

Name:

Answer Key

Student ID:

Blue Version

Section:

Magnitude/Distance Equations:

$$\begin{aligned}
 m_1 - m_2 &= 2.5 \log(L_2/L_1) \\
 m - M &= 5 \log(d/10\text{pc}) \\
 d(\text{pc}) &= 10^{1+(m-M)/5}
 \end{aligned}
 \tag{1}$$

Stefan-Boltzmann Equation:

$$L = \text{const.} \times R^2 T^4 \tag{2}$$

Be sure to read all instructions carefully, and check to see if problems are continued in the next column. Circle the letter in the multiple choice questions. Write the answer in the single-letter format requested in the matching questions.

1. [1pt] Solar surface granulation is caused by (Select one.)

- A) convection.  
 B) radioactivity.  
 C) radiation.  
 D) conduction.  
 E) thermal flux.

2. [6pt] Enter the spectral class described by each statement. Select from O, B, A, F, G, K, M, R, N, L, T. Do not use any class more than once.

A These stars have the strongest neutral Hydrogen lines.

K These stars have many lines from neutral metals, but are too hot to have many molecular lines.

G The Sun's spectral class.

M These are the warmest stars with significant molecular spectra.

O These stars have weak atomic absorption lines, because most of their atoms are ionized.

T This spectral class is the coolest, and includes methane lines, typical of planets.

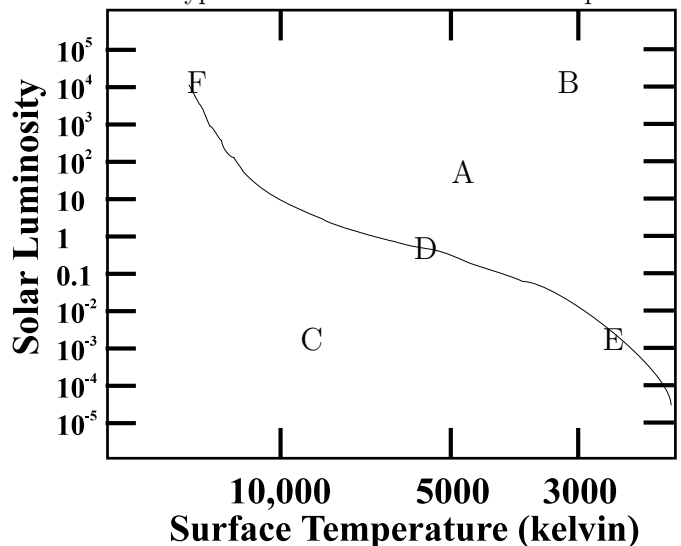
3. [1pt] A binary system in which the binary nature of the system is inferred from periodic doubling of absorption lines is called \_\_\_\_\_? (Select one)

- A) a period doubling binary  
 B) a close binary  
 C) a visual binary  
 D) an eclipsing binary  
 E) a spectroscopic binary

4. [1pt] Tremendous explosions in regions around sunspots, which eject particles and emit radiation, are called (Select one.)

- A) filaments.  
 B) plages.  
 C) prominences.  
 D) coronal holes.  
 E) solar flares.

5. [6pt] Using the Hertzsprung-Russell diagram match the letter with the type of star that is located at that position.



F A class O main sequence star

C A white dwarf star

A A red giant star

E A class M main sequence star

B A supergiant star

D Our Sun

6. [1pt] A binary for which the presence of an unseen companion to the primary star is inferred from its motion on the celestial sphere is called \_\_\_\_\_? (Select one)

- A) a visual binary  
 B) an eclipsing binary  
 C) an astrometric binary  
 D) a type-I binary  
 E) a spectroscopic binary

7. [1pt] The parallax angle of a star is measured to be 0.33 seconds of arc. The distance to this star is (Select one)

- A) 33 parsecs
- B) 3 parsecs
- C) 10 parsecs
- D) 1/9 light year
- E) 1/3 parsec

---

8. [1pt] The distance to a star is measured to be 100 parsecs and the apparent magnitude of this star is  $m = +2$ . What is this star's Absolute Magnitude,  $M$ ? (Select one)

- A) -5
- B) +3
- C) -3
- D) -7
- E) +7

---

9. [1pt] Which of the following stars is at the greatest distance from Earth? A star with parallax angle equal to (Select one)

- A) 0.1 arcseconds
- B) 0.02 arcseconds
- C) 0.05 arcseconds
- D) 0.5 arcseconds
- E) 0.2 arcseconds

---

10. [1pt] Which of the following pieces of information is not directly indicated by the location of a star in a Hertzsprung-Russell diagram? (Select one)

- A) Surface Temperature
- B) Luminosity
- C) Absolute Magnitude
- D) Color Index
- E) Space Velocity

---

11. [5pt] Determine the type of spectrum you would expect for the following. (Select E for Emission, A for Absorption, C for Continuous).

