Geography 416-411
Exercise #1
Radiation Laws
5 points

Name:_____

1. Calculate the ratio of the energy being radiated by a material of emissivity, ϵ =. 90 and temperature of 27.3°C relative to the energy being radiated from an equal area of another material of ϵ =.50 and temperature of 0°C.

2. Given a material with following properties: α=.80, r=.15, t=.05, calculate the percentage change in the energy emitted by the material when its temperature increases from 40°F to 100°F if its ϵ does not change with T or λ. Please state any laws and assumptions that you use.

3. If your average surface temperature is 30°C and the average surface temperature of a nearby tree is 20°C, what is the difference in your wavelength (μm) of maximum radiation emission?

Equations:

$E = \epsilon\sigma T^4$ $\lambda_{max} = 2897\ \mu m°K / T°K$ $\alpha(\lambda) = \epsilon(\lambda)$

$\sigma = 5.67 \times 10^{-8}\ W/m^2\ °K^4$ $a + r + t = 1$ $°C = .556\ (°F - 32)$