

**Astronomy 1504/1514 Section 10**  
**Midterm 2, Version 1**  
**Mar 12, 2010**

Choose the answer that best completes the question. Read each problem carefully and read through all the answers. Take your time. If a question is unclear, ask for clarification during the exam.

Mark your answers on the scantron sheet and on your copy of the exam. Keep your copy of the exam and check your grade with the posted answers on my website and the grade posted on D2LRN. You will have 1 week to ask for corrections.

1. Given two blackbodies Moe and Joe. Moe is twice as hot as Joe. What can we say about Moe and Joe?
  - a) Moe is bluer than Joe and Moe puts out much more energy per unit area than Joe
  - b) Joe is redder than Moe and Joe puts out much more energy per unit area than Moe
  - c) Moe is redder than Joe and Moe puts out much less energy per unit area than Joe
  - d) Joe is bluer than Moe and Joe puts out much less energy per unit area than Moe
2. Which of the following spectral class stars is coolest?
  - a) O
  - b) B
  - c) F
  - d) M
3. Just before a star becomes a white dwarf it is likely to produce:
  - a) a black hole
  - b) a planetary nebula
  - c) a supernova
  - d) a neutron star

4. We expect to find Herbig Haro Objects:
- a) in globular clusters
  - b) in star forming regions
  - c) in the galactic center
  - d) all of the above
5. Shock waves can cause interstellar gas clouds to collapse by:
- a) heating them up
  - b) initiating nuclear reactions
  - c) compressing them
  - d) creating a magnetic field
6. Which of these types of stars is the most common in the solar neighborhood?
- a) main sequence O stars
  - b) red giants
  - c) main sequence M stars
  - d) sun-like stars
7. Given two stars having the same temperature, which one will be brighter?
- a) the one with a larger radius
  - b) the hotter one
  - c) the more massive one
  - d) the white dwarf
8. Which type of star is the most massive?
- a) red dwarfs
  - b) main sequence O stars
  - c) white dwarfs
  - d) main sequence M stars
  - e) main sequence F stars
9. A  $5 M_{\odot}$  star would use which process to burn hydrogen on the main sequence?
- a) the proton-proton cycle
  - b) the CNO cycle
  - c) the triple-alpha reaction
  - d) gravitational contraction

10. We make use of the properties of gravity in binary systems to measure a star's
- a) brightness
  - b) distance
  - c) mass
  - d) luminosity
11. Which of these stars will take the longest time to form?
- a)  $8 M_{\odot}$  stars
  - b)  $2 M_{\odot}$  stars
  - c)  $1 M_{\odot}$  stars
  - d)  $0.8 M_{\odot}$  stars
12. Most of the photons we receive from the sun are emitted by the:
- a) interior
  - b) photosphere
  - c) chromosphere
  - d) corona
13. Sunspots appear dark because:
- a) they lack magnetic fields
  - b) they are cooler than the surrounding photosphere
  - c) they are holes in the photosphere
  - d) of optical illusion
14. The solar granulation is evidence for:
- a) magnetic fields
  - b) convection
  - c) differential rotation
  - d) solar flares
15. Hydrostatic equilibrium of the sun is maintained by the balance between gravity and
- a) gas pressure
  - b) quantum mechanical pressure
  - c) ionization
  - d) anti-gravity
16. Stars burn hydrogen to helium on the main sequence in order to produce:
- a) mass
  - b) energy
  - c) heat
  - d) none of the above

