Physics 100 - Spring 2007 - Recitation 11

(1) According to big bang cosmology, "nucleosynthesis" occurred at ~100 seconds after the start of the Big Bang.

What is meant by nucleosynthesis?

Why didn't nucleosynthesis occur earlier... Say at a time like one microsecond after the Big Bang?

(2) What is the Cosmic Microwave Background (CMB)?

What is the origin of the light in the CMB? ... What is it that you are seeing when you observe the CMB?

(3) Review the concept of "Blackbody radiation" if needed.

Order in terms of photon energy (frequency)

Microwaves, Ultraviolet light, visible light, infrared light

The light that became what we call the CMB was emitted by a "blackbody" with a Temperature of 3000°. The spectrum of this light peaked in the ultraviolet region of the spectrum. Why, then, do we observe this light to be in the infrared and microwave portions of the electromagnetic spectrum?

(4) In Big Bang cosmology, the point at which light nuclei and electrons join together to create neutral atoms is called "Recombination". Why is this term misleading?

(5) Water has a chemical formula H_2O. You are mostly water.

Where did most of the hydrogen atoms in your body originate?

Where did most of the oxygen atoms in your body originate?

Why is it that these sources differ?

(6) The next time you meet someone who thinks they are the center of the universe, you can tell them that according to Big Bang Cosmology they are most certainly Not the center of the universe.

Explain this.

(7) If you had little boxes containing matter from different times during the early universe, what particles would you expect to find in boxes labeled 10^{-20} s, 300 s, 200,000 years after the Big Bang, respectively?

(8) What is meant by our "observable universe"?
How big is it?
Does our observable universe change with time? If so, how?

(9) Suppose light could reach us from the moment of the Big Bang. In what direction would you look to see it?