Astronomy 110 Test 2 Review (also quiz 2)

NOTE: THIS IS NOT MEANT TO BE EXHAUSTIVE, THIS IS TO HELP THE YOU TRAIN ON THE QUESTION FORMATS AND THE CONCEPTS. Just because an issue is mentioned here does not mean that it cannot be on a test. WebCT has practice quizzes and tests for your use. There are also separate practice quizzes to help you train on using laws and formulae.

The topics covered will be how the sky moves, history through Newton, light, heat and heat transfer Jovian and possibly Terrestrial Planets. Use the syllabus for specific readings which are mainly in Castle chapters 6, 7, 8 (and maybe 9). (if we get that far) and in Pathways Units 10-25,, 34 52, 54.4 and possibly 32, 33, 34. As in the first test, Pathways key items, questions for Review, and Test Yourself questions are normally relevant. Expect problems like the ones on the homework and ALSO questions about which law of physics should be used. Expect some questions like the homework.

The problems that you should know from Pathways are U10 probs 1,2,3; U11 probs 1,2,3; U12 probs 1,2,3; U14 prob 3;U 18 robs 1,2,3,4; U 19 probs 1,2; U25 prob 1;

History-Know about possible archeoastronomy sites including Fahade Butte (the Sun Dagger), the Mayans, Stonehenge, Egyptians. Know roughly when they were constructed, what they look like, what they are aligned with, and where they are located.

Be aware of the Greeks, what they did and how their models worked. Understand the contributions of the Islamic world, the Middle Ages, Copernicus, Brahe, Kepler, Galileo and Newton. Know how each model worked. Understand what the models did and didn't predict, what they features are for. Do not worry about the modern parts of the history outline (after Newton). These are just to provide you with background information.

Be able to assess how each of the geocentric and heliocentric models explains rising and setting, motion of the Sun, motion of the planets.

Be aware of what happened to Galileo and why. Understand why people did or did not believe in Copernicus' model.

I would ask you the date when someone lived or who wrote a particular book.

Newton and Kepler formulated laws that you will be using. There is a table at the end of chapter 7. It is meant for your to organize these laws and their uses. Fill it in and go over the practice problems at the end of chapter 7 to train yourself on how to decide what equation is needed for each type of problem.

Appreciate the difference between Newton's Laws, which predict additional phenomena, and Kepler's laws or Ptolemy's epicycles which describe the phenomena and their futures) but do not tell how to deal with new information. Your book includes the formulae for circular and escape velocities. Understand how they could be used and what it means to escape, or not.

Be able to distinguish a correct vs. an incorrect ellipse, and distinguish whether the foci are in the correct place. Be able to determine where a planet would go the fastest in its orbit. Be able to draw and label the major and minor axes of an ellipse. You should be able to find the period of a planet given the semimajor axis of the orbit around the Sun, or visa versa. You do not need to memorize any distances, they will be given. **You will need to know the formulae and the speed of light for the Doppler shift equation**. Know where on an orbit a planet moves the fastest.

Things to Remember:

- The apparent motions of celestial objects (like stars, Moon etc), how often they repeat, and how each model explains their occurrence
- Kepler's and Newton's laws
- Defining features of an ellipse
- Meaning of momentum
- Law of Gravity

Formula for speed in a circular orbit, and for escape velocity
What Galileo discovered, and the significance of each major observation
Cosmologies of the various Greeks, Copernicus, Kepler, Galileo, Newton
Ptolemy's purpose for the Epicycle, Deferent and Equant
When various people lived (at least the order and the century)
How various solar and lunar calendars work

Understand how the solar and lunar rise and set points change over the course of the year. Understand which alignments are built into some ancient sites. Be clear on the observed (apparent) retrograde motion of the planets. Pathways has an animation

Understand what parallax is, why people thought it would allow one to detect motion of the Earth and measure distance to celestial bodies, and how the fact that neither parallax nor other effects of the motion of the Earth were observed led people to believe that the Earth is unmoving. Understand WHY they were unable to measure the parallax of stars.

We will learn Kepler's three laws. Do understand what an ellipse is, and the effect of more or less velocity would be on the shape of an orbit. You will need to be able to use Kepler's third law.

Be aware of Tycho Brahe's accomplishments and why he didn't believe the heliocentric model of the Universe. Remember Galileo's discoveries and how they related to the heliocentric model.

