

Physics Department

Physics 200
Final Exam

June 16, 1997
Time: 1 1/2 hours

Name: _____

I.D. No. _____

Information:

- (1) No make up of this exam without justified reason
- (2) In case of multiple choice questions, you are allowed to cross (or circle) one answer.

<u>Page</u>	<u>Grade</u>
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(1)

(2)

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(9)



• The time of the year where the sun is 23.5° north of the celestial equator (highest noon time position) is called :

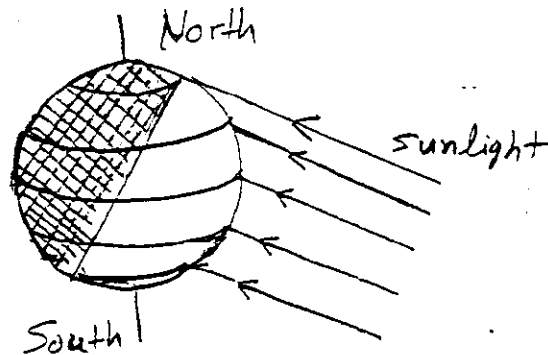
- Winter solstice first day of spring spring equinox
 September 22 or 23 Summer solstice

• When the Earth is between the moon and the sun, what kind of eclipse, viewed from the Earth can occur ?

- total solar partial solar annular lunar

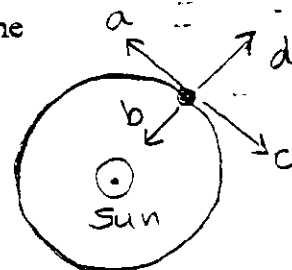
• What time of year does the figure below represent for the northern hemisphere ?

- vernal equinox spring equinox
 winter solstice summer solstice



• In the figure below which line indicates the direction of the force of gravity on the Earth as it orbits the sun ? (circle one)

- a b c d



• Kepler's second law means :

- (a) a planet's orbital period increases with increasing distance from the sun
 (b) The sun is in one focus of the elliptical planet's orbit
 (c) Planets close to the sun have shorter period than those farther away
 (d) Planets move rapidly in their orbit when closer to the sun

• (a) Give the correct order of the planets listed below according to their distance from the sun

Mars, Earth, Jupiter, Saturn

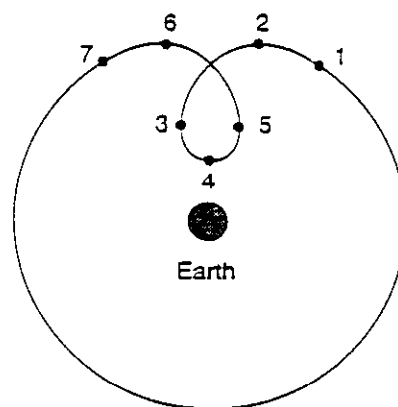
Your answer : _____

(b) Which planets are missing from the above list ?

Your answer : _____

● Figure at the right illustrates:

- (a) Kepler's second law (b) Moon's orbit
- (c) Copernican model (d) Ptolemaic explanation of retrograde motion



● What is the basic difference between the copernican heliocentric model and the ptolemy's geocentric model:

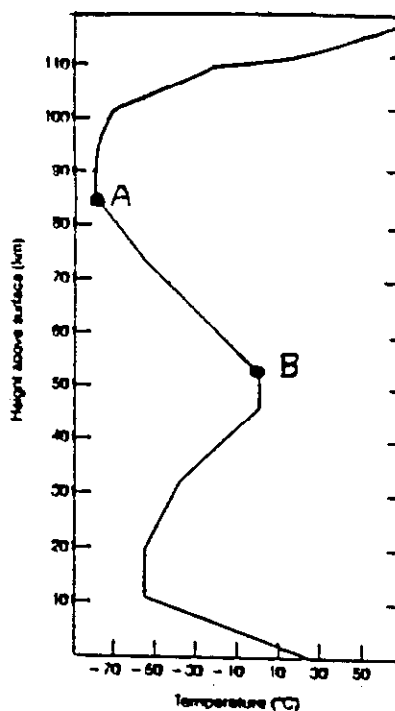
- (a) Copernicus used nine planets
- (b) the sun at the center
- (c) Copernicus epicycles were smaller than Ptolemy's
- (d) Copernicus added the moon to the other planets.

