Introductory Astronomy **NAME:**

Homework 19: Some Star Basics: Homeworks and solutions are posted on the course web site. Homeworks are **NOT** handed in and **NOT** marked. But many homework problems (∼ 50–70 %) will turn up on tests.

Answer Table

	a	b	c	d	e
1.	O	O	O	O	O
2.	O	O	O	O	O
3.	O	O	O	O	O
4.	O	O	O	O	O
5.	O	O	O	O	O
6.	O	O	O	O	O
7.	O	O	O	O	O
8.	O	O	O	O	O
9.	O	O	O	O	O
10.	O	O	O	O	O
11.	O	O	O	O	O
12.	O	O	O	O	O
13.	O	O	O	O	O
14.	O	O	O	O	O
15.	O	O	O	O	O
16.	O	O	O	O	O
17.	O	O	O	O	O
18.	O	O	O	O	O
19.	O	O	O	O	O
20.	O	O	O	O	O
21.	O	O	O	O	O
22.	O	O	O	O	O
23.	O	O	O	O	O
24.	O	O	O	O	O
25.	O	O	O	O	O
26.	O	O	O	O	O
27.	O	O	O	O	O
28.	O	O	O	O	O
29.	O	O	O	O	O
30.	O	O	O	O	O
31.	O	O	O	O	O
32.	O	O	O	O	O
33.	O	O	O	O	O
34.	O	O	O	O	O
35.	O	O	O	O	O
36.	O	O	O	O	O

Name:

	a	b	c	d	e
37.	O	O	O	O	O
38.	O	O	O	O	O
39.	O	O	O	O	O
40.	O	O	O	O	O
41.	O	O	O	O	O
42.	O	O	O	O	O
43.	O	O	O	O	O
44.	O	O	O	O	O
45.	O	O	O	O	O
46.	O	O	O	O	O
47.	O	O	O	O	O
48.	O	O	O	O	O
49.	O	O	O	O	O
50.	O	O	O	O	O
51.	O	O	O	O	O
52.	O	O	O	O	O
53.	O	O	O	O	O
54.	O	O	O	O	O
55.	O	O	O	O	O
56.	O	O	O	O	O
57.	O	O	O	O	O
58.	O	O	O	O	O
59.	O	O	O	O	O
60.	O	O	O	O	O
61.	O	O	O	O	O
62.	O	O	O	O	O
63.	O	O	O	O	O
64.	O	O	O	O	O
65.	O	O	O	O	O
66.	O	O	O	O	O
67.	O	O	O	O	O
68.	O	O	O	O	O
69.	O	O	O	O	O
70.	O	O	O	O	O
71.	O	O	O	O	O
72.	O	O	O	O	O

1. Did you complete reading the intro astro web lecture before the **SECOND DAY** on which the lecture was lectured on in class?

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

2. Stars are spheres:

   a) of hot gas. b) with a core of solid iron and a hydrogen outer layer. c) with a core of liquid iron and a hydrogen outer layer. d) with a core of pure helium gas and a hydrogen outer layer. e) of hot rock.

3. The Sun's surface composition by mass (which approximates the average cosmic composition and is typical of non-ancient stars) is about:

   a) 100 % helium.
   b) 71 % hydrogen, 27 % nitrogen, and 20 % everything else.
   c) 71 % carbon, 27 % nitrogen, and 2 % everything else.
   d) 71 % hydrogen, 27 % nitrogen, and 2 % everything else.
   e) 71 % hydrogen, 27 % helium, and 2 % everything else.

4. "Let's play *Jeopardy*! For $100, the answer is: The angular motion of stars on the sky as seen against the background of more distant stars due to the Earth's motion around the Sun."

   What is ____________, Alex?

   a) the Doppler shift b) planetary parallax c) stellar parallax d) stellar paradox e) stellar motion

5. Van Maanen's star has a stellar parallax of 0.232 arcseconds. About how far away is this star? Recall the distance formula for stellar parallax is

   $$d_{\text{parsec}} = \frac{1}{\theta_{\text{arcsecond}}} ,$$

   where $\theta_{\text{arcsecond}}$ is the parallax angle in arcseconds and d_{parsec} is the distance in parsecs.

   a) 0.232 pc. b) 1 pc. c) 4.3 pc. d) 2.32 pc. e) 10 pc.

6. The closest star to Earth (not counting the Sun) is ____________ at 1.30 pc (4.22 ly).

   a) Barnard's Star. b) Jeffery's Star. c) Sirius A. d) Alpha Centauri A. e) Proxima Centauri.

7. If all the stellar parallaxes (i.e., parallax angles measured during a half revolution of the Sun) were **INCREASING** with time, this would mean that the stars were all:

   a) getting smaller. b) moving away. c) getting dimmer. d) getting redder. e) moving closer.