17. The heavy elements in our bodies were formed:
- a) in a black hole
  - b) in neutron stars
  - c) in the interiors of massive stars
  - d) in interstellar space
18. For a star cluster, the position of the "main sequence turnoff" tells us
- a) the cluster age
  - b) the number of stars in the cluster
  - c) the mass of the cluster
  - d) all of the above
  - e) none of the above
19. The H-R diagram is:
- a) a plot of apparent magnitude vs. absolute magnitude for stars
  - b) a plot of temperature vs. color for stars
  - c) a plot of luminosity vs. temperature for stars
  - d) a plot of mass vs. distance for stars
20. Stars spend 90% of their lives, where in the HR diagram?
- a) on the main sequence
  - b) on the supergiant branch
  - c) on the sub giant branch
  - d) on the white dwarf branch
21. When we refer to some stars as giants, we mean that they have increased their \_\_\_\_\_ leaving the main sequence:
- a) masses
  - b) temperatures
  - c) radii or diameters
  - d) this is one of the unfortunate historical terms which is not related to what it sounds like
22. Which of these stars will produce a core-collapse supernova?
- a) O5 Ia
  - b) G2 V
  - c) M2 IV
  - d) M3 V

23. The “quantum mechanical pressure” that supports white dwarfs is:
- a) dependent upon temperature
  - b) dependent upon mass
  - c) independent of temperature
  - d) independent of mass
24. At the end of its life the sun will become a:
- a) white dwarf
  - b) neutron star
  - c) pulsar
  - d) black hole
  - e) main sequence star
25. The lifetime of the sun is about:
- a) one million years
  - b) ten million years
  - c) one hundred million years
  - d) one billion years
  - e) ten billion years
26. Stars leave the main sequence because:
- a) they want to go to the center of the galaxy
  - b) they have exhausted their hydrogen supply near the center
  - c) they have exhausted their helium supply near the center
  - d) their center becomes a black hole
27. Type Ia supernovae are caused by:
- a) the core-collapse of a massive star
  - b) the thermonuclear explosion of a Chandrasekhar mass white dwarf
  - c) accretion onto a neutron star
  - d) accretion onto a black hole
28. What is the correct order of stellar evolution for single stars with masses of  $3 M_{\odot}$
- a) hydrogen fusion in the core, red giant, white dwarf, supernova
  - b) red giant, hydrogen fusion in the core, planetary nebula, white dwarf
  - c) hydrogen fusion in the core, hydrogen shell, helium fusion in core, helium shell, planetary nebula, white dwarf
  - d) hydrogen fusion in the core, hydrogen shell, helium fusion in core, helium shell, carbon fusion, supernova

29. What is the correct order of stellar evolution for single stars with masses of  $20 M_{\odot}$
- a) hydrogen fusion in the core, red giant, white dwarf, supernova
  - b) red giant, hydrogen fusion in the core, planetary nebula, white dwarf
  - c) hydrogen fusion in the core, hydrogen shell, helium fusion in core, helium shell, planetary nebula, white dwarf
  - d) hydrogen fusion in the core, helium burning in the core, carbon fusion, silicon fusion, iron core, supernova
30. Why are hydrogen Balmer lines weak in O stars?
- a) They don't have much hydrogen
  - b) Most of the hydrogen is in the ground state
  - c) Most of the hydrogen is in the second level
  - d) Most of the hydrogen is ionized
31. A G2 star is moving away the earth with a velocity of 10,000 km/s. Its spectral lines are:
- a) Not visible
  - b) Shifted to the red end of the spectrum
  - c) Shifted to the blue end of the spectrum
  - d) Not shifted at all
32. A nova explosion begins
- a) at the surface of a main sequence star
  - b) in the core of a main sequence star
  - c) at the surface of a white dwarf
  - d) in the core of a white dwarf
33. M stars are cool stars around 4000 K. Which is *not* true of an M star?
- a) Most of the hydrogen will be ionized
  - b) Most of the hydrogen will be neutral
  - c) Most of the electrons will be in the ground state of hydrogen
  - d) The Balmer lines will be weak
34. Which of these stars live the longest?
- a) The Sun
  - b) O stars
  - c) F stars
  - d) M stars

35. The helium flash occurs when:

- a) The helium core of a star begins helium burning, due to the fact that it is supported by quantum mechanical pressure
- b) When a Type Ia supernova goes off
- c) During a nova explosion
- d) In the formation of a planetary nebula

-END OF TEST-