# By how much do the equinoxes move in one year (roughly)?

- 360 degrees
- 1 degree
- 1 arc minute
- 1 arc second

# Saving the appearances is a key phrase in the development of the theory of planetary motions. What is it, exactly?

- You want to appear to be doing serious astronomical work, even though you have only weak arguments for your theory
- A theory is said to save the appearances when it is bogus but uses the right buzz words
- The minimal job description of a planetary theory is that it reproduces the positions of planets, sun & moon in the sky, ie. their appearances.
- None of the above

Which two fundamental misconceptions made Ptolemy's geocentric model very complicated and prevented it from adequately describing the movements of bodies in the Solar System?

I) The Sun is at the center of the universe.

II) All heavenly bodies move in combinations of perfect circles.

III) The Earth is at the center of the universe.

IV) The stars never move.

a) I and IV.

b) II only.

c) III only.

d) II and III.

One form of Kepler's 3rd law is $P^2/a^3 = 1$. If a planets major axis a is twice as large as Earth's, what is its period P around the Sun?

- 1 year
- A little less than 3 years
- A little more than 12 years
- 29 years

# Why are the phases of Venus at odds with the geocentric epicycle picture?

a) Venus would not be expected to significantly change size.

b) Venus would not appear "new" as the Moon does.

c) Venus would not appear "full" as the Moon does.

d) Venus would not appear “crescent" as the Moon does.

# Where in Newton's Principia would you find the three laws of Motion (Axioms)?

- Beginning
- Middle
- End
- Not in the book at all

# If the Earth is prolate it looks like ...

- Ernie
- Bert
- An apple
- A perfect sphere

# If the Earth is prolate ...

- The distance from 45N latitude to the pole is shorter than to the equator
- The distance from 45N latitude to the pole is longer than to the equator
- The distance from 45N latitude to the pole is the same as to the equator
- None of the above

# Why could the sun not be used to determine Longitude at sea in 1700?

- Because you cannot stare into the sun to measure its exact position
- Because you nee to know the time and pendulum clocks don't work on ships
- The sun could actually have been used back then to determine longitude but the method to use it was not yet invented
- None of the above

# How can the sun be used to determine the longitude of the observer?

- You measure the length of the shadow at noon
- You measure when local noon occurs and compare this to the universal time your watch is set to.
- You measure the time from sunrise to sunset which is indicative of your longitude
- None of the above

What is stellar aberration? Specifically, which pattern in the sky do we label by that name?

- The apparent annual motion of stars around a mean or average position.
- The daily motion of stars due to the fact that we view the sky from different viewpoints, e.g. the observer's position at sunrise and sunset are one Earth diameter apart.
- The distorting effects of the Earth's atmosphere causing stars to appear higher (larger altitude angle) than they would be without the atmosphere.
- None of the other statements is correct.

# What causes stellar aberration? That is, how do we explain that this pattern occurs?

- It is caused by the proper motion of the stars. Stars are not completely fixed with respect to each other, but over long periods they move with respect to each other.
- It is caused by the motion of the observer on Earth. Due to the orbital motion of the Earth, we change our vantage point. Therefore a star appears in front of a different background, i.e. its position changes.
- It is caused by the finite speed of light. The aberration constant (angle, size of the effect) is the ratio of the speed of the observer (i.e. Earth's orbital speed) and the speed of light.
- None of the other descriptions is correct.

# Stellar aberration is easily confused with stellar parallax. Which is not a statement that applies to both patterns?

- Both are independent of the distance to those stars exhibiting aberration or parallax
- Both are due to the orbital motion of the Earth, and in both cases stars appear to move in a circle or ellipse around their average positions within a year.
- Both are about apparent motion of stars in the sky, not about motion of the stars in space.
- Both are very small effects that cannot be discovered without precise instruments such as dedicated telescopes (e.g. transit instruments).

# There are several ways to distinguish aberration from parallactic motion. Which is not one of them?

- Aberration is a much larger effect. Even for close stars the motion due to aberration is more than 10 times larger than the parallactic motion.
- A star reaches is southernmost position in March due to aberration, but in December due to parallax and the aberration constant is the same for all stars, whereas the parallactic angle depends on the distance of the star from Earth.
- Parallax is due to the orbital position change of Earth, whereas aberration is due to the different direction of Earth's orbital velocity throughout the year.
- All are ways to distinguish stellar parallax from aberration.
-

# Why was the discovery of stellar aberration such a big thing?

- Because it was the first direct evidence for the motion of the Earth around the sun, i.e. in space.
- Because it was the first proof that Copernicus's heliocentric model of the solar system is right.
- Because it showed that really small effects can be observed with precise enough instruments like telescopes.
- None of the others are correct.

