

Working individually, correctly answer the following questions. To get credit for your answer, you **must show all work in a legible and organized way.**

Scenario - A new planet has been discovered in our solar system - Zebulon 1. From the comfort of your spaceship you analyze the radiant emissions from this planet and discover that the wavelength of maximum emission is 1000 nm. Assuming the planet behaves like a blackbody, answer questions 1-4.

- 1) What is the frequency of maximum emission?
- 2) What is the energy content of a mole of photons at the wavelength of maximum emission?
- 3) What total rate at which EM radiation is being emitted from each square meter of the planet/atmosphere system?
- 4) From previous research, you know that 40% of the radiation emitted by Zebulon 1 is prevented from reaching space because it is either absorbed or scattered by the planet's atmosphere. You've also determined that the materials in the atmosphere attenuate planetary radiation with an efficiency of 0.05 km^{-1} (i.e., the extinction coefficient = 0.05 km^{-1}). How thick is the planet's atmosphere?
- 5) Go the following web site: <http://climatemodels.uchicago.edu/isam/> then select the "About this model" tab. Read the "Overview" & "How To" material, then watch the Video Introduction. After you have completed this, then use the model to do the following:
 - a. Determine what would happen between 2015 and 2100 to the concentration of CO_2 in the atmosphere, and the global temperature, if CO_2 emissions by burning fossil fuels and land use stayed at 2015 levels. Include the graphical output from your experiment. What causes this result?
 - b. It is thought that leveling off the total increase at 1.5 C might avoid the worst consequences of global warming. Use the model to find an emissions scenario that meets this goal. Include the graphical output from your experiment. What does your scenario tell us about what society needs to be doing?
 - c. Use the model to explore a compelling question of your own. Explain why the question is interesting, and how you used the model to examine your question. Include the graphical output from your experiment, and provide an accurate summary of the important implications of the results you found.

NOTE: Include a screenshot of the graphical output for each part of question 5.

To receive credit your answers must be emailed to me as a **PDF file** by **the deadline given in class.**