

## Astronomy 110 Review – Spring 2015

We have covered the following topics from chapters 1 through 3, (excluding most of 1-2, refracting telescopes in 3-8 (but we're covering refraction!), and just skimming the details of non-optical telescopes from 3-14 to the end of chapter 3). You will also need chapter 4-7 to cover the Doppler shift. Do not consider this a list of definitions to memorize. Understand the meaning, use, and importance of all these topics and ideas as well as memorizing any necessary definitions. The list is fairly complete, but covers general topics and does not list every detail. The exam will have *around* 55 multiple-choice questions and 5 to 10 short answer questions. These could involve diagrams. **You need the Apperson DataLink Form #28040.** It has 100 multiple choice spaces on one side and room to write on the back.

---

Scientific Theories: what they are and what they're good for. What makes them scientific? Why must they be predictive? How was the discovery of Neptune a test of the theory of gravity?

Units of time, mass, length and temp: weight vs. mass. The special astronomical units of distance. Units of energy and power.

The celestial sphere and the lines on it. (Celestial poles, equator, horizon, ecliptic)

What are constellations? What is the zodiac?

Position of the celestial pole seen from different places on Earth.

Motion of the north celestial pole, North Star, and other stars over a night.

The causes and definitions of the following:

Days

Lunar Months: synodic and sidereal (why are they different?)

Years and leap years.

Seasons: what causes them? The relationship of the ecliptic, the celestial equator, and the seasons. The two main ways the heating of the Earth differs between the seasons.

Motion of the Sun on the ecliptic.

Phases of the Moon (and other objects, such as Venus).

Eclipses: solar & lunar (3 types of each, but don't bother with penumbral lunar eclipses). When do they occur? What is the line of nodes, and why is it important?

Names of seven moving objects in the sky known to ancient peoples.

Geocentric and heliocentric cosmology: different ideas about the motions of the planets, structure of the Solar System, orbit shapes (below).

Differences between early Greek and Babylonian astronomy.

Hipparchus (none of the details about his models, though)

Ptolemy and cosmology (orbits & epicycles). His book.

Copernicus and his breakthrough. His book. The real explanation of retrograde motion.

Tycho Brahe and his measurements: positions of planets, distance of comet, supernova.

Galileo's telescopic observations (of Jupiter, the Moon, the Sun, and Venus) and their importance to cosmological ideas.

Kepler's 3 laws.

What is Parallax?

Newton's book.

Newton's 1<sup>st</sup> law, inertia.

Newtonian vs. Aristotelian ideas of motion

Why do planets orbit? How did Newton's ideas of motion on Earth compare to

Aristotle's/Ptolemy's? How did Newton's idea of the causes of orbital motion differ from

Aristotle's/Ptolemy's? How does this relate to inertia and gravity? In which direction does the force of gravity pull an orbiting planet, moon, or satellite?

Newton's law of gravity ( $F = \frac{Gm_1m_2}{r^2}$ ).

What is a wave?

Light as a Wave ( $c=\lambda f$ ).

Refraction, diffraction,

Color vs. wavelength.

The Electromagnetic Spectrum from longest wavelength to shortest. What gets through the Earth's atmosphere? Angstroms and nanometers (more units for wavelength).

Light as a Particle

Units of energy and power

The energy of a photon ( $E = \frac{hc}{\lambda}$ ). How does the energy depend on color?

What is white light?

White light as a mixture of colors. Prisms.

Can you have a photon of white light?

The Doppler effect.

How does it relate to direction of motion? speed? distance?

Telescopes – We're only covering reflecting telescopes in any detail.

How do they work?

Why do we need them?

Advantages of bigger telescopes.

Advantages of space observations.

Advantages of electronic detectors.

Active optics.

Possibly useful review questions (also, understand the “Key Ideas”) The book does not have review problems on every topic that I covered. The ones below are the ones that are directly relevant to the test.

8<sup>th</sup> edition:

Ch 1: Review: 1,3,4,5,7,8,9,13,14,16,17,19,20,21,22,24,25,27,28,33,38,44,49,50,52,54.

