Physics Dept.   Physics 200   June 26, 1998
                                 Final Exam   Time: 1 ½ hour.

Name:_____

I.D. No.:_____

- No make up of this exam without legal reason
- In multiple choice questions crossing more than one answer cancels the question.
- All questions are obligatory
- Physical data
  speed of light $C = 3 \times 10^8$ m/s
  1 Angstrom = 10^{-8} cm

Page   Grade

1.

2.

3.

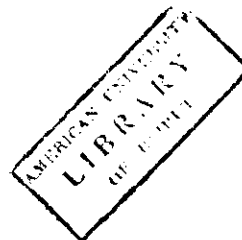4.

5.

6.

7.

_____

Total:

True or False

Indicate by crossing which question is True or False (each question has one point)

	True	False
• The sidereal day is based on the rotation of the Earth with respect to distant stars	☐	☐
• When a particular event happens, Beirut clocks indicate 2 hours later than Greenwhich clocks.	☐	☐
• Black bodies are objects that cannot emit any radiation because the have black color.	☐	☐
• Radiation at wavelength of 3 meters are visible to human eye.	☐	☐
• Sceismic transverse waves (s-waves) cannot travel through a liquid.	☐	☐
• The greenhouse effect is primary responsible for the circulation patterns in the Earth's atmosphere.	☐	☐
• The Disk of the Milkey Way contains only old stars.	☐	☐
• Cepheids variables have longer pulsation periods than RR Lyrae variables.	☐	☐
• RR Lyrae variable stars are found in open clusters.	☐	☐
• All things except of light are attracted by gravity	☐	☐
• The central temperature of the Earth is close to 6000K	☐	☐
• The central temperature of the Sun is less than 10^7 K	☐	☐
• According to the Kepler's first law, a planet moves faster when it is closest to the sun.	☐	☐
• Population I stars are found in the galactic disk.	☐	☐
• A star cluster of an age of 10 billion years still contains many O-type.	☐	☐
• It is not possible to ionize hydrogen by using visible light.	☐	☐

- If a new object is discovered that has an orbital period of 25 years, what is its average distance from the sun (in Astronomical Units)?

  ☐ 8.6 ☐ 29.2 ☐ 25 ☐ 625

- A calcium absorption line of a certain star is observed to be shifted to 4426.2 Å. What is the velocity of the star producing the calcium line?, *if the unshifted line is 4426.0 Å.*

  ☐ +13.5 km/s ☐ - 13.5 km/s ☐ + 27.0 km/s ☐ -27.0 km/s

- In the Figure on the right, the initial and final states of the hydrogen atom are shown schematically.

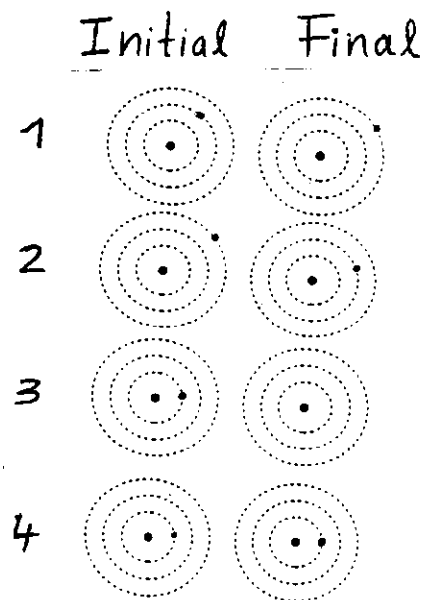 (a) Which final state leads to emission of light?

  ☐ 1 ☐ 2 ☐ 3 ☐ 4

  (b) Which final state leads to absorption light

  ☐ 1 ☐ 2 ☐ 3 ☐ 4

  (c) Which final state corresponds to ionization of atom.

  ☐ 1 ☐ 2 ☐ 3 ☐ 4

Initial   Final

1 2 3 4

- If the moon were at 1/10 its current distance it would experience a gravitational force from the Earth that would be:
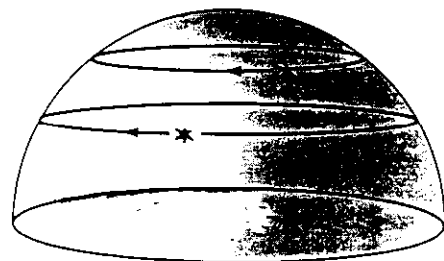
  ☐ unchanged ☐ 10 times larger

  ☐ 100 times larger ☐ 1/100 smaller

- Consider the apparent motion of stars as in Figures (a) and (b) on the right.

  (a) Where are you on Earth according to Figure (a)?

