Introductory Astronomy

Homework 20: The Nature of Stars Not to be handed in. Homework solutions are posted already.

1. 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.

2. The main sequence spectral star types are:

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

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

   What are _____, Alex?

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

4. 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.

5. 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.

6. "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

7. Most obviously luminous stars, at least in stellar environments like that surrounding the Sun, burn hydrogen in their core and lie in a Hertzsprung-Russell (HR) diagram on a band called the:

   a) horizontal branch. b) main sequence. c) sub-giant branch. d) asymptotic giant branch. e) secondary sequence.

8. 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.

9. 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.

10. The luminosity classes of stars are:

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

11. They are usually the most luminous stars (i.e., $L \gtrsim 3 \times 10^3\, L_\odot$) and put in luminosity classes Ia and Ib. They are called:

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

12. "Let's play *Jeopardy*! For \$100, the answer is: These objects appear on Hertzsprung-Russell diagrams and they are not assigned a luminosity class though reasonably they could be assigned to class VI."

    What are _____, Alex?

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

13. "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

14. 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.

15. 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.

16. "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 6 stars are usually visible to the naked eye under reasonable seeing conditions."

    What are _____, Alex?

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

17. "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

18. The ages of the stars in globular clusters put a lower limit on the age of the observable universe. The calculated ages of these stars are about:

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

19. Although there is in fact a continuum of star age and metallicity, the distribution of stars for convenience breaks two main groups: 1) relatively young and metal rich (metallicity of order 2-4 % by mass) and 2) relatively old and metal poor (typical metallicity of order 0.1 %, but with a huge range). 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.