

Quiz 1 review

- The Hertzsprung-Russel Diagram of stars DIRECTLY compares what TWO of the following properties of stars?

1. Size
2. Density
3. Luminosity
4. Temperature

- If a body emits light as blackbody radiation, there is a unique correspondence between
- A. the temperature of the object and the wavelength at which it is brightest
- B. the temperature of an object and its surface area
- C. the mass of the object and the power radiated
- D. The mass of the object and its surface temperature

- Suppose a blackbody is brightest at a wavelength of one micron. If the temperature of the blackbody is doubled, at what wavelength would it be brightest?
- A. 2 microns
- B. one micron
- C. 0.5 micron
- D. 1.2 micron

- Pluto is now 30 times farther from the sun than is the Earth. How much fainter would the sun appear from Pluto than from Earth?
- A. 30 times
- B. 300 times
- C. 90 times
- D. 900 times

- An astronomical unit is:
 - A. the distance between the sun and Earth
 - B. the distance between the Earth and the moon
 - C. the angle between opposite sides of the sun
 - D. the angle between the sun and the nearest star

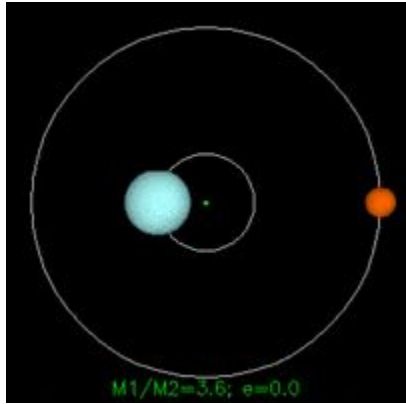
- Which statement best describes "stellar parallax" when measuring star distance?
- A. as a term used for "parsec"
- B. the geometric term for stellar angles
- C. as another term used for "light year"
- D. the apparent shifting of a star's position over a year

- **A "parsec" (pc) is short for**
- **A.** partial seconds in light years.
- **B.** parallax in continuity.
- **C.** a unit of time
- **D.** parallax in arc seconds.

- **A parsec is also a unit of distance (not time) and is equivalent to about**
- 1.36 light years.
- 3.26 light years.
- 19 light years.
- 31 light years.

- **Stellar parallax is accurate in determining star distances to within around 100 pc of Earth.**
- True
- False

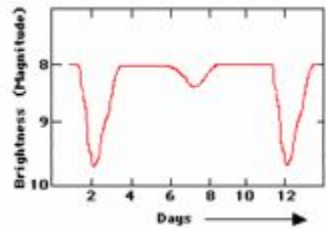
- **With greater distance, the parallax angle**
- increases
- decreases
- stays the same



___ binaries orbit far enough from each other that they can be viewed individually.

- A. Spectroscopic
- B. Independent
- C. Visual
- D. Parallax

- A star moving **away** from us will show spectral lines that are _____ due to the doppler effect
- thicker
- brighter
- blueshifted
- redshifted



The image shows a light curve for what type of binary star sytem?

- A. Spectroscopic
- B. Eclipsing
- C. Visual
- D. Double

- A star moving **toward** us will show spectral lines that are _____ due to the doppler effect
- thicker
- brighter
- blueshifted
- redshifted

- For a star system to be an Eclipsing Binary, we must be seeing the stars
- answer choices
- "Edge On"
- "Top Down"
- From the left
- individually rendered

- Which type of Binary Star system is most useful for determining the masses and radii of the stars?

answer choices

- Spectroscopic Binary
- Astrometric Binary
- Eclipsing Binary
- Double Star System

- It is possible for a star system to be both a spectroscopic binary AND an eclipsing binary

answer choices

- True
- False
- True, but the odds are infinitesimal

- How are stars classified?

answer choices

- Color and temperature
- Temperature and brightness
- Brightness and color
- Temperature and color



The hottest stars are_____.

