

ASTRONOMY 3: INTRODUCTORY ASTRONOMY: THE SOLAR SYSTEM
WINTER 2010
MIDTERM EXAM *STUDY GUIDE*

I have never made a study guide before, so hopefully this will be of some value. The midterm is largely non-mathematical, but there is some simple math. It is much less mathematical than the homeworks. You won't need a calculator, but you can bring one if you like.

There are 64 multiple choice questions (1 point each) and 10 short answer questions (3 points each) for a total of 94 points. Short answer questions will only require 1-3 sentences.

Some chapters we spent less than one lecture period on. Some chapters we spent 2 lectures on. Generally, chapters that we spent more time on (7, 8, and especially 9 and 10) are preferentially weighted in terms of the number of questions and total points. That seems like a pretty helpful piece of information.

You should know Kepler's laws and especially Kepler's 3rd law (his original version and Newton's version) backwards and forwards. You should know what causes the phases of the moon very well.

1. The scales and the appearance of the sky (chapter 1, 2)
 - a. The distance scale
 - b. Daily motion of the sky: the celestial sphere
 - c. Appearance of the sky: seasons on earth, stars and planets, winter and summer constellations, southern and northern hemispheres
 - d. Phases of the moon, eclipse
2. Brief History of Solar System Exploration: (3)
 - a. Geocentric versus heliocentric model of the solar system: how did they account for the retrograde motion of the planets?
 - b. Kepler's three law of planetary motion
3. Energy and Motion (4)
 - a. Newton's three laws of motion and the concept of force
 - b. Law of universal gravitation.
 - c. Acceleration along a curved orbit and angular momentum
4. Light and telescopes (5,6)
 - a. dual nature of light
 - b. inverse square law: surface brightness decreases as inverse square of the distance
 - c. photons of different wavelength: different type of photons
 - d. Windows of Earth atmosphere: ability of different types of photons from outer

space in reaching the ground

5. Starlight and Atomic Structure (5)

- a. Temperature and heat
- b. intensity and color of black body radiation
- c. elements: atoms, protons, neutrons, electrons.
- d. absorption and emission lines: atomic transitions
- e. Doppler effect

6. Overview of the solar system (7)

- a. two classes of planets
- b. dynamical and chemical properties of planets
- c. minor planets: asteroids, Kuiper Belt objects, and comets.
- d. a brief tour of individual planets and their distinguishing properties

7. Formation of the solar system (8)

- a. The nebula hypothesis
- b. protostellar disks
- c. gross properties of the solar system: terrestrial versus gaseous giant planets, space debris
- d. the age of the solar system: nuclear decay
- e. building of the solid planets: condensation, coagulation, impact, fragmentation
- f. gas accretion onto cores
- g. clearing of debris particles and gas

8. Planetary Geology (9)

- a. Diverse surface of terrestrial planets
- b. Probing planetary interior with seismic (P and S) waves
- c. The core-mantle structure inside the Earth, Venus, Mars, Mercury, and the Moon.
- d. Sources of heat for planetary interiors: accretion, differentiation, radioactive decay.
- e. Heat transfer by convection, conduction, and radiation: cooling and planetary size
- f. shaping the surface by impact craters, volcanism, tectonics, erosion.

9. Planetary Atmospheres (10)

- a. Atmospheric temperature structure of Earth's atmosphere
- b. What is the greenhouse effect and how does it affect various planets
- c. Methods of creating and losing atmospheres
- d. Particular properties of Venus, Earth, and Mars
- e. Atmospheric circulation