# How did Maskelyne “weigh” the Earth?

- By scaling up the mass of a mountain to the volume of the Earth
- By comparing the attraction of a pendulum to a mountain to its attraction to Earth
- By relating the density of granite to the known density of Earth.
- None of the above

# The Transit of Venus is used to determine the distance to Venus using the parallactic effect. What is the baseline?

- The distance Earth-Venus
- The diameter of the earth
- The distance between the two observer locations measured along the surface of the Earth
- The distance between the two observer locations measured in 3D space

# How can we tell from binary star motions what the masses of stars are?

- The faster they move, the more mass they must have
- The more circular the orbit, the closer in mass are the stars
- Impossible, because the stars are too far away
- None of the above

William Herschel made many important contributions to astronomy and physics. Which is not one of them?

- The motion of the sun within the Milky Way.
- Infrared radiation and the planet Uranus
- Finding and explaining stellar aberration
- All of them were discovered by Herschel.

Light can be characterized by its wavelength λ, its frequency f, its color or its energy E. Which is a correct statement?

- The higher the frequency, the shorter the wavelength and the higher the energy.
- If one of the properties is known, say λ, all others can be computed; they are all redundant.
- All EM waves travel at the speed of light.
- All are correct statements

The main objects in the solar system are the sun, Jovian planets and terrestrial planets. Their sizes are related in that order by:

- 1:100:1000
- 100:10:1
- 1000,000:1000:1
- None of the above

The main objects in the solar system are the sun, Jovian planets and terrestrial planets. Their volumes are related in that order by:

- 1:100:1000
- 100:10:1
- 1000,000:1000:1
- None of the above

The main objects in the solar system are the sun, Jovian planets and terrestrial planets. Their masses are related in that order by:

- 1:100:1000
- 100:10:1
- 1000,000:1000:1
- None of the above

The main objects in the solar system are the sun, Jovian planets and terrestrial planets. Their masses are related in that order by:

- Actually: 300,000:300:1
- Densities of sun & Jovians are 1/3 of the terrestrials!

# The Earth's atmosphere …

a) … consists mostly of oxygen

b) … is only about 1/5 oxygen

c) … has a lot of carbon dioxide which causes the greenhouse effect and global warming

d) None of the others

# The main reason Earth's atmosphere stays warm is heat from ...

- volcanoes.
- the hot core of the Earth.
- the greenhouse effect.
- solar radiation.

# There is very little atmosphere on the Moon because ...

it was blown away by meteor bombardment.

dry rocks on the Moon absorbed its own atmosphere.

its low mass and high temperature allowed most gases to escape.

the gravitational tidal forces from the Earth stripped it away.

# The Tides

a) There is one high and one low tide per day on a given point on Earth.

b) There are two high and two low tides per day on a given point on Earth.

c) There is one tide (either high or low) on any given day.

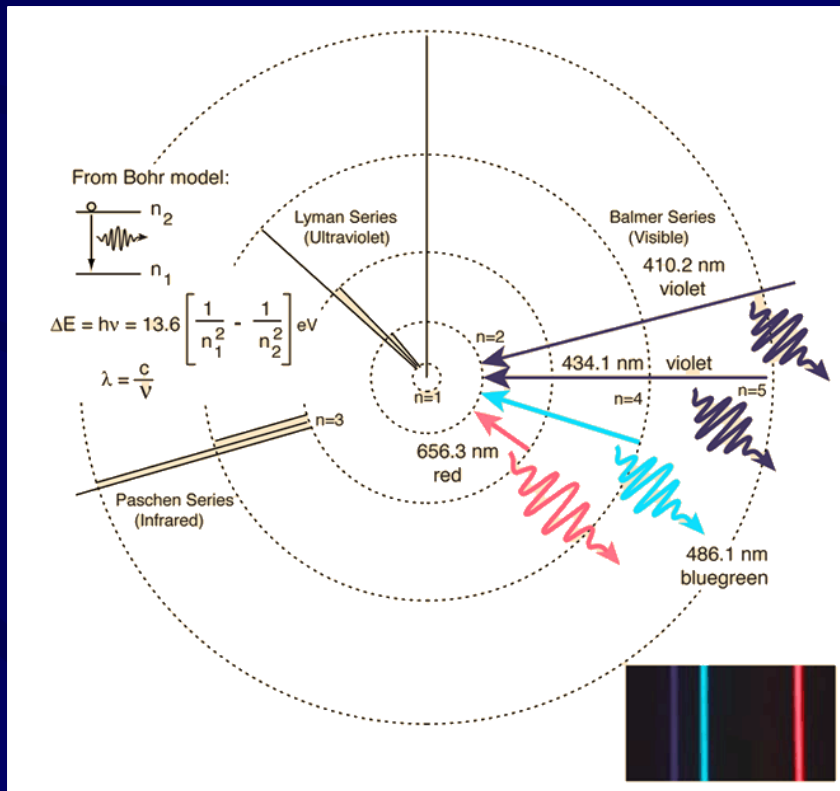
d) There are two high tides per month (one at new moon, one at full moon)

