ASTRO 301 (50405) : HOMEWORK 1

Assigned on Tu Sep 19/06. Due on Tu Sep 26 at 11 am in class

Instructions:
(1) The number of points for each question is indicated in brackets. **In order to get full credit, you must show the method that you used to derive the answer**. See the class website (*http://www.as.utexas.edu/~sj/a301-fa06/*) for the grading policy;
(2) See Appendix A of your textbook for the value of constants. A few are are listed here: 1 AU $\sim 1.5 \times 10^{11}$ m; 1 $M_\odot \sim 2 \times 10^{30}$ kg; Mass of a proton $\sim 1.7 \times 10^{-27}$ kg.

1. A recently discovered star of mass 10 $M_\odot$ has 5% of its mass in the form of ^{12}C atoms. How many ^{12}C atoms does this star contain? Assume that a ^{12}C atom contains 6 protons and 6 neutrons and that the mass of the neutron is the same as that of the proton. **[10 pts]**

2. Imagine that a comet located 40 AU away is approaching Earth head-on at 40 km s^{-1}. How many years will it take before the collision occurs, assuming that the comet maintains a constant speed? **[20 pts]**

3. The age of the Universe today is 13.7 billion years (13.7 Gyr). In class, we made up a mock calendar on which the age of the Universe is represented by 12 months (January to December) or 365 days, such that the Universe starts on Jan 1 at 00h:00m:00s and evolves to the present day by Dec 31 at 12:00:00 (midnight). Galaxy surveys have revealed that young galaxies in the Universe were violently merging 10.8 Gyr ago. On this mock calendar, when would such mergers occur? Express your answer in the form "Week X in the month of Y", where X is a number between 1 and 5, and Y is a month between January and December. **[20 pts]**

END OF ASSIGNMENT