  ☐ at the North pole ☐ at the South pole
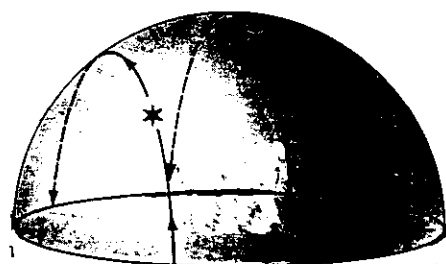
  ☐ at 45° latitude ☐ at equator

  (b) Where are you on Earth according to Figure (b)?

  ☐ at south pole ☐ at equator ☐ at north pole ☐ at 23° latitude

(a)

(b)

- Which of the following wavelength regions have photons with the highest energy:

  ☐ Radio   ☐ visible   ☐ ultraviolet   ☐ infrared   ☐ microwaves

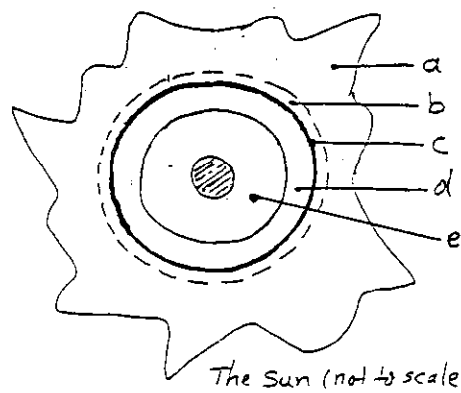- On the right a schematic diagram of the sun is shown.

  (a) identify the chromosphere

  ☐ a   ☐ b   ☐ c   ☐ d

  (b) identify the convective zone

  ☐ a   ☐ b   ☐ c   ☐ d

  (c) identify the corona

  ☐ a   ☐ b   ☐ c   ☐ d

  The Sun (not to scale)

- You are given four stars A, B, C, D. Their intensity peaks in the observed Planck curve are 3000 Å, 5000 Å, 7000 Å and 6000 Å respectively. Which star is the hottest?
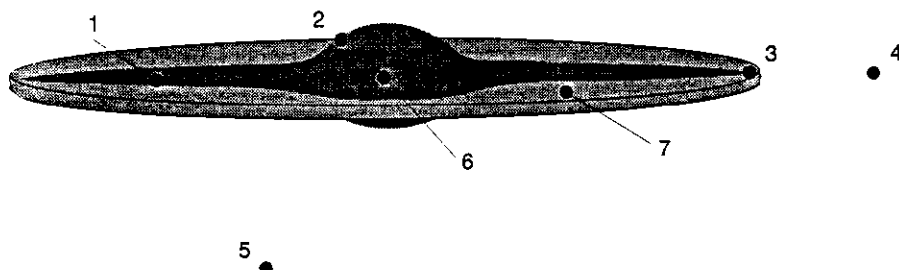
  Answer :_____

- What was the most significant difference between the heliocentric model and the geocentric model of Ptolemy?

  ☐ Number of planets different   ☐ heliocentric model was based on elliptical deferent?

  ☐ The Moon orbited the Earth   ☐ the sun was at the center

- The graph below shows the schematic structure of the Milkey Way Galaxy. The point marked 5 is below the plane.

  (a) What number best represent the location of the sun?

  ☐ 1   ☐ 5   ☐ 3   ☐ 6

  (b) An old globular cluster would be located at what number?

  ☐ 1   ☐ 2   ☐ 7   ☐ 5

- The table below shows some properties of various stars. On the basis of these data answer the following questions (a) to (f)

star	Absolute Magnitude (M)	Apparent Magnitude (m)	Spectral Type
Elnath	-1.13	1.65	B7 IV
Deneb	-7.2	1.25	A2 Ia
Mirfak	-2.2	1.79	F5 Ib
Betelgeuse	-7.0	0.50	M2 Ia

(a) Which star is intrinsically the brightest _____

(b) Which star has the greatest apparent magnitude _____

(c) Which star has the greatest surface temperature _____

(d) Which star is a reddish supergiant?_____

(e) What is the distance of the star Betelgeuse from us?_____

(f) The star Elnath has a parallax of 0.028 arc sec. What is its distance from Earth?

Answer :_____parsec

- The Figure on the right shows a schematic evolutionary sequence of a solar-like star in the Hertzprung-Russell diagram.