● A planet has a radius twice the Earth's radius and a mass twice the Earth's mass. The planet gravitational force is :

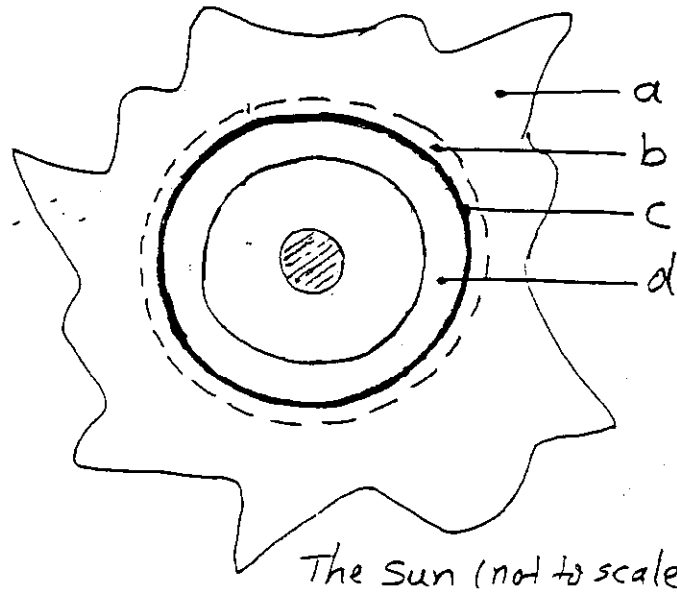
- (a) the same as that of the Earth's
- (b) twice the Earth's
- (c) half the Earth's gravitational force
- (d) one fourth the Earth's gravitational force

● The figure below shown the height as a function of temperature in the Earth's atmosphere. Consider the line A to B. Why does the temperature increases along this line ?

- (a) Because sunlight is absorbed by the carbon dioxide
- (b) Because of the greenhou_se effect
- (c) Because sunlight is absorbed by the oxygen molecules and Ozone
- (d) Because sunlight is absorbed by the nitrogen and oxygen molecules



- The figure below shows a schematic diagram of the sun. Answer the following questions



- (a) Identify the photosphere (circle one of these)

a b c d

- (b) Identify the sun's convective zone (circle one of these)

a b c d

- In the figures below, the initial and final states of the hydrogen atom are shown schematically.

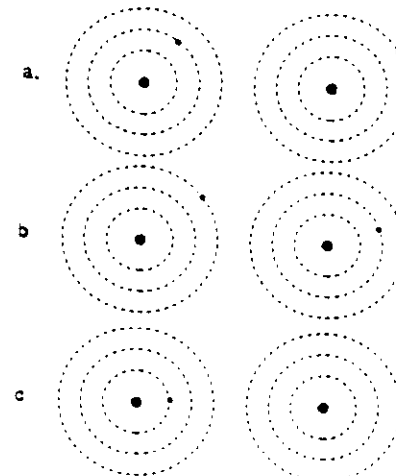
Initial State Final State

- (a) Which final state corresponds to ionization (circle one)

a b c

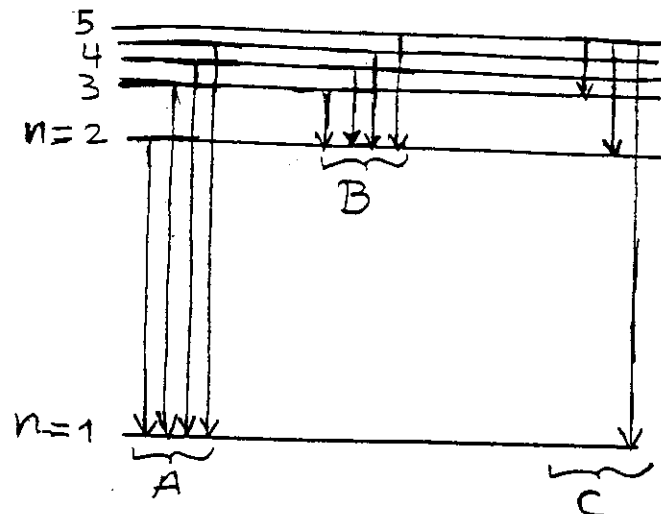
- (b) Which final state corresponds to an emission of light? (circle one)

a b c



- In the figure below, the energy level diagram of the hydrogen atom is shown schematically. Which transitions lead to visible light? (circle one)

