Astronomy II (ASTR-1020) — Homework 3

Due: 3 March 2009

The answers of this multiple choice homework are to be indicated on a Scantron sheet (either Form # 822 N-E or Ref # ABF-882) which you are to buy at the bookstore. **Remember to use a No. 2 pencil on these Scantron sheets**. Don't forget to write your name and the **Homework No.** (*e.g.*, 2) on the Scantron sheet. You are to turn in this Scantron at the beginning of class on the date indicated above. There are 20 questions on this homework assignment.

Useful Constants

G	=	6.673×10^{-11} m^3/s^2/kg	g	=	9.80 m/s^2
c	=	3.00×10^5 km/s	h	=	6.626×10^{-34} J s
k	=	1.38×10^{-23} J/K	$H_\circ$	=	50 km/sec/Mpc
$M_{\rm moon}$	=	7.35×10^{22} kg	$M_\odot$	=	1.99×10^{30} kg
$M_\oplus$	=	5.98×10^{24} kg	$R_\oplus$	=	6.38×10^6 m
$R_\odot$	=	6.96×10^8 m	$T_\odot$	=	5800 K
1 AU	=	1.50×10^{11} m	$L_\odot$	=	3.90×10^{26} W
e	=	1.60×10^{-19} C	σ	=	5.67×10^{-8} W/m^2/K^4
m_e	=	9.11×10^{31} kg	m_p	=	1.67×10^{-27} kg
1 ly	=	9.46×10^{15} m	1 pc	=	3.09×10^{16} m
1 km	=	10^3 m	1 hr	=	3600 s
1 mi	=	5280 ft	1 mi	=	1.609 km
1 day	=	24 hrs	1 yr	=	365.24 days
1 Å	=	10^{-10} m	1 nm	=	10^{-9} m

1. Objects that have $M < 0.01\ M_\odot$ are called

a) white dwarfs b) black dwarfs c) planets

d) main sequence stars e) brown dwarfs

2. When the internal pressure of a layer of gas in a star is balanced by the weight of material on top of that layer, such a layer is said to be in

a) radiative equilibrium

b) thermal equilibrium

c) hydrostatic equilibrium

d) momentum equilibrium

e) thermodynamic equilibrium

3. Which of the following best describes a red giant clump star?

a) hydrogen core burner b) helium core burner c) helium shell burner

d) collapsing protostar e) hydrogen shell burner

4. Which one of the following is a law of stellar structure?

a) A star's magnetic field lines must remain constant through the interior of the star.

b) The internal magnetic pressure is balanced by the weight of the star.

c) The luminosity of a star is balanced by the nuclear energy generation in the core.

d) The mass flowing in one shell must be balanced by the mass flowing into an adjacent shell.

e) None of the above.

5. Why are Cepheids used as a distance indicator to external galaxies?

a) They are bright and following a period-luminosity law.

b) They are bright hence it is easy to use trigonometric parallax.

c) They are found in clusters which allows us to use the moving cluster method.

d) Their pulsation period is directly related to their distance.

e) All Cepheids are the same brightness hence their apparent brightness tells us their distance.

6. Pulsating stars fall on what strip on the H-R Diagram?

a) main sequence b) sub dwarf c) Chandrasehkar

d) Eddington e) instability

7. Which of the following best describes a main sequence star?

a) hydrogen core burner b) helium core burner c) helium shell burner

d) collapsing protostar e) hydrogen shell burner

8. Approximately how much longer will the Sun remain on the main sequence?

a) 20 billion years b) 5 billion years c) 10 million years

d) 6000 years e) 12 billion years

9. When the energy that flows into a layer of gas in a star is balanced by the flow of energy out of that layer, such a layer is said to be in

a) radiative equilibrium b) thermal equilibrium c) hydrostatic equilibrium

d) momentum equilibrium e) dynamic equilibrium

10. Which of the following energy mechanisms does the Sun currently derive most of its energy?

a) coal burning

b) fusion with CNO cycle

c) fission of uranium

d) photoelectric effect

e) fusion with proton-proton chain

11. Why do main sequence stars stay fairly stable in both size and luminosity?

a) They are in both thermal and hydrostatic equilibrium.

b) Non-local thermodynamic processes dominate their interiors.

c) Degenerate electron pressure is balanced by degenerate neutron pressure.

d) The interior of a star is a vacuum and hence cannot change.

e) They are continuously creating new matter as they lose mass through stellar winds.

12. How much more luminous is a 20 $M_\odot$ main sequence star to a 5 $M_\odot$ main sequence star?

a) 4 times b) 16 times c) 20 times d) 256 times e) 5 times

13. Stars that have $0.08M_\odot < M < 0.4M_\odot$ are/will

a) go through a helium flash.

b) completely convective.

c) not massive enough to support nuclear fusion.

d) last 10% of their lifetime as a red giant.

e) supernova.

14. We observe emission lines from highly-ionized metals in a stellar spectrum. What must be true about this star based on this observational fact?

a) It has a chromosphere.

b) It has a planetary system.

c) It is a binary star.

d) It is a variable star.

e) It has a corona.

15. The Russell-Vogt theorem states that

a) almost all properties of a stars are determined by its magnetic field and rotation rate.

b) 90% of all stars lie on the main sequence.

c) white dwarfs must be much smaller than main sequence stars.

d) stars shine due to thermonuclear reactions.

e) almost all properties of a stars are determined by its mass and composition.

16. How are the stellar winds of an O main sequence star and an M giant star similar?

a) They are thermally driven from the star's hot corona.

b) They are driven by conductive transport.

c) They are driven by radiation pressure.

d) They are driven by a Honda Accord.

e) They are driven by convection transport.

17. The resistance to the flow of radiation through gas is referred to as what of the gas?

a) opacity b) inertia c) ohmage d) wattage e) transparency

18. We know the age of star clusters by

a) counting tree rings.

b) the number of stars in the cluster.

c) radioactive dating.

d) asking them.

e) the main sequence turn-off.

19. The statement that two electrons cannot exist in the same quantum state at the same time is better known as the

a) Hertzsprung Criterion b) Pauli Exclusion Principle c) Dirac Notation

d) Bohr Model e) Russell Diagram

20. Why don't we see chromospheres and coronae in massive stars (*i.e.*, O & B types)?

a) They don't have convective envelopes.

b) Because of their strong magnetic fields.

c) They spin too slow.

d) They don't have planetary systems.

e) They don't have radiative envelopes.