H-1 Match the beliefs with **<u>all</u>** the people who held them. They are NOT one for one. The point is for you to look these up and summarize, so the answers are not included.

a) Spherical Earth	1) Copernicus
b) Crystalline spheres	2) Aristotle
c) Counter rotating spheres	3) Kepler
d) Disk like earth or planet	4) Hipparchus
e) Elliptical Orbits	5) Anaximander
f) Rotating Earth	6) Tycho Brahe
g) Epicycle	7) Ptolemy
h) Geocentric Universe	8) Anaximenes
i) Cylindrical Earth	9) Eudoxus
j) Primum Mobile	10) Thales
k) Heliocentric Universe	11) Anaximenes
l) Equant	
m) Firmament	

H-2 What supports the solid part of the Earth, according to Thales?
H-3 Why did the Greeks think that the Earth is a sphere? That is, what is the evidence that they found and the logic they used?
H-4 How did Ptolemy explain the mechanism which makes the stars rise and set?
H–5 What causes the cosmos to move in Aristotle's model?
H-6 Why did the Sun move through the constellations according to Ptolemy:?
H-7 What alignments would you find at Stonehenge? When was it built?
H-8 What is the major contribution of the Babylonians to the development of modern astronomy?
H-9 How does Ptolemy's model explain the "irregularities of the motion of the planets," that is they do not progress at a constant speed through the sky (different from retrograde motion). How does Copernicus' model explain it?
H–10 What does retrograde mean?
H–11 Parallax was not observed until 1838. How did the fact that it was not observed affect the models which Tycho Brahe and Aristotle suggested?
H-12 How did Eratosthenes measure the size of the Earth?
H-13 What measurements did Aristarchus use to measure the distance to the Sun?
H-14 What book did Copernicus write to document his theory?
H-15 Why did Kepler give up on the idea of circular orbits? What did he use instead?
H-16 What is the deferent? Be able to find it on a diagram of a solar system model.
H-17 Who discovered precession?
H-18 Where did Anaximenes believe that the Sun and Moon go at the end of the day?

H-19 When did Aristotle live?
H-20 What did Galileo discover which was direct support of the Copernican model?
H-21 What are perfect solids? Why did Kepler use them ?
H-22 What are Kepler's three laws?
H-23 What did the Islamic world do with Ptolemy's model? What did they rename his book?
H-24 What measurements did Aristarchus use to find the size of the Moon?
H-25 If you were to discover a medicine wheel, what would you be looking at? Where (geographically) are you likely to be?
H -26 You want to build an artificial satellite of the Sun. You want it to have a period of exactly 5 years. What will the semimajor axis of the orbit of the planet be?
H -27 An asteroid is found to have a semimajor axis of 32 Astronomical Units. How long will it take to orbit the Sun?
H–28 You want to launch a vehicle which will orbit the Sun, and return to the vicinity of the Earth in 64 years, what will the semimajor axis of its orbit be? (the orbit can be any elliptical shape you want and it can pass by the Earth when it is near the Sun).
H–29 Draw an ellipse and label the foci (plural of focus), the major axis, the minor axis, and one semimajor axis.
H–30 Is it physically possible for a planet to orbit the Sun in a circle? How does this correspond to Kepler's first law?
H-31 Where is Fahade Butte? What sort of construction is there? What is the name of the people who we believe built it? What astronomical alignments are there?
H–32 What kind of calendar did the Egyptians use?
H-33 If you notice a comet and find that its orbit has a semimajor axis of 64 Astronomical Units, what is its period in orbit around the Sun?
H-34 What is the difference between the Julian and the Gregorian calendars? When was each brought into use?

Gravity and Motion (Castle ch 7, Pathways U 14-20)
I don't stress how Kepler explained the reason for the motion of the planets. Do, however, learn about Newton's three laws of motion and conservation laws. (They are in the chapter, but subtlely) Actually conservation laws are the more important in physics. We will be doing some problem solving with the conservation laws and the law of gravity.

Understand how gravitational force varies with distance between the bodies, and how weight varies with distance. Remember that for a spherically symmetric body, the gravitational force seen on the outside is just the same as would be observed if the mass were all concentrated at the very center of the body.

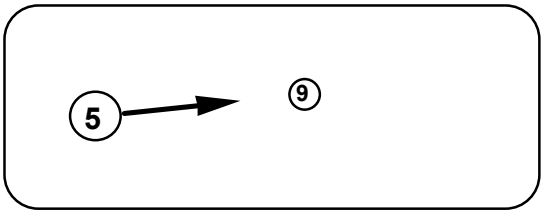
Be clear on what causes tides and how often they occur. We will discuss the overall effects of the tides on the Earth/Moon system in class.

Understand the definition of a black hole and what would cause one (there is more than one way, and more than one size). Understand the way that we detect black holes.