- E A spectrum produced from electrons making transitions from higher-energy states to lower-energy states.
- E A gas cloud in space that is excited by high energy photons.
- A Light coming from the Sun.
- A Star light passing directly through a cold hydrogen gas cloud
- C Light coming from a hot piece of metal.

12. [1pt] Spectral classes, surface temperatures, and \_\_\_\_\_ contain almost the same information? (Select one)

- A) color indices
- B) luminosities
- C) spectroscopic parallax
- D) absolute magnitudes
- E) apparent magnitudes

---

13. [1pt] What color would you expect a spectral class K star to be? (Select one)

- A) blue-white
- B) white
- C) blue
- D) green
- E) yellow-red

---

14. [1pt] The spectral sequence for stars is now known to be primarily a sequence in \_\_\_\_\_? (Select one)

- A) core density
- B) mass
- C) surface temperature
- D) surface density
- E) elemental composition

---

15. [1pt] The study of the positions of stars and their motions across the sky is (Select one.)

- A) color indexing.
- B) astrometry.
- C) trigonometric parallax.
- D) speckle interferometry.
- E) spectroscopic parallax.

---

16. [5pt] How would the properties of the Sun change if we made the following modifications. Fill in the blank with the best answer. (For each statement select H = Half, T = Twice, F = Four times, Q = One quarter, or S = The same).

- F If the Sun were twice as close as it is now, it would have .... the apparent brightness.
- S If the Sun were twice as close, but had only half its current radius the apparent brightness would be .... compared to what it is now.
- F If the Sun were an M-type star and had only half the photosphere temperature of what it has now, it would have to be .... larger in radius for the Earth to receive the same amount of light.
- Q If the Sun were twice as far away, it would have .... the apparent brightness.
- T If the Sun had a 1.4 times larger radius, it would have .... the apparent brightness.

17. [1pt] A temperature-luminosity diagram of stars usually includes a diagonal band called the (Select one.)

- A) main line.
- B) color index.
- C) star diagonal.
- D) H-R line.
- E) main sequence.

18. [1pt] When a solid body is heated to high temperatures the result is a(n) (Select one.)

- A) continuous spectrum.
- B) absorption line.
- C) emission line.
- D) emission spectrum.
- E) absorption spectrum.

19. [1pt] Which of the following stars has the highest photospheric temperature? (Select one.)

- A) G
- B) O
- C) brown dwarf
- D) A

20. [1pt] If enough measurements can be made in a binary star system, the masses of the stars can be determined by using \_\_\_\_ ? (Select one)

- A) Newton's 1st law
- B) Kepler's 3rd law
- C) the theory of special relativity
- D) Kepler's 1st law
- E) the Stefan-Boltzmann law

21. [1pt] Algol (the 'Winking Demon Star') varies its light output because \_\_\_\_ ? (Select one)

- A) it has several large planets around it that eclipse its light
- B) it is an eclipsing binary
- C) its surface temperature fluctuates periodically
- D) it is a pulsating variable
- E) it is a nova

22. [1pt] Which of the following star types is most like the Sun? (Select one.)

- A) G9 supergiant
- B) white dwarf
- C) O
- D) F9 dwarf

23. [1pt] Object 1 has an apparent magnitude of  $-6$ ; object 2 has an apparent magnitude of  $-1$ . Which object is brighter, and by how much? (Select one)

- A) object 1 by a factor of 2.5
- B) object 1 by a factor of 100
- C) object 1 by a factor of 10
- D) object 1 by a factor of 3
- E) object 2 by a factor of 100

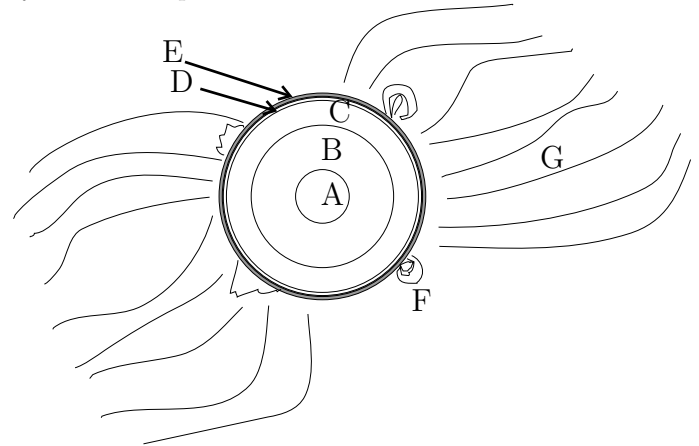
24. [1pt] Which of the following spectral classifications corresponds to the highest surface temperature? (Select one)

- A) U2
- B) G2
- C) M6
- D) B4
- E) A3

25. [1pt] The orientation of the Sun's magnetic field changes, repeating a full cycle every (Select one.)

- A) 11 years.
- B) 33 years.
- C) year.
- D) 22 years.

26. [7pt] The figure shows a very simplified version of the structure of the Sun. For each statement below, select the symbol in the picture.



D Photosphere

G Corona

E Chromosphere and Spicules

B Radiative Zone

A Core

F Prominence

C Convective Zone