A B C



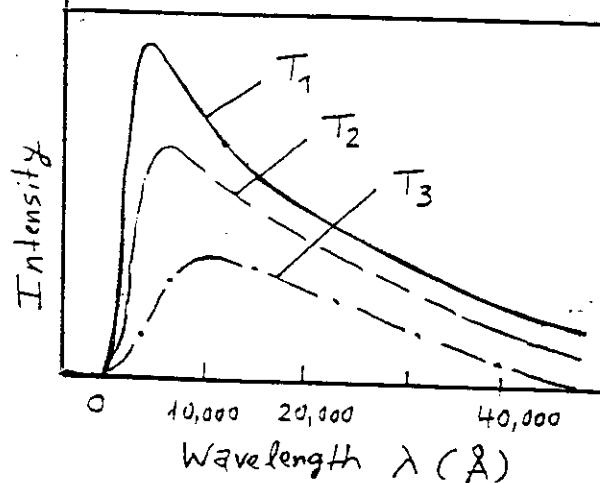
- The wavelength (λ) in Angstroms (\AA) of the photon emitted in the transition from the level $n = 3$ (energy = 1.94×10^{-11} erg) to the level $n = 2$ (energy = 1.63×10^{-11} erg) of the hydrogen atom is about ;

- (a) 6200 \AA (b) 6800 \AA (c) 6400 \AA (d) 7000 \AA

(the Planck constant is $h = 6.626 \times 10^{-27}$ erg/sec)

Can you see this light with naked eye ? YES , NO

- In the figure below three Planck curves 1,2 and 3 are shown. If the corresponding temperatures are T_1 , T_2 and T_3 .



- (1) Which of the following is true ?

- (a) $T_1 = T_2 = T_3$
 (b) $T_1 < T_2 < T_3$
 (c) $T_1 > T_2 > T_3$

(d) none of the above,
 my answer is : _____

- (2) How large is the area under the curve corresponding to the temperature T_3 ?

Your answer : _____

- The following stars have intensity peaks (shown in parentheses) in their Planck curves star A (3000 \AA), star B (5000 \AA), star C (7000 \AA), star D (6000 \AA). Which star is the hottest?

A B C D

- Which of the following gives the correct order of wavelength (increasing or decreasing)

- (a) gamma rays - visual - ultraviolet
 (b) x-rays-infrared- radio
 (c) radio- ultraviolet - infrared
 (d) infrared - radio - visual

- The table below gives some characteristics of the star included in this table. Answer the questions below using these data.

Star Name	Absolute magnitude <i>M</i>	Aparrent magnitude <i>m</i>	Spectral type	Luminosity class
Spica	-3.5	+ 1.0	B	III
Antares	-3.8	+ 1.0	M	I
Sirius	+1.4	- 1.5	A	V
Rigel	+4.4	0.0	G	V
Deneb	-7.2	+1.3	A	I