Example questions concerning physics etc.
P-1 You are batting and a batting machine is pitching to you. If the machine is fed with both tennis balls(light) and hard balls (heavy). If you can't tell between the balls when you see them, how else could you tell which is which? (the pitching machine is not adjustable, it puts the same force on the balls as it lobs them at you)

P-2 You are playing pool. The table looks like the picture below. The 5 ball is hit by the pool. The 5 ball has mass 3 times that of the 9 ball . What could happen to the balls?
a) The 5 ball will bounce off the 9 ball and reverse direction. The 9 ball will remain stationary.
b) The 5 ball and the 9 ball will move in the same direction and with the same speed that the 5 ball had originally
c) The 5 ball and the 9 ball will move in the same direction that the 5 ball was originally going. The 5 ball will move more slowly than it was previously. The 9 ball will move faster than the 5 ball after the collision.
d) The 5 ball and the 9 ball will move in opposite directions at the equal speeds e) The two balls will both move off at right angles to the direction which the 5 ball was moving

Pool Table



P-3 Name three quantities which are conserved in physics.

P-4 When you fire a gun, the bullet comes out the front with velocity V. The gun
a) Stays there
b) Tries to move backward as fast as the bullet went out (but your hand stops it)
c) Tries to move backward, more slowly than the bullet went (but your hand stops it)
d) Tries to move in the same direction as the bullet, but more slowly than the bullet went. (but your hand stops it)
e) Tries to move toward the floor

P-5 What principle would you use to describe the motion of the gun (in the preceding problem) when you fire it?
a) The law of gravity b) Conservation of energy c) Conservation momentum
d) Newton's first law e) Kepler's second law

P-6 When you see a comet near the Sun, the speed it will move can be predicted by (more than one answer)
a) Kepler's first law b) Kepler's second law c) Newton's first law
d) Kepler's third law e) Conservation of angular momentum

P-7 You are playing tether ball and the ball is winding up the pole at the very end, it moves very fast. This is an example of
a) Conservation of energy b) Conservation of linear momentum
c) Conservation of angular momentum d) Kepler's third law e) Law of gravity

P-8 You carry a chicken and a bathroom scale (the kind with springs) to the top of a very high building. You expect
a) The chicken will get air sick b) The chicken will weigh more
c) The chicken will weigh less d) The chicken will become lighter than air and float away
e) You will all become weightless.

P-9 If you are in the space shuttle, you might say you are weightless. Is this because
a) The gravity of the Earth only goes as far as the atmosphere
b) The gravity goes only a few miles above the surface of the Earth, regardless of whether there is air
c) Gravity accelerates the shuttle more than it accelerates you, so you seem to float away from the shuttle
d) Gravity accelerates you and the shuttle the same, so you seem to float
e) You are so close to the Moon, that it pulls on you harder than does the Earth. So you do not feel the Earth's gravity.

P-10 What defines a black hole? What might cause one?

P-11 What does it mean to have escape velocity? What if you have less? What if you have more?

P-12 We think that the Universe is expanding. What do we think will determine whether it will ever stop expanding?

P-13 How far from the Earth do you have to go so there will be no force from Earth's gravity?

P-14 If you move further from a body, does the amount of velocity which you will need in order to escape increase or decrease?

P-15 How fast is Pluto moving as it orbits the Sun? (look up the data you need from the book, then compute)

P-16 If you wanted Mercury to escape from its orbit, how fast would it need to go?
How much faster is that than it is going now?

P-17 The Moon orbits the Earth and obeys the same laws as do the other planets. It moves at about 1 km/sec in its orbit. How fast would it need to go to escape from its orbit and to leave the vicinity of the Earth?

P-18 What is the cause of tides?
a) Too much water b) The earth's rotation c) The fact that the force of gravity decreases with distance d) The Sun e) Centrifugal force

P-19 How many high tides are there in a day at a given location? a) None b) One
c) Two d) Three e) Varies by season

P-20 If the month and the day were the same length, what would happen to tides?
a) They would get more extremeb) They would get less extreme c) There would be only one a day d) Nothing, they would be the same as they are now
e) They would stay at the same location on earth

Light (Castle ch 8, Pathways Units 21-25,unit 25 prob 1, all other units, not problems but all Terms, Questions for Review and Test Yourself)
Understand the different names for light and that the difference between them is just the wavelength. Understand the cause, the appearance, and what information we can find from continuous, emission, and absorption spectra. The punch line is that bodies emit light depending on their temperature and on their composition.

Understand the structure of an atom, with protons and neutrons concentrated in the nucleus and electrons surrounding them. Understand the three types of spectrum, continuous, emission and absorption and know what causes them.

Get the idea that temperature tells the kinetic energy, an d hence the velocity of the particles in the material. There is both an average velocity and a distribution around the average. The distribution of velocities results in the distribution of wavelengths of light, called a black body curve.