Please, answer the following questions:
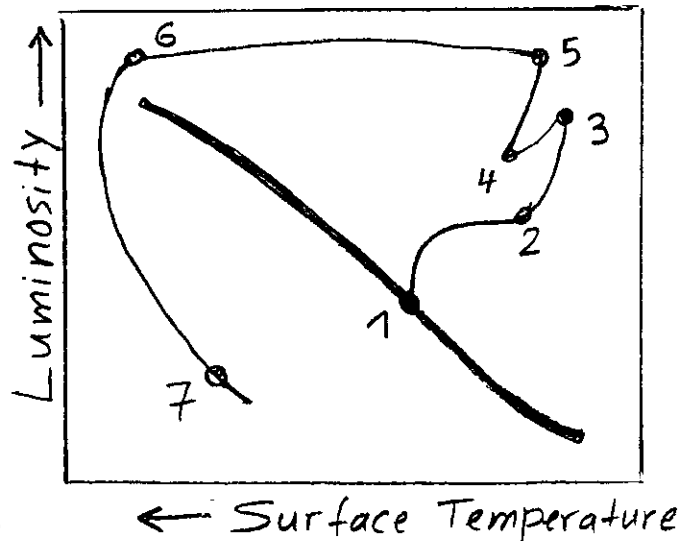
(a) Where does the star in this diagram burn its hydrogen in the inner core?

☐ 1→ 2   ☐ 2 → 3   ☐ 3 → 4

☐ 4→ 5   ☐ 5 → 6   ☐ 6→ 7

← Surface Temperature

(b) Where does the helium flash occur?

☐ at 2   ☐ at 5   ☐ at 3   ☐ at 7

(c) How is the star called when it evolves to point 5.

Answer :_____

(d) How is the star called when it evolves to point 7?

Answer : _____

(e) The star ejects part of its initial mass to form a planetary nebula at point

☐ 5   ☐ 6   ☐ 4   ☐ 3

- Which of the following is true for type II Cepheids?

    A. They are low mass stars   B. They are giant stars
    C. They have done their helium burning in the core
    D. A, B, and C are true   E. Only A and B are true

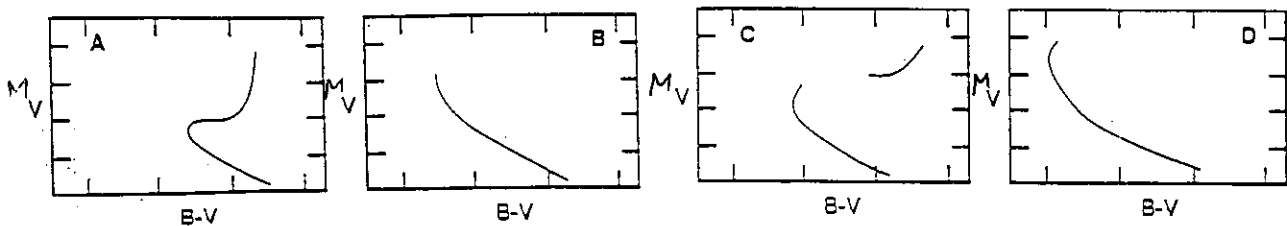- The Figures below show schematically several rotation curves.
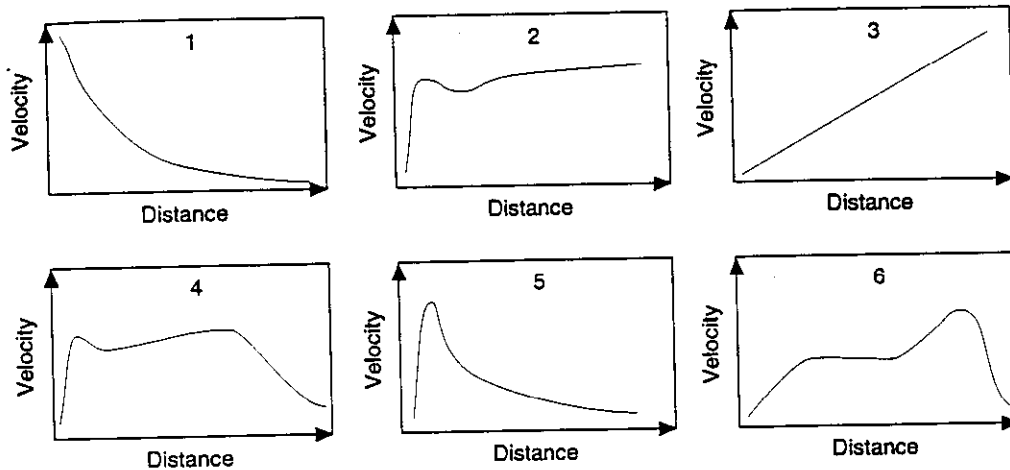
(a) What rotation curve represent that of our Milky Way Galaxy.

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6

(b) What rotation curve would represent that of our four Milky Way if it would have no massive corona?

