

# Astronomy 20

## Homework # 3

Handed out on October 15, 2004

**Due in class on Friday, October 22, 2004**

1. (a) Compute the energy density of the Cosmic Microwave Background, with  $T = 2.73^\circ\text{K}$ . What is the typical photon energy? How many photons are there per  $\text{cm}^3$ ?  
(b) How much would it be for the solar temperature,  $T = 6,000^\circ\text{K}$ ? What is the actual energy flux and “average photon” flux from the Sun, at the Earth? What is the resulting radiation energy density?  
(c) Compare these numbers with the thermal energy density in the room ( $T \approx 300^\circ\text{K}$ ; assume ideal gas).

2. Kutner prob. 2.12

3. Kutner prob. 3.5

4. Kutner prob. 3.11

5. Kutner prob. 3.14

6. **Earn extra credit!** This problem is OPTIONAL! This is how it works, assuming that there *are* any worthwhile answers: the grand-prize winner gets the extra 20% credit; the runner-up gets 10%; honorable mentions get just that; and the rest are also-runs. So:

Come up with a new mnemonic for the stellar spectral types, OBAFGKMLT. (It used to be OBAFGKMRNS, and the traditional mnemonic was “Oh, Be A Fine Girl/Guy, Kiss Me Right Now Sweetheart”; that was in the politically incorrect days...)

You can submit more than one answer. They can be arbitrary risque as well. You can request the anonymity and protection from the law and school authorities if you so wish. Have fun!