# Mars' rotation axis is tilted by about the same angle as Earth's. That means that…

- Mars experiences summer whenever Earth experiences summer
- The sun in the Martian summer reaches the same height as it does in summer on Earth
- Mars seasons have the same length as Earth's seasons
- None of the above

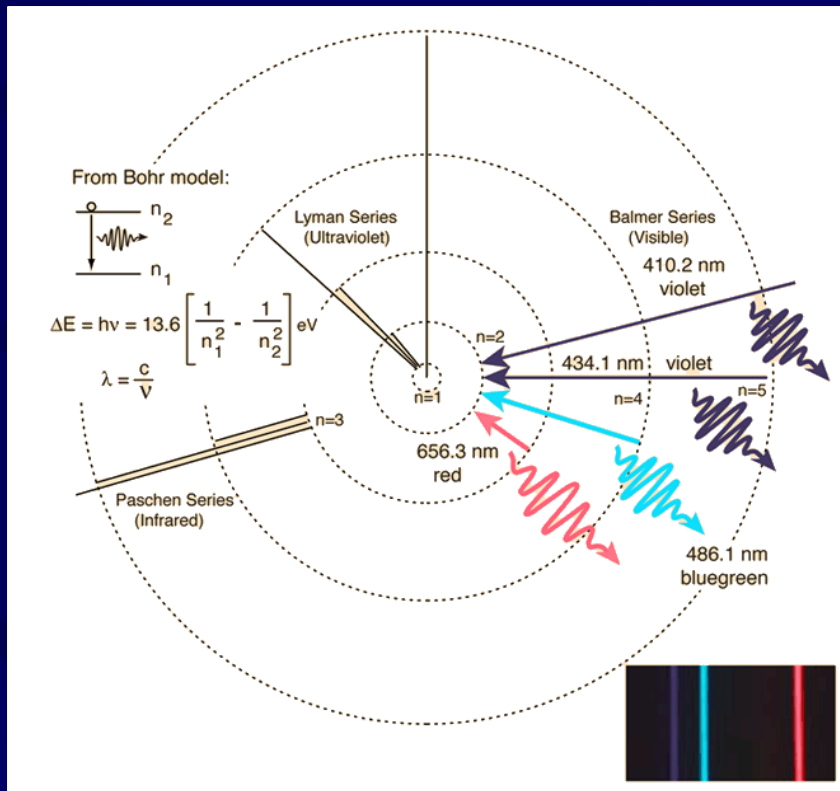
# An electron in a hydrogen atom jumps from the third to the second energy level.

- It has the same amount of energy
- It now has more energy
- It now has less energy
- None of the above



An electron in a hydrogen atom jumps from the third to the second energy level. What is the color or wavelength of the photon emitted?