8. A dim star is located at about 2 million astronomical units from Earth. Recall $1\,\text{AU} = 1.496 \times 10^{11}\,\text{m}$ and $1\,\text{pc} = 3.09 \times 10^{16}\,\text{m}$. Approximately, what is the distance to the star in parsecs?

   a) 1.5×10^{11} pc. b) 2×10^{6} pc. c) 3×10^{17} pc. d) 3 pc. e) 10 pc.

9. In galaxy collisions, direct star-star collisions in which star matter impacts star matter occur:

   a) very rarely because interstellar distances are very large compared to star sizes. b) with high frequency. c) never. d) never: such collisions are physically impossible. e) for all stars in the colliding galaxies.

10. Because gravity is a long-range, inverse-square-law force, significant gravitational interactions between two stars:

    a) almost never occur. b) are relatively common. c) never occur. d) occur only when the star matter impacts on star matter. e) occur only when star matter does not impact on star matter.

11. The total power of a star (i.e., energy output per unit time) is called:

    a) brightness. b) rightness. c) lightness. d) luminosity. e) incandescence.

12. The brightest stars are of order ________ times more luminous than the Sun and the dimmest are of order ________ times the Sun's luminosity.

    a) 10^{-4}; 10^6 b) 1/2; 2 c) infinite; zero d) 10^6; 10^{-4} e) 2; 1/2

13. "Let's play *Jeopardy*! For $100, the answer is: This is the energy per unit time per unit area **OR** the energy per unit time per unit area in some wavelength band **OR** the energy per unit time per unit area per unit wavelength (or frequency) from some light source (e.g., a star or the Sun)."

    What is ____________, Alex?

    a) fugue b) flow c) luminosity d) light e) flux

14. The light from astronomical bodies is often studied by observering their light flux in **BROAD** wavelength bands using colored filters. (The emission is usually reported in astronomical magnitudes, but one doesn't need to know that.) The study of emission in this way is called:

    a) spectroscopy. b) optometry. c) trigonometry. d) photometry. e) geometry.

15. The flux (energy per unit time per unit area perhaps in a wavelength band or per wavelength) of light from a star as a function of distance from the star in the absence of extinction by the interstellar medium obeys a/an:

    a) inverse-cube law. b) reverse-cube law. c) gravity law. d) force law.
    e) inverse-square law.

16. "Let's play *Jeopardy*! For $100, the answer is: The inverse-square law describing how the light flux from a star decreases with distance is proven from **THIS** general physical principle when applied to a star and its surrounding vacuum space in a steady state condition."

    What is the ____________, Alex?

    a) principle of equivalence b) cosmological principle c) perfect cosmological principle
    d) relativity postulate e) conservation of energy principle

17. If you knew the luminosity of a star, then it distance could be determined directly:

    a) from its luminosity alone.
    b) a measurement of its flux using the inverse-cube law.
    c) a measurement of its flux using the inverse-square law.
    d) a measurement of its flux using any inverse power formula.
    e) in no known way.

18. According to one standard reference, the solar luminosity $L_\odot = 3.846 \times 10^{26}$ W http://nssdc.gsfc.nasa.gov/planetary/factsheet/sunfact.html 2013 and the solar constant (i.e., the solar flux at the mean distance of the Earth) $f = 1367.6\,\mathrm{W/m^2}$. Stellar luminosity L and flux f are related by the inverse-square law

    $$f = \frac{L}{4\pi d^2} ,$$

    where d is the distance from the center of the star to the location where f is measured. Solve for d analytically and then find mean Earth-Sun distance.

    a) $d = \sqrt{L/(4\pi f)}$ and $d = 1.496 \times 10^{11}$ m. b) $d = \sqrt{L/f}$ and $d = 1.496 \times 10^{11}$ m. c) $d = \sqrt{L}$ and $d = 1.496 \times 10^{2}$ m. d) $d = \sqrt{L/(4\pi f)}$ and $d = 1.496 \times 10^{2}$ m. e) $d = \sqrt{1/f}$ and $d = 1.496 \times 10^{11}$ m.

19. "Let's play *Jeopardy*! For $100, the answer is: This metaphorical expression is the name for the collection of distance measurement techniques used to establish cosmic distances on all scales."

    What is the ____________, Alex?

    a) Gandalf distaff b) distance distaff c) distance adder d) distance viper
    e) distance ladder

20. The first rung of the distance ladder is uses the distance measurement technique of:

a) stellar parallax. b) spectrosoopic parallax. c) Cepheids. d) the Tully-Fisher relation. e) Type Ia supernovae.