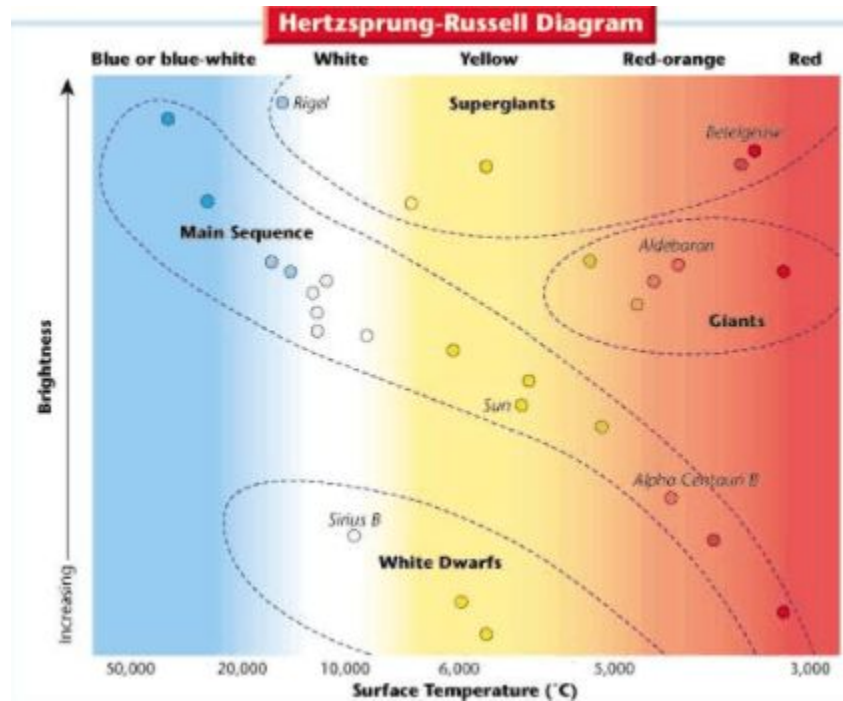
answer choices

- white
- blue-white
- red
- blue

- What is apparent brightness?

answer choices

- The measure of how bright a star appears to an observer on Earth.
- How far away a star is from Earth.
- The brightness of a star.
- A measure of how bright the star would be if all stars were the same distance from Earth.



The Hertzsprung-Russell diagram plots the answer choices

- Absolute magnitude versus the apparent magnitude.
- Mass versus absolute magnitude.
- Luminosity versus surface temperature.
- Surface temperature versus mass.

- Gloria is at the observatory and is examining a newly discovered star through a powerful telescope. She wants to find out how bright the star actually is. What information does she need to calculate the absolute magnitude of a star?

answer choices

- Apparent magnitude and distance from Earth of the star.
- Color and distance from Earth of the star
- Color of the star
- Color and composition of the star

- The table compiles information about the distance of various stars from Earth, their apparent magnitude, and their absolute magnitude. Which of the stars listed in the table above would look the brightest when compared to other stars from an equal distance?

answer choices

- Sirius
- Betelgeuse
- Rigel
- Aldebaran

Star	Distance from Earth (ly)	Apparent Magnitude	Absolute Magnitude
Sirius	8.6	-1.46	1.4
Vega	25	0.03	0.6
Arcturus	34	-0.04	-0.3
Aldebaran	60	0.85	-0.3
Rigel	1400	0.12	-8.1
Betelgeuse	1400	0.5	-7.2

- The table compiles information about the distance of various stars from Earth, their apparent magnitude, and their absolute magnitude. Which star has the least luminosity?

- answer choices

- Sirius

- Rigel

- Arcturus

- Betelgeuse

Star	Distance from Earth (ly)	Apparent Magnitude	Absolute Magnitude
Sirius	8.6	-1.46	1.4
Vega	25	0.03	0.6
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The table compiles information about the distance of various stars from Earth, their apparent magnitude, and their absolute magnitude.
Which star is the closest to earth?

- How bright a star appears in the night sky relative to other stars seen there is called its

answer choices

- luminosity
- spectral class
- absolute magnitude
- apparent magnitude

- What is Stellar Luminosity?

answer choices

- Star's total energy output
- The total power a star radiates into space
- Star's surface brightness
- Star's surface temperature

- An astronomer observes two stars and finds that they have the same apparent magnitude. Based on his observation, which conclusion could not be true?

answer choices

- Both stars are the same distance from the Earth and emit the same amount of energy.
- One star is farther from the Earth, and emits more energy than the other one.
- Both stars have the same absolute magnitude and are the same distance from the Earth.
- One star has greater luminosity and is closer to the Earth than the other one.