- Red / 656nm
- Blue / 486 nm
- Violet / 434 nm
- UV / 300 nm



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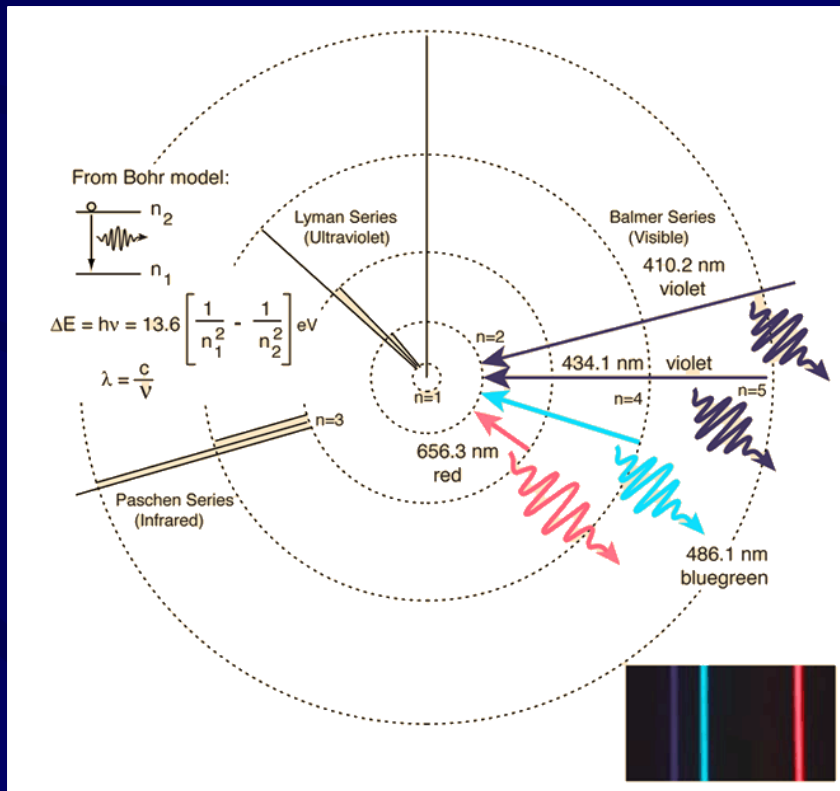
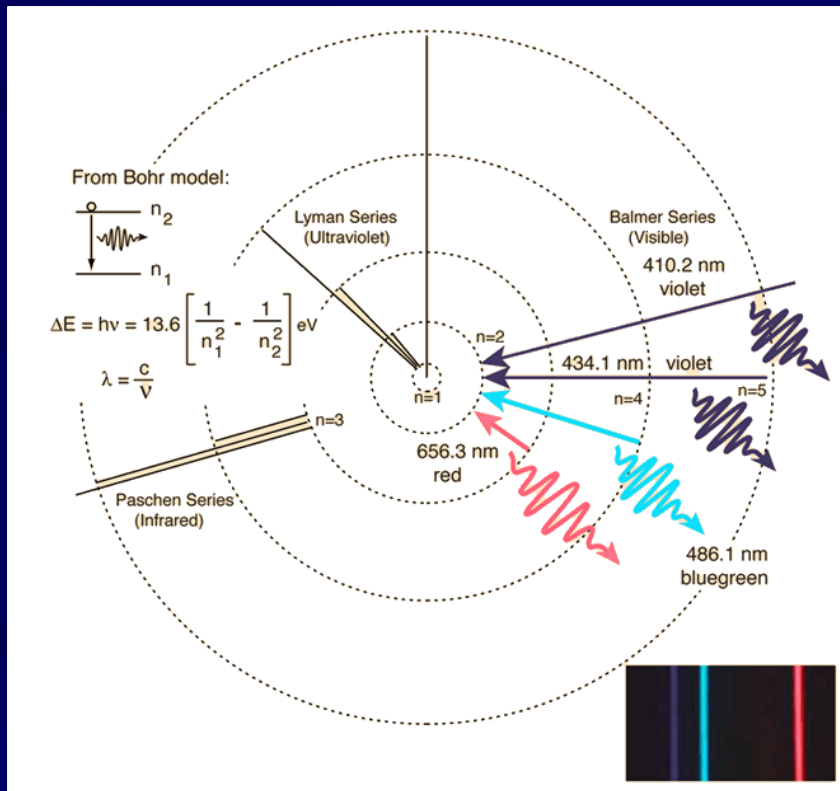


An electron in a hydrogen atom jumps from the second to the third energy level.
How did it get the energy necessary for the jump?

- It emitted an EM wave of a certain energy/frequency (photon)
- It absorbed a photon
- It does not/cannot change its energy
- None of the above



# Two atoms with a different number of protons, but same number of neutrons …

- … do not exist
- … are the same element, but different isotope
- … are different elements, so have different names
- … have the same number of electrons

# A very hot, but dim star shows up where in a Hertzsprung-Russell diagram?

- Left upper corner
- Middle
- Lower left corner
- Upper right corner

Two stars have the same chemical composition, spectral type, and luminosity class, but one is 10 light years from the Earth and the other is 1000 light years from the Earth. The farther star appears to be ...

a) 100 times fainter.

b) 10,000 times fainter.

c) 100,000,000 times fainter.

d) the same brightness since the stars are identical.

# Why does fusion of hydrogen release energy?

a) Fusion breaks the electromagnetic bonds between hydrogen atoms, releasing energetic photons.

b) The mass of a helium nucleus is smaller than the mass of four protons.

c) The mass of a helium nucleus is larger than the mass of four protons.

d) The velocity of four protons is larger than the velocity of a helium nucleus.

# Giant stars are rarer than main sequence stars because…

a) they do not form as often as main sequence stars.

b) giant stars are unstable.

c) the giant stage is very short compared to the main sequence stage.

d) elements heavier than helium are relatively rare.

# The helium burning phase for a star of a given mass is much shorter than the hydrogen burning phase primarily because

a) the helium mass fraction in the core is less than the hydrogen mass fraction was when the star was young.

b) helium releases less energy per reaction than hydrogen.

c) the star becomes a white dwarf before it can use most of its helium.

d) the temperature never rises high enough for complete helium burning.

# Which of the following stars is probably oldest?

a) a 1 solar mass main sequence star

b) a 1 solar mass white dwarf

c) a 10 solar mass main sequence star

d) a 10 solar mass red giant