Pathways has interactive exercises concerning black body radiation(U23), the Bohr atom(U24), and Doppler effect (U 25). They are on http://www.mhhe.com/schneider. Click on Self Study, go to the unit and then to interactives.

light-1 What is the difference between a radio wave and an x ray?
light -2 Which, among the following, is not a type of light more than one answer)
a) Radio waves b) Ultraviolet c) Cosmic rays d) Sound e) Gamma rays
light -3 What can we tell from a continuous spectrum?
light -4 What does a continuous spectrum look like?
light -5 Describe the structure of an atom
light -6 What happens in an atom when light is emitted?
light -7 What happens in an atom when light is absorbed?
light -8 If you are three times as far from a source of light as is your friend, how much light do you receive each second from the source on the same size receiver?
a) Same amount b) Half as much c) One third as much d) One ninth as much
e) One sixth as much
light -9 An electron has a _____ electric charge. a) Positive b) Negative
c) Neutral d) Any, depends on type of electron
e) Any, depends on whether it is part of an atom or not

light-10 How can one tell the difference between the black body radiation of a 10,000K body and a 3000K body of the same size at the same distance?
light-11 How can one tell that a body is approaching or receding from us?
light-12 If a body is approaching us at 50km/sec, what will the wavelength from at line of Hydrogen be? The wavelength of the hydrogen line is 6361Å when seen in the laboratory.
light –13 The hotter a body, the (more than one answer possible)
a)Brighter it is b) The redder it is c) The bluer it is d)The further away it appears e) The fainter it is when seen in the laboratory.

Jovian and Terrestrial Planets, Star and Planet Modeling, Formation of the Solar System
(Castle ch 9,11, Pathways 32, 33, 34, 42 Unit 33 probs 1,2 ; U42 prob 1)
Be able to compare and contrast the features of Jovian and terrestrial planets. Know which planets belong to each category. A mnemonic for the planets in order is My Very Excellent Mother Just Served Us Nine Pizzas (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto).

Understand how the composition of the planets relates to their density and to the distance from the Sun when they formed. Know what elements are common and which are less common in the Universe. Understand how we model the interiors of stars and planets. Know how we have been discovering planets orbiting stars other than our Sun. Know how radioactive dating works.

Solar System in General Jovian vs. Terrestrial Planets

Terrestrial Planets	**Jovian Planets**
Mercury, Venus, Earth, Mars	Jupiter, Saturn, Uranus, Neptune
Near Sun	Far from Sun
Dense	Less dense
Few moons	Many moons
Spin rather slowly	Spin rapidly
Small mass	Large mass
Distinct solid surface which can show mountains, craters etc	We don't see the "surface", we see opaque layers of gas. The material gets denser and hotter going toward the center. As it gets denser, it can be called a solid, but not until a level far below the visible level.

Pluto is neither type of planet. It fits better with the Kuiper belt objects, small bodies which orbit the Sun near Pluto's orbit al distance and even further from the Sun. See page 348 for a figure showing the positions of comet orbits in the Kuiper belt.

1) If you want to find a planet with high density, where would you look?
2) How can we know that terrestrial planets are denser than Jovian planets?
3) Put the stages of formation of the Solar System into time order
4) What are some methods that allow us to find planets orbiting stars other than the Sun?
5) What are the equations used to model the interior of planets and stars? (explain what they relate)

Selected Answers History 26) 2.92 AU 27) 181.02 yr, 28) 16 AU, 33) 512 yr
Gravity and Motion P-1) heavy ball is more massive, but the force from the machine is the same, so speed of the more massive ball will be lower and it will hit the ground closer to the machine, P-2) c, P-4) c, P-5) c, P-6) b and e, P- 7) c, P- 8) c, P-9) d, P-10) use the speed of the earth as it orbits the Sun and the circular velocity law to get about 4.8 km/sec, P-16) 68.5 km/sec, P-17) 1.414 km/sec , P-18) c, P-19) c, P-20) e

Light answers L-1 radio wave has longer wavelength, L-2 c and d, L-3 temperature only, L-4 all colors, like a rainbow. The temperature determines the amount of light in each color. See pp167-8, L- 5 see p 33-4, L-6 ,7 see pp155-7, L-8 d, L-9b, L-10 hotter body gives off more radiation at every wavelength, and a larger proportion of short wavelength light pp167-8, L-11Doppler shift, L-12 Wavelength received is smaller than wavelength sent because source and you are getting closer. So change in wavelength is -1.060167 Å and the wavelength received will be 6359.94 Å.,L-13 a and c