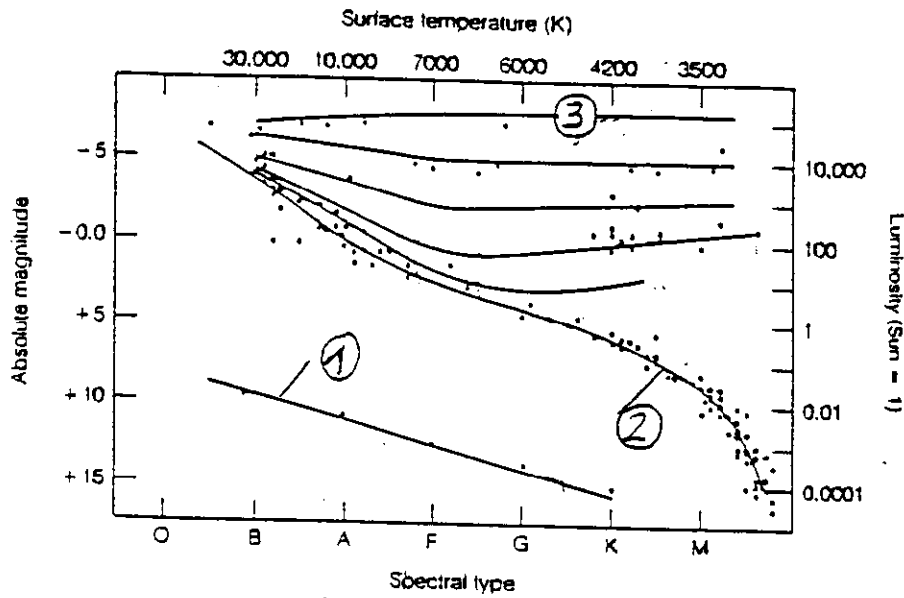
- (a) Which star has the greatest apparent brightness : _____
- (b) Which star is intrinsically the brightest : _____
- (c) Which star has the highest surface temperature : _____
- (d) Which star has the lowest surface temperature : _____
- (e) Which star is a red-colored supergiant : _____

- The star Betelgeuse has the following data :

Parallax (second of arc)	B	V
0.0063	+ 1.90	+ 0.50

- (a) Can you see this star with naked eye? YES , NO
- (b) Its "color index" is _____ and it would appear _____ in color.
(answer) (which color)

- Consider the diagram shown below. Answer the following questions.

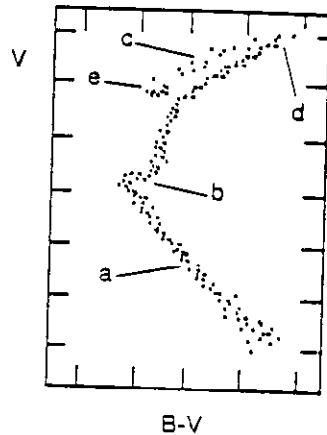


- What is the name of such diagram ? _____
- Which curve represents the "Main sequence" ? _____
- Which curve represents the "White Dwarfs" ? _____
- Which curve represents the "Supergiants" ? _____
- Which curve represents the luminosity class V ? _____

- If the "distance modulus" of a particular star is $m - M = +10$, what is the distance of this star from the Earth?

- 10^2 PC
 10^4 PC
 10^3 PC
 10^6 PC

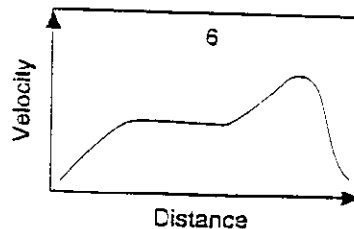
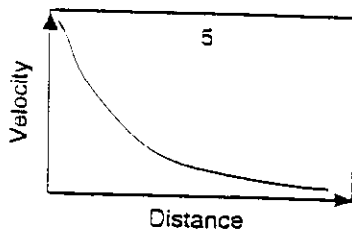
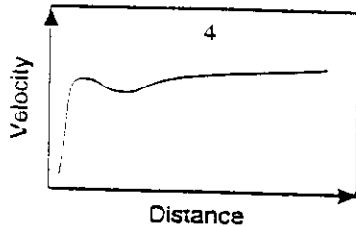
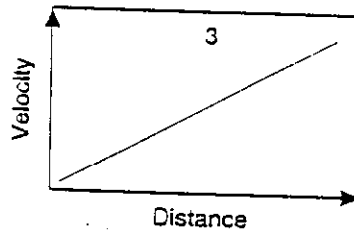
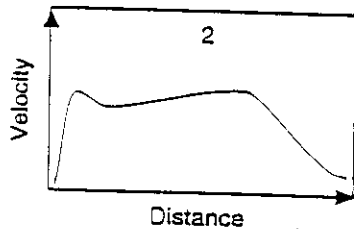
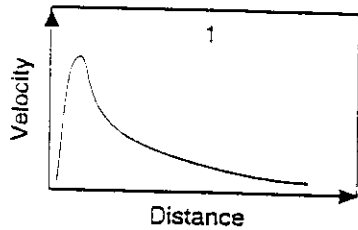
● In the color magnitude diagram shown at the right:



