AST111: Things to Know for Exam #1

Exam Date: Thursday, September 21, 2017

You may use one 3”×5” note card (both sides)

You may use your “Moon Machine” (may contain notes on its use)

The exam will consist of about 60 multiple choice questions.

The exam will cover the following topics:

Astronomy and the Universe:

What is the scientific method?; give examples of fundamental properties; describe and use scientific notation; define the meaning of various metric prefixes; identify several alternative units of length; why are angular measurements so useful in astronomy?; what units are used to measure angles?; what is the small-angle formula?

Knowing the Heavens:

What is the difference between a constellation and an asterism?; describe the basic motions of the Earth; what is the celestial sphere?; identify important points and lines on the celestial sphere (celestial equator, ecliptic, NCP, equinoxes, solstices, zenith, etc.); identify the causes of the seasons; what is meant when one refers to tropic, temperate, and arctic regions on Earth?; what is precession and what are its effects?; make a comparison of mean solar time vs. apparent solar time vs. sidereal time; why is the Sun not a good time keeper?; why do we use time zones?; describe the difference between Julian and Gregorian calendars

Eclipses and the Motion of the Moon:

Describe the sequence of lunar phases; use the “Moon Machine” to determine the phase of the Moon, time of day, and/or position in sky; how do the Moon’s synodic and sidereal periods compare?; does the Moon rotate?; what happens during a lunar eclipse?; describe the circumstances of a solar eclipse; what conditions are necessary for an eclipse to occur?; how often do eclipses reoccur?; what information did ancient astronomers have regarding shapes, sizes, and distances in the Sun-Earth-Moon system?

Gravitation and the Motions of the Planets:

Compare and contrast geocentric vs. heliocentric models of the solar system; what are meant by the terms deferent, epicycle, direct motion, and retrograde motion?; describe various planetary configurations (conjunction, opposition, greatest elongation, etc.); what were the contributions of Copernicus, Tycho, Kepler, Galileo, and Newton?; what is the difference between synodic and sidereal periods?; describe the general properties of an ellipse; identify Kepler’s laws of planetary motion; why were Galileo discoveries so controversial?; identify and apply Newton’s laws of motion and gravity; describe the concepts of speed, velocity, and acceleration; do Newton’s ideas always work?; how is orbital motion maintained?; compare mass vs. weight; do all objects fall at the same rate near the surface of the Earth?; do they fall differently on the Moon or other planets?; how do gravitational forces account for the Earth’s tides?
The Nature of Light and Matter:
Is the speed of light infinite?; if not, how can it be measured?; what are the different types of waves (longitudinal, transverse)?; describe the characteristics of waves; what is the wave equation?; what is meant by the term electromagnetic spectrum?; identify various regions of the electromagnetic spectrum; what portion is detected by the eye?; what is blackbody radiation and what are Planck curves?; know Wien’s law!; what is the Stefan-Boltzmann law?; identify the common temperature scales; why is one scale more useful than the others?; give evidence for both the wave and particle nature of light; what is the relationship between the energy of a photon and its frequency?; how are different types of spectra formed (i.e., Kirchhoff’s laws)?; why was Rutherford’s experiment important in understanding the nature of atoms?; describe Bohr’s model of the hydrogen atom; what is meant by the Balmer series, Lyman series, etc.?; be familiar with the terms absorption, emission, ionization, ground state, and excited state; describe the Doppler effect; what important piece of information is obtained using the Doppler effect?

Optics and Telescopes:
What are meant by the terms diffraction (note: see wave nature of light), refraction, and reflection of light?; identify different types of optical telescopes – be very specific!; what are the advantages and disadvantages of the different types of optical telescopes?; what are chromatic and spherical aberrations?; describe the basic properties of telescopes; how are these properties measured or defined?; how are the large optical telescopes of today different from their predecessors?; what are the characteristics of good observing sites; why is space a good place to put a telescope?; what kind of observations can be made from the ground and what kind can be made only from space?; what is meant by the term interferometry?; know the advantages and disadvantages of common means of detecting light

Miscellaneous:
Identify the author and general content of the following texts:
Almagest (The Great Compilation)
De Revolutionibus Orbium Caelestium (On the Revolution of the Heavenly Orbs)
New Astronomy with Commentaries on the Motions of Mars – usually referred to as New Astronomy
Harmonice Mundi (Harmony of the Worlds)
Siderius Nuncius (Starry Messenger)
Dialogue Concerning the Two Chief World Systems, the Ptolemaic and the Copernican
Philosophiae Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy) – usually referred to as The Principia