Star	Distance from Earth (ly)	Apparent Magnitude	Absolute Magnitude
Sirius	8.6	-1.46	1.4
Vega	25	0.03	0.6
Arcturus	34	-0.04	-0.3
Aldebaran	60	0.85	-0.3
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The table compiles information about the distance of various stars from Earth, their apparent magnitude, and their absolute magnitude.

Which of the stars listed in the table above would look the dimmest when observed from Earth?

answer choices

- Sirius
- Rigel
- Aldebaran
- Arcturus

- an apparent shift in the position of an object when viewed from different locations

answer choices

- light year
- absolute magnitude
- parallax
- spectrum

- the amount of light radiated into space per second by a star

answer choices

- luminosity
- apparent magnitude
- absolute magnitude
- star cluster

- Which of the following pairs of terms directly relates to the actual brightness of a star?
- Absolute magnitude and apparent magnitude
- Apparent magnitude and luminosity
- Size and luminosity
- Absolute magnitude and luminosity

- Two stars have the same apparent magnitude as seen from Earth's surface. Star A is 33 ly away. Star B is 346 ly away. Which of the following statements is true?
- Star A has a smaller absolute magnitude
- Star B is larger than star A
- Star B is more luminous than star A
- The stars have the same absolute magnitude

- Imagine three identical stars (meaning that they have the same intrinsic luminosity). The apparent magnitudes of the stars are given below; which star is the most distant?
- A)m=8 B)m=10 C)m=12

- What is the distance, in parsecs, to Proxima Centauri, given that its parallax angle is $0.76''$?
- A) 0.76 pc B) 1.3 pc

Star A has an absolute magnitude of 5, and star B has an absolute magnitude of 4. How does the solar radiation produced by the two stars compare?

- 1. Star A produces $\frac{5}{4}$ the radiation of star B**
- 2. Star A produces $\frac{4}{5}$ the radiation of star B.**
- 3. Star A produces 2.512 times the radiation of star B.**
- 4. Star B produces 2.512 times the radiation of star A.**

Absolute magnitude relates to how objects would be if they were all at the same distance away. What is this distance?

- 1.10 parsecs.**
- 2.10 light years.**
- 3.1 million miles.**
- 4.1 parsec.**

Relationship between brightness and apparent magnitude

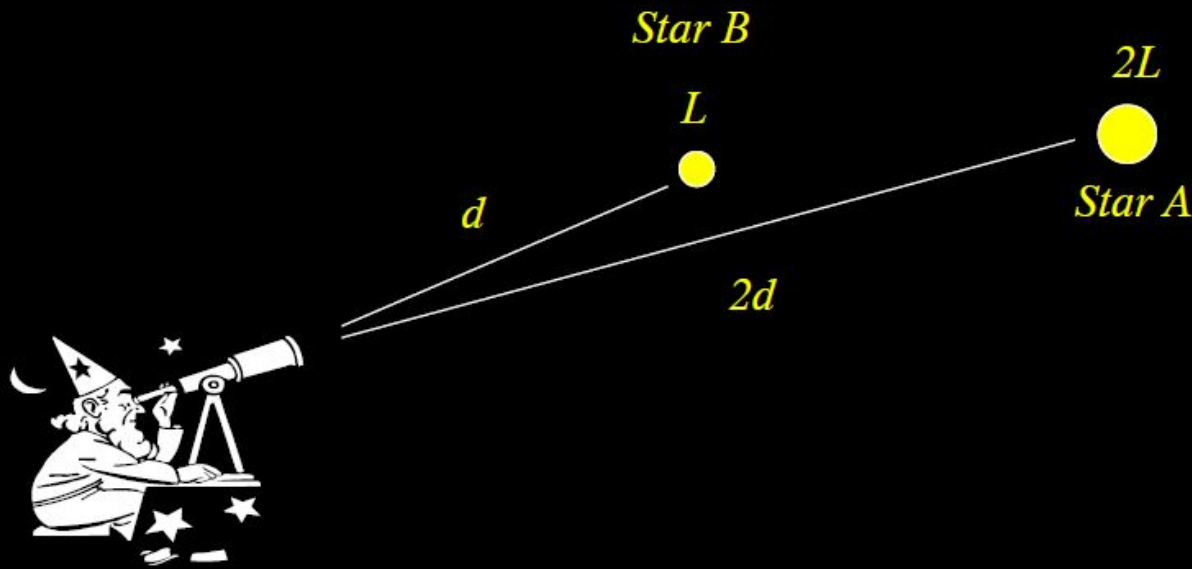
$$m_1 - m_2 = 2.5 \log_{10} \left(\frac{b_2}{b_1} \right)$$