- (a) Identify the main sequence
choose one letter: _____
- (b) Identify the position where Helium ignition occurs:
choose one letter: _____
- (c) Identify the stars that are most likely RR Lyrae stars
choose one letter: _____
- (d) Where is the position of the subgiants in this diagram?
Choose one letter: _____

● Which of the following rotation curves resembles that of our Milky way Galaxy

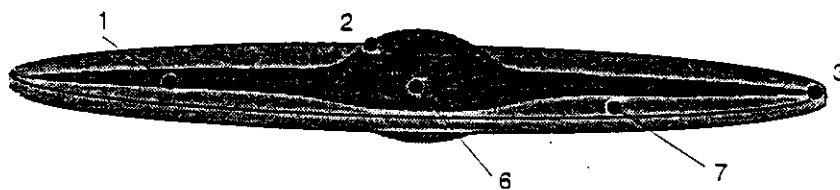
- 1 2 3 4 6



b) Which of the above curves represents most closely the Milky way if it did not have a corona?

- 1 2 3 4 5

- The graph shows the visible features of the Milky way Galaxy. The point 5 is below the plane.



5 •

Our Home

- a) What number best represents the approximate location of the sun?

 1

 5

 3

 4

- b) An old star in the halo of the Galaxy would be located at what number?

 1

 2

 5

 3

- During the red giant phase of evolution, low-mass stars are:

- burning hydrogen in their cores
- burning helium in their cores
- burning helium in their cores and hydrogen in a shell
- only contracting

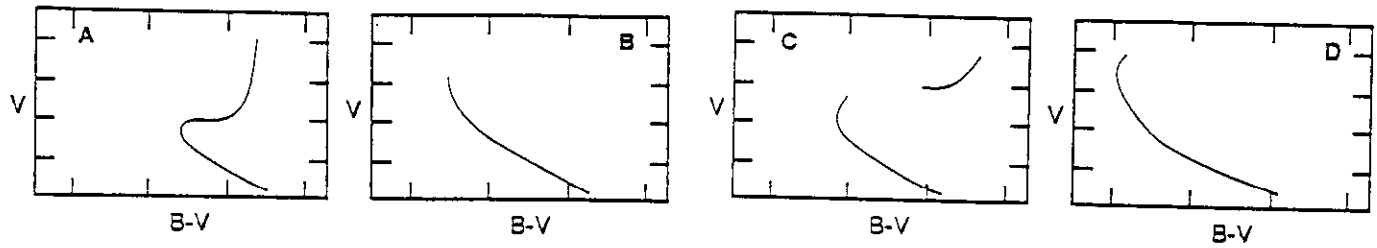
- Stars may end their evolution by forming:

- only black holes
- only neutron stars
- only white dwarfs
- White dwarfs, neutron stars or black holes depending on the mass

- The 21-cm line of hydrogen is important for astronomy because

- stars emit strongly at this wavelength
- many cool dark clouds can be detected by it.
- it enables astronomer to detect *black holes*
- the interstellar material absorbs at this wavelength.

The curves in each of the four color-magnitude diagrams represent the location of all stars in a star cluster



(a) Which cluster is the youngest?

- A B C D

(b) Which cluster is most likely to contain cepheid variables?

- A B C D

(c) Which cluster is most likely the oldest?

- A B C D

In the laboratory, one finds a certain special line of sodium at a wavelength $\lambda_0 = 5890$ Angstrom (\AA). As seen in the spectra of a particular star it is at $\lambda = 5892$ \AA .

(a) At what velocity is the star moving ?

Your answer : _____ *km/s*

(b) In which direction is the star moving ?
away from us or toward us ?

Your answer : _____

Which of the following statements characterizes the Helium fusion in stars:

- (a) Two helium nuclei are converted to one carbon nucleus
- (b) Three helium nuclei are converted to one carbon nucleus
- (c) Three helium nuclei are converted to one oxygen nucleus
- (d) Four helium nuclei are converted to one carbon nucleus

Which series of letters represents the spectral sequence of stars from cool to hot :

- OBAFGKM BOFGAKM MKGFABO MKGFAOB