Introductory Astronomy NAME:

Homework 20: Star Basics II: Homeworks and solutions are posted on the course web site. Homeworks are **NOT** handed in and **NOT** marked. But many homework problems ($\sim$ 50–70 %) will turn up on tests.

1. Did you complete reading-homework-self-testing for the Introductory Astronomy Lecture (IAL) by the weekly due date?

   a) YYYessss! b) Jawohl! c) Da! d) Sí, sí. e) OMG no!

2. The surface (i.e., photosphere) temperature of an ordinary star can be determined from:

   a) the shape of its **NON-BLACKBODY** spectrum (particularly the location of the peak).
   b) an analysis of its **EMISSION** line spectrum.
   c) no known means.
   d) the shape of its approximately **BLACKBODY** spectrum (particularly the location of the peak) and/or an analysis of its **ABSORPTION** line spectrum.
   e) thermometers.

3. The surface (i.e., photosphere) temperature of an ordinary star can be determined by:

   a) measuring its mass. b) identifying its luminosity class. c) identifying its spectral type. d) any means at all. e) no means.

4. The main sequence spectral star types are:

   a) ABCDEFGHIJKLMNOP. b) OBIWANKEN. c) OBAFGKM. d) OBGKMAF. e) OAGKMAO.

5. "Let's play *Jeopardy*! For $100, the answer is: Each stellar spectral types is divided into these subtypes."

   What are _____, Alex?

   a) 0 Ia, Ib, II, III, IV, V, VI, VII b) Chico, Groucho, Gummo, Harpo, Karlo, Zeppo c) Larry, Curly, and Moe d) a,b,c,d,e,...,x,y,z e) $0, 1, 2, \ldots, 9$

6. The Sun's spectral type is:

   a) G2. b) red giant. c) A−. d) Z9. e) unknown.

7. The hydrogen Balmer lines in main sequence stars:

   a) always increase in strength with increasing temperature.
   b) are strongest at surface temperature of order $10,000\,\mathrm{K}$.
   c) always decrease in strength with increasing temperature.
   d) cannot be seen at all.
   e) have constant strength with varying temperature.

8. The approximate colors of the hydrogen Balmer lines Hα, Hβ, Hγ, and Hδ are, respectively:

   a) blue-green, red, violet, and blue-violet. b) red, blue-green, blue-violet, and violet. c) red, white, blue, and mauve. d) rouge, mauve, lime, and tangerine. e) rot, nasal, grunge, and exhaust.

9. "Let's play *Jeopardy*! For $100, the answer is: It is a plot of stellar luminosity (or absolute magnitude) versus star temperature (or spectral type)."

   What is a _____, Alex?

   a) butterfly diagram b) Hertz-Avis (HA) diagram c) mass-luminosity diagram
   d) Feynman diagram e) Hertzsprung-Russell (HR) diagram

10. The main sequence on a Hertzsprung-Russell (HR) diagram is a curve (actually a narrow band) of _____ luminosity with increasing _____.

    a) increasing; surface temperature b) decreasing; surface temperature c) constant; surface temperature d) increasing; hydrogen content e) decreasing; hydrogen content

11. Main sequence stars, giants, supergiants, and white dwarfs all give rise to easily identifiable groups on a:

a) Hertzsprung-Russell (HR) diagram. b) butterfly diagram. c) Zipf plot. d) Harley-Davidson (HD) diagram. e) x-y diagram.

12. On a Hertzsprung-Russell diagram contours of constant radii run:

    a) linearly **UPWARD** to the right. b) horizontally across the diagram.
    c) vertically up the diagram. d) linearly **DOWNWARD** to the right.
    e) in a spiral to the center.

13. Stars:

    a) can always be resolved. b) can never be resolved. c) usually cannot be resolved, but with special techniques remote, small ones can be. d) usually are resolved. e) usually cannot be resolved, but with special techniques close, large ones can be.

14. The luminosity classes of stars are:

    a) Chico, Groucho, Gummo, Harpo, Karlo, Zeppo. b) bright, very bright, super-bright, unbelievable. c) 1, 2, 3, 4, 5, 6. d) OBAFGKM. e) 0, Ia, Ib, II, III, IV, V, VI, VII.

15. They are the most luminous stars (i.e., luminosities of order $10^6\,L_\odot$) and put in luminosity class 0. They are called:

    a) giants. b) dwarfs. c) horizontal branch stars. d) hypergiants. e) red dwarfs.

16. "Let's play *Jeopardy*! For $100, the answer is: These objects appear on Hertzsprung-Russell diagrams and they are assigned a luminosity class VII."

    What are _____, Alex?

    a) hypergiants b) white dwarfs c) black holes d) green giants e) green dwarfs

17. "Let's play *Jeopardy*! For $100, the answer is: They are the kind of stars to which the mass-luminosity relation applies."

    What are _____ stars, Alex?

    a) supergiant b) red giant c) red dwarf d) main-sequence e) Hollywood

18. On a log-log plot the mass-luminosity relation approximates a:

    a) straight line that increases with mass. b) horizontal line. c) vertical line. d) quadratic curve. e) straight line that decreases with mass.

19. Two stars gravitationally bound to each other and orbiting their mutual center of mass constitute a:

    a) binary star system. b) triple star system. c) single star. d) galaxy. e) universe.

20. The evolution of stars in a close binary systems have additional complexity beyond single single star systems because the binary stars:

    a) are always very massive. b) are always very far apart. c) are unbound gravitationally.
    d) can interact. e) cannot interact.

21. "Let's play *Jeopardy*! For $100, the answer is: These are loosely-bound, irregularly-shaped groups of stars consisting of order 100 to 1000 stars and having size scales of order 4 to 20 pc."

    What are _____, Alex?

    a) singles b) binaries c) open clusters d) globular clusters e) galaxies

22. "Let's play *Jeopardy*! For $100, the answer is: A physical group of stars in the constellation Taurus, sometimes called the Seven Sisters or, in Japan, Subaru, of which at least 7 stars (which are the Seven Sisters) are usually readily visible to the naked eye under reasonably good seeing conditions."

    What are the _____, Alex?

    a) Toyotas b) Wives of Chauntecleer c) Brides of Dracula d) Hyades e) Pleiades

23. "Let's play *Jeopardy*! For $100, the answer is: These are structures of a few to a few hundred stars and span of order 10 to 100 pc. They are generally gravitationally unbound though gravitationally

interacting."

What are _____, Alex?

a) singles b) binaries c) associations d) globular clusters e) galaxies

24. "Let's play *Jeopardy*! For $100, the answer is: These are compact, dense, spherical, gravitationally-bound systems of stars. They can have from of order 20,000 to several million stars and their central concentrations have diameters of order to 5 to 25 pc.

What are _____, Alex?

a) singles b) binaries c) associations d) globular clusters e) galaxies

25. The ages of globular clusters put a lower limit on the age of the observable universe. The calculated ages of globular clusters do have a range, but typically are about:

a) 12.5 Gyr. b) 12.5 million years. c) 100 million years. d) 4.6 Gyr. e) zero.

26. Although there is in fact a continuum of star ages and metallicities, the distribution of core-hydrogen-burning stars for convenience breaks two main groups: 1) relatively young and metal rich (metallicity of order mass fraction 0.001–0.03) and 2) relatively old and metal poor (typical metallicity of order mass fraction $\lesssim 0.001$, but going down to as low as mass fraction $\lesssim 10^{-6}$). These two groups are called, respectively:

a) Population I and Population II. b) Population A and Population B. c) dwarfs and giants.
d) white dwarfs and red giants. e) giants and supergiants.