$3 \times 10^6$		
0.6			

2. Calculate the wavelength in which the maximum amount of energy is emitted from the sun (assume  $T=6000\text{K}$ ), the Earth ( $T=300\text{K}$ ), and from you ( $T=98.6\text{F}$ ). In which regions of the EM spectrum do these peaks occur?
3. Match the line on which you must be standing to have the sun overhead at noon to the position of the Earth in its orbit around the sun. Note that seasons refer to the Northern Hemisphere:

Line

Earth's position

Tropic of Cancer

Autumnal equinox

Equator

Summer solstice

Arctic Circle

None of these

Tropic of Capricorn

Vernal equinox

Antarctic Circle

Winter solstice

4. Define the following terms (in your own words):

a. isotropic

b. transmission

c. Kirchhoff's Law

d. black body

e. gray body

f. brightness temperature

g. steradian