Assignment #4 Physics 346

Due 4:30 pm **Friday** February 24, 2012

Use Phys 346 drop box located at entrance to Physics Dept. off main floor of AQ.

1. A cooling tower is used to remove heat from a nuclear power plant at 80°C. The rate of evaporation in the cooling tower is 50 kg/s. The latent heat of evaporation of water at 80°C is 2.33×10^6 J/kg.

   (a) Calculate the heat removed by the cooling tower per second.

   (b) Assume instead that this amount of heat were removed by flowing water such that the maximum temperature increase is limited to 10°C. How much water would be required in this case?

2. Absorption of light is usually governed by Beer's law which states that $I = I_0 e^{-kx}$ where I is the light intensity, k= the absorption constant which depends on wavelength and gas concentration, and x is the path length. Assume that the atmosphere has an effective thickness of 15 km with a uniform composition (this is a gross approximation).

   (a) Calculate the value of k that we would require to reduce the outgoing infrared radiation from earth by 70%, i.e. a **transmission** of 30%.

   (b) For this value of k what is the power per square meter absorbed by the atmosphere assuming a surface temperature of 286K?

   (c) Doubling of the greenhouse gases will result in a doubling of k. By how much does this increase the absorbed power per square meter? State your result as a fractional increase.

3. Questions from your text:
   Ch 5 Problems #10
   Ch 6 Problems # 6, 13, 14, 17, 18