

Astronomy 192 Section 001
Homework 9 – Due Wednesday, March 23rd

Name _____ KEY _____
Student Number (Last 4 digits only!) _____ 0000 _____

The purpose of this assignment is to review some of the topics covered in earlier chapters in light of what you know from Chapters 15-17.

Part I. Earth Stuff = Star Stuff. (50 points) Reread “Our Cosmic Origins”, “Expansion versus gravity” and “Star Stuff” from pages 6-8 of your text before answering the following questions.

A. Which two elements were most abundant in the early Universe?

Hydrogen and Helium

B. Which two elements are most abundant in the existing molecular clouds in our Milky Way Galaxy?

Hydrogen and Helium

C. Which two elements are most abundant in our Sun?

Hydrogen and Helium

D. Which chemical element is the most common byproduct of helium fusion in low-mass stars?

Carbon

E. White dwarf stars are most likely composed of which element?

Carbon

F. The simplest organic molecules are composed of which two chemical elements?

Hydrogen and Carbon

G. Processes in which heavy nuclei are formed from lighter ones are called?

Fusion

H. Processes in which heavy nuclei break into smaller fragments are called?

Fission

I. Which of the two processes described in G and H is currently used in nuclear reactors on Earth?

Fission

J. Which nucleus is stable against either of the processes in G and H?

Iron (Fe)

Part II. (30 points) Reread “Galactic rotation” on pages 18-19 of your text before answering the following questions.

A. Roughly how many orbits of the Milky Way galaxy has our Sun made since it was formed 4.6 billion years ago?

20

B. What is a typical lifetime (in years) of an O-type star? (Hint: take a look at the H-R diagram.)

$10^7 = 10$ million years

C. Consider an O-type star as in Part B. If that star were orbiting the center of the Milky Way along with our Sun, how many orbits (or what fraction of an orbit) would it make during its hydrogen-burning lifetime?

$1/23^{\text{rd}}$ or 0.0434 orbits

Part III. Distance measures. (20 points)

1. In order to determine the luminosity of stars, one needs to know both
 - A. their surface temperature and their distance from us
 - B. their distance from us and their surface area
 - C. their apparent brightness and their surface area
 - D. their distance from us and their apparent brightness
 - E. their surface temperature and their apparent brightness

2. Distances to stars within our solar neighborhood can be determined using
 - A. sonar
 - B. radar
 - C. parallax
 - D. clusters
 - E. the Doppler effect

3. Two main sequence stars with the same surface temperature have
 - A. the same surface area
 - B. the same mass
 - C. the same luminosity
 - D. the same main-sequence lifetime
 - E. all of the above

4. True or false. Any two stars with the same luminosity can be used to determine their relative distance from Earth?

True

5. Star clusters aid in the determination of galactic length scales because
 - A. their angular size depends only on their proximity to Earth
 - B. all clusters have the same physical size
 - C. it is easy to identify main-sequence stars within a cluster
 - D. they all have the same surface temperature
 - E. untrue, they don't help at all!