

AST 102 - TEST ONE - SPRING 07

Name Key

Slides: Describe the slide shown: (10 percent, 1 point each)

1. Sunspots
2. Solar Spectrum - Absorption Spectrum
3. Corona - Coronal holes
4. Usual Binary
5. Aurora - Northern Light
6. Annie Jump Cannon
7. Sunspot Cycle
8. Eclipsing Binary
9. Corona
10. Prominence

One Word: (10 percent, 1 points each)

1. In the Sun, what is the name for the method in which hydrogen is fused into helium?

proton-proton chain

2. Who invented the H-R diagram?

Hertzsprung - Russell

3. Which main sequence spectral type has the most mass?

O

4. What is the distance to a star if its parallax angle is 0.04''?

$$d = \frac{1}{.04} = 25 \text{ pc}$$

5. What type of spectrum is created by a hot low-density gas?

Emission or Bright line Spectrum

6. What type of stars are used to determine a stars mass?

Binary

7. In what layer of the Sun's atmosphere are solar flares found?

Chromosphere

8. Which main sequence stars contain an outer radiative zone and an inner convective zone?

high mass

9. What color is a star with a B magnitude of 4.7 and a V magnitude of 3.9?

$$4.7 - 3.9 = 0.8$$

Red

10. What is the spectral type and luminosity class of the Sun?

G2V

Multiple Choice: (10 percent, 1 point each)

1. What is the age of the Sun?

- a) 6000 years
- b) 10,000,000 years
- c) 4.5 Gyrs
- d) 10 Gyrs
- e) none of the above

2. Which star would be the brightest?

- a) B2wd
- b) M3III
- c) G2V
- d) K4I
- e) All are equal in brightness
- f) Impossible to know

3. Which type of radiation is given off by the Sun's corona?

- a) Microwaves
- b) Visible Light
- c) Gamma Rays
- d) Ultraviolet Light
- e) none of the above

4. Which of the following has the highest frequency?

- a) Microwaves
- b) Visible Light
- c) Gamma Rays
- d) Ultraviolet Light
- e) all have equal wavelengths

5. A star has $B = 14.72$ and $V = 15$. What is its color?

- a) red
- b) blue
- c) white
- d) green
- e) infrared

$$14.72 - 15 = -0.28$$

6. The position of a star on the main sequence in the H-R diagram is determined by which stellar property?

- a) location in the galaxy
- b) the size of the molecular cloud from which it was formed
- c) bipolar outflow
- d) mass
- e) none of the above

7. A star has a tangential velocity of 5 km/sec and a radial velocity of 12 km/sec. What is its space velocity?

- a) 17 km/sec
- b) 13 km/sec
- c) 7 km/sec
- d) -3 km/sec
- e) none of the above

$$5^2 + 12^2 = v_s^2$$
$$v_s = 13$$

8. Which stars are fusing hydrogen in their core?

- a) main sequence stars
- b) giants
- c) supergiants
- d) white dwarfs
- e) horizontal branch stars
- f) none of the above

9. One star has an apparent magnitude of 3.5 and another of -1.5. What is their difference in brightness?

- a) 150
- b) 100
- c) 10000
- d) 1000000
- e) 100000000

$$3.5 - -1.5 = 5$$

100

10. One star has an apparent magnitude of 3.5 and an absolute magnitude of -1.5. What is its distance?

- a) Less than 10 pc
- b) Greater than 10 pc
- c) Equal to 10 pc
- d) Equal to 32.6 lyrs
- e) Impossible to know

$$m - M$$
$$3.5 - -1.5 = 5$$

Definitions: Define or explain the following: (20 percent, 2 points each)

Distance Modulus:

The difference between the apparent and absolute magnitude

Visual Binary Star:

Two stars which can be seen to orbit each other

B Magnitude:

Brightness of a star through a blue filter

Photosphere:

The lowest layer of the sun's atmosphere

Center of Gravity:

Point which binary stars orbit about

Bolometric Magnitude:

Magnitude accounting for all wavelengths

Hydrostatic Equilibrium:

Balance between gas pressure and gravity

Proton - Proton Chain:

Means by which H is turned into He in low mass stars

Annie Jump Cannon:

