

AY4 Homework #4, Sprint 2008

1. **Label each of the following statements about the solar wind true or false.**

- ☐ The solar wind is composed of energetic photons – x-rays and gamma rays
- ☐ The Earth's surface is protected from the solar wind by the Earth's magnetic field
- ☐ The northern and southern lights are due to the solar wind
- ☐ The solar wind is made mostly of neutrinos

2. **How is the solar cycle connected to the number of sunspots observed?**

3. **What is the Solar Neutrino Problem?**

4. **What is the equilibrium in a collapsing protostar?**

- ☐ Gravity balanced by thermal pressure.
- ☐ electrical attraction forces between the electrons and protons.
- ☐ Nuclear fusion balanced against gas pressure.
- ☐ There is no hydrostatic equilibrium established for protostars.

5. **Why is there a lower limit of around $0.08M_{\odot}$ to the mass of main-sequence stars?**

6. **Where is the site of star formation?**

- ☐ Only in the most distant parts of the Galactic halo where temperatures are cold enough for gas clouds to collapse.
- ☐ In the outer parts of the solar system where it is cold enough for gas clouds to collapse.
- ☐ In gas clouds where electron degeneracy is the pressure source.
- ☐ None of these is correct.

7. **Why is a high temperature required for Hydrogen fusion?**

8. **What is the energy source for a Red Giant star?**
☐ Core helium fusion.
☐ Core Hydrogen fusion.
☐ Core contraction plus Hydrogen fusion in a shell around the core.
☐ Core contraction plus electron degeneracy.
9. **When the Sun becomes a Red Giant which of the following statements will be true, which false?**
☐ it will be producing more energy than it does now
☐ it will have a larger radius than it does now
☐ it will have a higher mass than it has now
☐ it will have a higher core temperature than it has now
10. **Giant elliptical galaxies are thought to be made up of stars which were all formed about 12 billion years ago in a single burst of star formation (note that this may or may not be the correct story, but assume for now that it is). Which of the following objects would you expect to be present in an elliptical galaxy (answer True) and which would you not expect to present (answer False)?**
☐ red giants
☐ blue main-sequence stars
☐ planetary nebulae
☐ low-mass main sequence stars
11. **The Sun will eventually go through which of the following phases?**
☐ white dwarf
☐ red giant branch
☐ nova
☐ horizontal branch
12. **Which of the following statements about White Dwarfs are true?**
☐ They were once the core of an asymptotic giant branch star
☐ They are supported against gravity by e^- degeneracy
☐ They are steadily cooling off as they radiate energy
☐ They are all at least $1.4M_{\odot}$
13. **What is the equilibrium in a white dwarf?**
☐ Gravity balanced by electron degeneracy pressure.
☐ Gravity balanced by thermal pressure.
☐ Electrical attraction forces between the electrons and protons.
☐ There is no hydrostatic equilibrium established for white dwarfs.
14. **What is the Chandrasekar limit?**

15. Review. **Star A and Star B have the same trigonometric parallax and the apparent brightness of A is four times that of B.** (Assume no dust toward either star)

a) What are their relative distances

b) what are their relative luminosities?

Doppler Shift: $\frac{\lambda_v - \lambda_0}{\lambda_0} = \frac{\text{velocity}}{c}$

Wien's Law: $\lambda(\text{max}) = \frac{0.29}{\text{Temp}}$

16. Review **Suppose you take a spectrum of a distant galaxy that is moving toward the Earth at 5000 km/sec. You see the hydrogen emission line corresponding to an electron dropping from the second excited level to the first excited level. The “rest” wavelength of this photon is $= 6365 \text{ \AA}$.**

(a) Will the measured emission line be red or blue shifted?

(b) What wavelength will it be measured at (note, $c = 5 \times 10^5 \text{ km/sec}$)?