

ASTRONOMY 020

Problem Set #17

Due: February 20, 2004

1. Zeilik & Gregory, Chapter 16, problem 12.
2. In a paragraph each, describe the evolution of the following stars from the main sequence to their demise.
 - (a) $M = 1 M_{\odot}$,
 - (b) $M = 25 M_{\odot}$.
3. Explain how the main-sequence turnoff point in the H-R diagram of a stellar cluster is used to estimate its age.
4. Assume that the Sun contracts by 10% of its current radius and settles into a new equilibrium state. (Hint: refer back to the virial theorem.)
 - (a) Does the gravitational potential energy increase or decrease? What is the magnitude of this change?
 - (b) Show that the total energy decreases. What is the magnitude of this change? Where did the missing energy go?
 - (c) Does the thermal energy increase or decrease? What is the magnitude of this change?
 - (d) Estimate the internal temperature of the Sun after this contraction. Is it higher or lower than the initial value? Comment on this result.

Practice problem:

1. Zeilik & Gregory, Chapter 16, problem 8.
Answers: Use $t_{\odot} = 10^{10}$ yr in the equation given in Sec. 16-3B in the text.