Lady who created spectral types

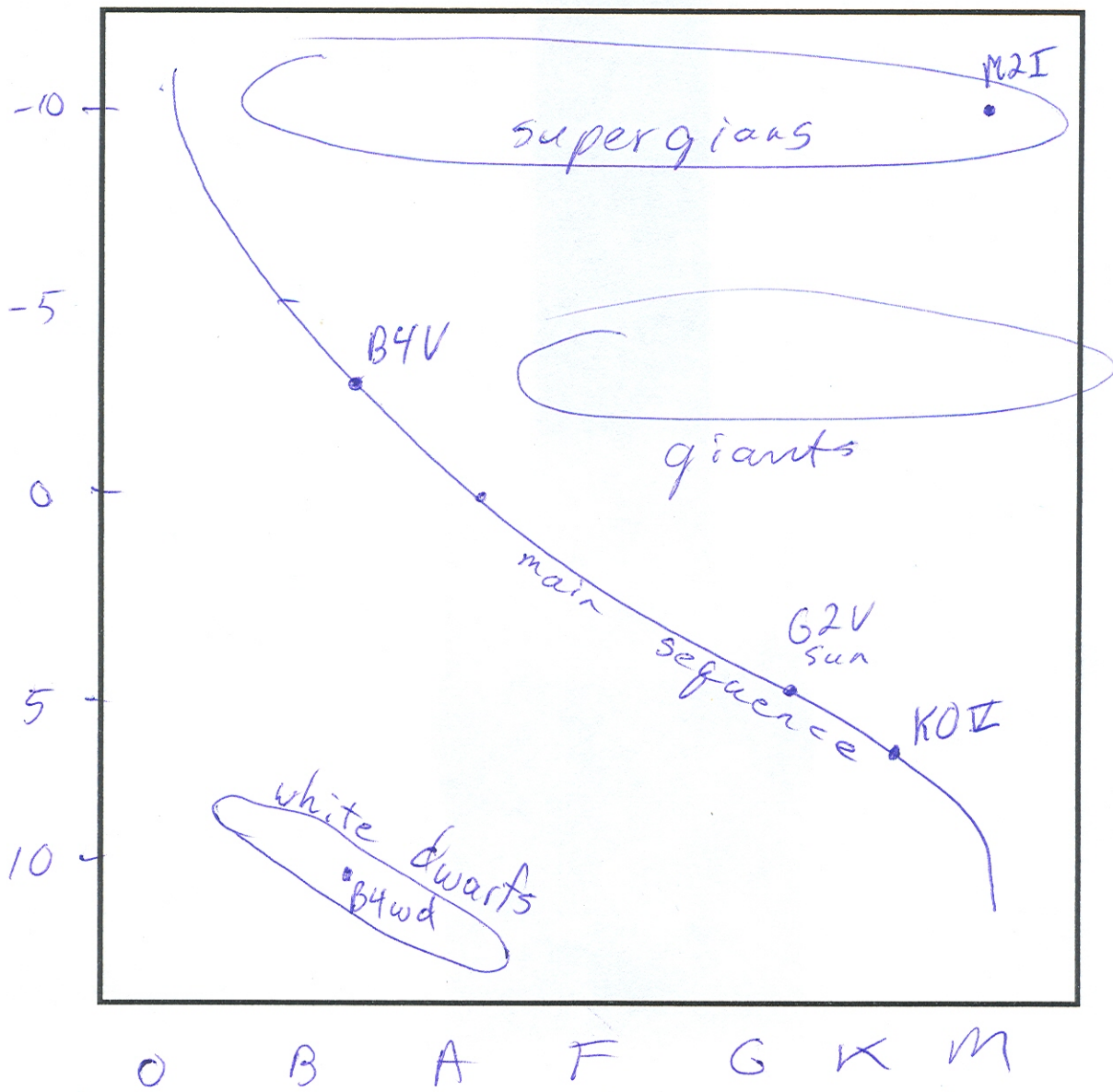
Eclipsing Binary:

Two stars whose orbit is aligned so that one star blocks the light from the other

H-R Diagram: Draw an H-R diagram making sure to include the following regions and stars, labeling each of them: (20 percent, 2 points each)

- a) Main sequence
- b) giants
- c) supergiants
- d) white dwarfs
- e) labels on both axes
- f) B4wd star
- g) K0V star
- h) M2I star
- i) B4V star
- j) G2V star

M



Short answer: (Do all three, 30 percent, 10 points each)

1) A star is 20 pc from the Sun, What is its parallax angle?

$$p = \frac{1}{20} = \frac{1}{20}'' = .05''$$

If its apparent magnitude is 1.3, then is its absolute magnitude greater or less than 1.3?

$$m - M > 0 \quad \text{less than}$$
$$1.3 > M$$

If the same star is a B2V and has a V magnitude of 2.4, then would its B magnitude be greater or less than this value?

blue star

$$B - 2.4 < 0$$
$$B - V < 0 \quad B < 2.4 \quad \text{less than}$$

Is the surface of this star hotter or cooler than the Sun?

hotter

2) Given three stars, a B5V, an A0wd and a M2I all at a distance of 10 pcs.

Which star is hottest?

B5V

Which star is largest?

M2I

Which one is faintest?

A0wd

Which one is fusing Hydrogen in its core?

B5V

Which one would not be visible with the naked eye?

A0wd

3) A star at a distance of 22 pc is seen to have a proper motion of 4.2 arcseconds/yr and emits light at 643 nm which is normally seen at 644 nm. What is the star's space velocity?

$$v_T = 4.74 \mu d$$

$$v_T = 4.74 (4.2) 22 = 437.98 \text{ km/sec}$$

$$\Delta\lambda = 643 - 644 = -1 \text{ nm}$$

$$\frac{-1}{644} = \frac{v_R}{300,000} \quad v_R = \frac{-300,000}{644} = -465.84 \text{ km/sec}$$

$$v_S^2 = v_T^2 + v_R^2$$

$$v_S^2 = (437.98)^2 + (-465.84)^2 = 639.4 \text{ km/sec}$$