What did you know? 3,4,6,8.

Ch 2: Review: 1,2,3,4,6,10,11,12,13,14,20,21,22,30,32 (test will not have numerical problems).

What did you think? 1,2,3,4,5,6,7.

Ch 3: Review: 1,2,5,6,7,8,10,11,12,13.

What did you think? 1,2,3,4,5.

Ch. 4: Review: 3,13,14,18 (1<sup>st</sup> part only),26.

9<sup>th</sup> edition:

Ch 1: Review: 1,3,4,5,7,8,9,13,14,16,17,19,20,21,22,24,25,27,28,33,38,44,48,51,52,54.

What did you think? 3,4,6,8.

Ch 2: Review: 1,2,3,4,6,10,11,12,13,14,15,20,21,22,31,33 (test will not have numerical problems).

What did you think? 1,2,3,4,5,6,7.

Ch 3: Review: 1,2,5,6,7,8,10,11,12,13.

What did you think? 1,2,3,4,5.

Ch. 4: Review: 3,13,14,18 (1<sup>st</sup> part only),26.

10<sup>th</sup> edition:

Ch 1: Review: 1,3,4,5,7,8,9,13,14,16,17,19,20,21,22,24,25,27,28,33,38,44,48,51,52,54.

What did you think? 3,4,6,8.

Ch 2: Review: 1,2,3,4,6,10,11,12,13,14,15,20,21,22,30,32 (test will not have numerical problems).

What did you think? 1,2,3,4,5,6,7.

Ch 3: Review: 1,2,5,6,7,8,10,11,12,13.

What did you think? 1,2,3,4,5.

Ch. 4: Review: 3,13,14,18 (1<sup>st</sup> part only),26.

Here are some of the questions I gave for homework in the past. These are the ones that are relevant to the test.

- 1) From San Diego, how does the daily path of the Sun across the sky appear to change with the seasons (how does it look, not why does it change)?
- 2) Why is it warmer in the summer than in the winter?
- 3) Why does the Moon exhibit phases?
- 4) If the Moon were twice as far from the Earth as it is, would eclipses be any different? If so, how? (Look at the figures.)
- 6) What were the “common sense” arguments used to support the (erroneous) idea that the Earth was motionless at the center of the Solar System? Can you think of any others that we didn't mention in class?

- 7) Describe the telescopic observations published by Galileo in his *Siderus Nuncius* (*Starry Messenger*) and other writings. How did they help to overturn the Aristotelian/Ptolemeic view of the Solar System?
- 8) Describe the Ptolemeic, Copernican, and Keplerian models of the Solar System. What kinds of orbits do planets have in these models?
- 10) What two properties of a planet are related to each other by Kepler's 3<sup>rd</sup> law (properties in words – not just letters that stand for properties!)?
- 11) If the aphelion of a comet's orbit is 5 times as far from the Sun as the perihelion, how do the speeds of the comet in its orbit compare at those two locations? What rule allows you to know the answer to this question?
- 13) Suppose two equal masses one km apart are attracted by gravity to each other with a certain force (the number doesn't matter). What would happen to the force if they moved twice as far apart? (Hint: this isn't just a simple proportionality or inverse proportionality)
- 16) Lean a pencil in a transparent glass full of water. Look at it from different directions. What do you see? Draw it. What property of light causes this?
- 17) Have you ever made a telephone call to another continent? Did you notice any strange effects? Often, the call goes by radio to a satellite 22,000 miles above the Earth, across to another satellite, and then down. What effect might this cause? What if you were talking to a person near another star, trillions of miles away?
- 18) For a satellite in circular motion around the Earth, which way does the force on the satellite point?
- 19) Radio waves, visible light, and X-rays are all part of the electromagnetic spectrum. What basic property is different between the three?
- 20) Use the spectrum in figure 4-8 for an example of the spectrum of an object at rest. How would the spectrum look if the object were moving towards us? To answer this question, draw the two spectra, for the object at rest and in motion.