Drop your homework to assistan's (M.B. Kelebek) mail box or office desk.

Related Lecture: Lecture notes on Solar and Atmospheric Radiation before you answer.

Q.1. (a) Knowing that the solar constant (I_o) for Earth is 1368 W/m^2, and that the solar radius 6.9x10^8 [m], <u>derive</u> an <u>equation</u> for the effective surface temperature of the Sun and show that it is about 6000°K).

   (b) <u>At what wavelength will be the maximum</u> energy radiated from the Earth's ground if its surface temperature is 300 [°K]. <u>Compare</u> this with the maximum wavelength that Sun radiates at 5870 K. Which object will radiate more energy?

   (c) Make a sketch of the electromagnetic spectrum (Planck spectrum) for each object radiating at the temperatures given in (b). Indicate the spectral regions on your plot. Do not make separate plots for each object. Show them all in ONE graph.

Q.2. (a) Assuming the surface temperature of the Sun is 5870°K, **calculate the total solar radiation** per unit area per unit time at the top of the atmospheres of Earth, Mars, and Jupiter. (1 AU= 1.5x10^8 km, Mars distance is 1.5 AU, Jupiter's distance from Sun is 5 AU).

(b) Neglect the effects of the atmospheres of these and calculate **the equilibrium or effective temperature (Te)** for each planet.

(c) **Make a Table** that shows your results of steps in (a, and b). See Table below as an example.

(d) **Compare** your results with the Observed Mean temperature given for these planets as 288°K, 210 °K, 150°K. Assume that the dominant gas in the atmospheres of these planets are air, CO_2 and ammonia, **respectively**. Using this information, **explain why** the calculated and observed temperatures are different.

   Use the planetary data sheet on our web page for the constants you need in this part.

Q.3. Brain Storm / Search and Learn: In this part, you are expected to search and learn yourself.
a. Explain the differences between Planck Law and Stephan-Boltzmann Law?
b. Explain the differences between temperature and heat? What are their units?
c. What is Albedo? Explain in which case a planet receives more energy at the surface: a planet with albedo or without albedo? Why?