

Submit this homework to Ninova for the evaluation of assistant Araş. Gör. Büşra Çetin.

Read chapters on Solar and Atmospheric Radiation lecture notes for these questions.

Q.1. ELECTROMAGNETIC RADIATION

- (a) Knowing that the solar constant (I_0) for Earth is 1368 W/m^2 , and that the solar radius $6.9 \times 10^8 \text{ [m]}$, derive an equation for the effective surface temperature of the Sun and show that it is about 6000°K .
- (b) At what wavelength will be the maximum energy radiated from the Earth's ground if its surface temperature is $300 \text{ [}^\circ\text{K]}$. Compare 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.
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Q.2. SOLAR CONSTANT

- a) To be used for space weather predictions and effects, one spacecraft at L1 will be stationed. **Calculate** the **total** solar radiation falling on the spacecraft's solar panels. Assume that the spacecraft has four solar panels placed perpendicular to the solar radiation. The size of the panels is 10 meters in length and 5 meters in width. Ignore the thickness of the solar panels.
- b) Consider now the solar panels are made of glass and reflect 15% of the incoming energy. How much this will change the energy received by each solar panel? Express your result as a % fraction of your result found in (a) for the total energy received by all panels.
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Q.3. BRAIN STORM / SEARCH AND LEARN:

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- (a) Discuss which one will have a warmer surface temperature: Planet with an albedo or planet without an albedo.
- (b) Explore Voyager-1 and Voyager-2 spacecraft such as when they were launched, the purpose of the spacecraft.
- (c) How does Voyager spacecraft determine the heliopause boundary? What is the observational signature of the heliopause that the scientist looks for?
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*Note:

1. Homework returned after due date will not be accepted.
2. Electronically typed Homework is not accepted. Return your homework in paper work with your handwriting.
3. Photocopied or Scanned homework is not accepted.
4. **Do not use** COMPUTER PRINTER OUTPUTS for your homework unless it is with your handwriting.