

Name: _____

Astronomy 161
Autumn Quarter 2007

Homework #4
Due Tuesday, November 13 in class

Instructions

This handout is your worksheet. Please write your answers in the spaces provided. In cases where a calculation is called for, please show your work including any sketches, so we can evaluate your answer and assign partial credit as appropriate. We will only accept homework on this worksheet.

1. The planet Mongo emits a continuous blackbody spectrum with maximum brightness occurring at a wavelength of 58000nm in the far infrared. Using Wien's Law, what is Mongo's approximate surface temperature?

2. When the Sun becomes a Red Giant star about 7.5Gyr from now, it will be about 2500× brighter than it is today. To seek refuge from the intense light of the Red Giant Sun, you would need to move to a place in the Solar System where the Red Giant Sun would have the same apparent brightness as we see from the present-day Sun on the Earth (1AU from the Sun). Where in the Solar System would you have to go in AU to seek refuge? What particular kinds of Solar System objects orbits in that location today?

3. Pure methane ice sublimates into gas at a temperature of 30K. The equilibrium temperature T_{eq} of a shiny methane iceball located at a distance D_{AU} in AU from the Sun is given by:

$$T_{eq} \approx 150K \sqrt{\frac{1}{D_{AU}}}$$

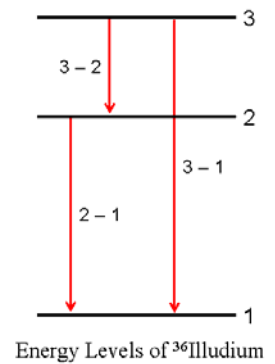
What is the closest a body covered in methane ice can be to the Sun and still stay frozen? Give your answer in AU.

4. The Large Binocular Telescope (LBT) has two primary mirrors, each with a diameter of 8.4 meters. The Hubble Space Telescope has a single primary mirror with a diameter of 2.5 meters. How many times more light can the LBT collect compared to Hubble?

5. The Illudium-36 atom has 3 electron energy levels, shown at the right. The energy difference between levels 1 and 2 is exactly **2× larger** than the energy difference between levels 2 and 3.

The wavelength of a photon emitted by an electron jumping from level 2 to 1 is 600nm.

Fill in the rest of the table below with the wavelengths for the other transitions in Illudium-36 (show your work in the space below)



Transition	Wavelength
2-1	600nm
3-1	
3-2	

Sketch the line spectrum of Illudium-36 on the scale given below. Label each transition