$$\frac{b_2}{b_1} = 100^{(m_1 - m_2)/5} \quad \frac{b_1}{b_2} = 100^{-(m_1 - m_2)/5}$$

1. Which of the two objects is brighter? By how much?

Jupiter	<i>Guru</i>	-2.60
Sirius A	<i>Vyadha</i>	-1.47

Distance-Luminosity relation:
Which star appears brighter to the observer?



A. Star A

B. Star B

- a) The distance modulus ($m-M$) of a star is -1.0 . At what distance is it from us?
- b) If a star at 40 pc is brought closer to 10 pc, i.e., 4 times closer, how bright will it appear in terms of the magnitude?
- c) A star at a distance of 20 pc is having $m = -20$. What will be its absolute magnitude?

Q: The surface temperatures of Sirius A and Sirius B are found to be equal. The absolute magnitude of Sirius B is larger than that of Sirius A by 10. How does their radii compare?

$$\frac{R_2^2 T_2^4}{R_1^2 T_1^4} = 10^{0.4(M_1 - M_2)}$$

Kepler's third law:

$$P^2 = \frac{4\pi^2}{G(m_1 + m_2)} a^3$$

- The α Centauri system is 1.338 pc distant with a period of 79.92 earth years. The A and B components have a mean separation of 23.7 AU (although the orbits are highly elliptical).
 - *What is the total mass of the system?*
- Observations reveal that the primary component, α Cen A has a mean distance of 11.2 AU from the system's barycenter. *What is the mass of each of the component stars in the system?*

- Over a period of 10 years, two stars separated by an angle of 1 arcsec are observed to move through a full circle about a point midway between them on the sky. Suppose that over a single year, that midway point is observed itself to wobble by 0.2 arcsec due to the parallax from Earth's own orbit
- How many pc is this star system from earth?
- What is the physical distance between the stars, in au.
- In solar masses, what are the masses of each star, M_1 and M_2 .

- Compute the luminosity L (in units of the solar luminosity L_{\odot}), absolute magnitude M , and peak wavelength λ_{max} (in nm) for stars with (a) $T = T_{\odot}$; $R = 10R_{\odot}$, (b) $T = 10T_{\odot}$; $R = R_{\odot}$, and (c) $T = 10T_{\odot}$; $R = 10R_{\odot}$. If these stars all have a parallax of $p = 0.001$ arcsec, compute their associated apparent magnitudes m .

- Suppose a star has a parallax $p = 0.01$ arcsec, peak wavelength $\lambda_{\text{max}} = 250$ nm, and apparent magnitude $m = +5$. About what is its:
 - Distance d (in pc)?
 - Distance modulus $m - M$?
 - Absolute magnitude M ?
 - Luminosity L (in L)?

- Surface temperature T (in T_o)?
- Radius R (in R_o)?
- Angular radius α (in radian and arcsec)?
- Surface brightness relative to that of the Sun B/B_o ?

- Friedrich Bessel was the first to use a parallax to measure a star's distance, for 61 Cygni, a binary system. Using the orbit of Earth, he found the parallax to be 0.3136 arcsec. Based on his measurement, what is the distance to 61 Cygni in parsecs and light-years?

- Suppose two stars have a luminosity ratio $L_2/L_1 = 100$. a. At what distance ratio d_2/d_1 would the stars have the same apparent brightness, $F_2 = F_1$?
- For this distance ratio, what is the difference in their apparent magnitude, $m_2 - m_1$?
- What is the difference in their absolute magnitude, $M_2 - M_1$?

- What is the difference in their distance modulus?
- If the stars have a surface brightness ratio of $I_2/I_1 = 100$, what is the stellar radius ratio, R_2/R_1 ?