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6

- The curves shown below represent four color-magnitude diagrams of various star clusters.

(a) What cluster is most likely the oldest

☐ A   ☐ B   ☐ C   ☐ D

(b) What cluster is most likely the youngest
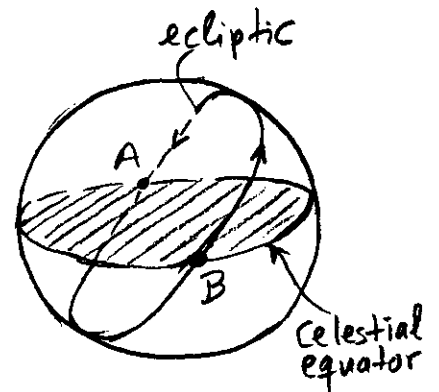
☐ A   ☐ B   ☐ C   ☐ D

(c) Which cluster contains most likely cepheid variables

☐ A   ☐ B   ☐ C   ☐ D
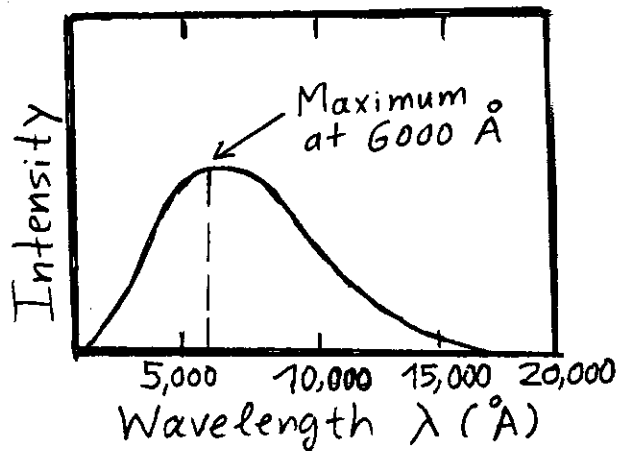
- In the Figure on the right, how are the points A and B called?

Point A : _____

Point B: _____

- Consider the following Plank curve

(a) If this curve represents the blackbody radiation emitted from a star, the star would look

☐ red　　☐ white　　☐ blue　　☐ green　☐ Yellow

(b) The temperature corresponding to this curve is :

Answer: _____ Kelvin

(c) The total amount of radiation emitted from this object is given by which physical law?

Answer: _____

- A star A has a surface temperature of 3000 K and star B has a surface temperature of 6000 K. If both stars radiate as black bodies, by what factor will star B radiates compared to A?

☐ 4　　　☐ 8　　　☐ 16　　　☐ 32

- How many times is a second magnitude star brighter an 12th magnitude?

☐ 2.5×10^4　　☐ 10^4　　☐ 10^3　　☐ 10^2

- The 21-cm radiation of hydrogen arises from which of the following:

  ☐ Transition between two orbitals of the hydrogen atom

  ☐ From recapturing an electron by the ionized hydrogen atom

  ☐ Spin flip of the electron spin in the hydrogen atom
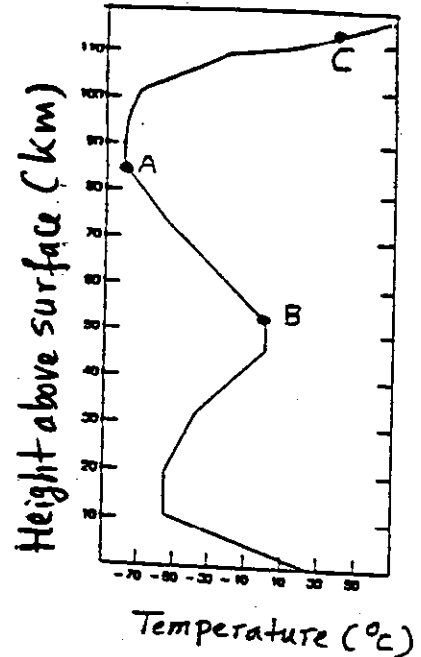
  ☐ From the ionization of the hydrogen atom

- In the Figure on the right, it is shown how the temperature of the Earth's atmosphere varies with the height above the Earth's surface.

  (a) Which region is called troposphere?

  ☐ below 10 km   ☐ up to 50 km

  ☐ above 50 km

  (b) Why the increase of the temperature along the part A to B?

  Answer: _____

Temperature (°C)

- The CNO Cycle and the proton-proton cycle have in common that they

  ☐ are effective at the same temperature.   ☐ have the same type of nuclei.

  ☐ effectively transform four protons into one helium nucleus.

  ☐ all the above is not valid, since nothing is common between these cycles.