AST 111 Fall 2010
Tu - Thu 10:30-11:45
STUDY GUIDE FOR EXAM 1

1. **YOU MUST NOT USE YOUR LAPTOP OR YOUR CELLPHONE—BRING A Calculator**
You Cannot Share a TEXTBOOK

2. **HINTS ON TAKING "OPEN BOOK AND NOTES" TESTS**:

a. Study as if it were a closed book test. You do not have time to look up each answer.

b. Carefully read the Chapter Summary, learn the "New Terms", try to do the Review Questions, and the Discussion Questions. Work as many problems as you can. Feel free to ask me if you are having problems doing them.

c. Don't forget the index or the glossary.

d. **Read the test questions carefully!**

e. Go through the test once and answer all the questions that you can. Then go back and do the other questions.

f. Mark on the test booklet: cross off obviously wrong answers, work the problems, and show your work. Circle the answer on the test booklet - this is the last resort if you have made a mistake on the answer sheet.

g. Carefully darken in the answer on the answer sheet, do not rip, mutilate, fold, or spindle it.

h. Check your answer sheet. Make sure you have answered all 50 questions.

i. **MAKE SURE THAT YOUR NAME IS ON THE ANSWER SHEET AND YOU HAVE PUT IN YOUR FULL UNIVERSITY ID NUMBER-LEFT JUSTIFIED.** I will subtract points if this is not done.

BRING A PICTURE ID. I WILL ASK YOU TO PLACE IT ON THE TABLE IN FRONT OF YOU AND I WILL GO AROUND THE CLASS DURING THE EXAM CHECKING EACH ID.

1. Appendix A: Units and Astronomical Data

a. Look at the Units - remember that I do not use the SI Units - just centimeter, gram, second units

b. Look at the material in Tables A-1 through A-6

c. Review Conversions. Note that if you watch what units you are using then the ones you don't want will cancel out.

d. Review the different types of temperature. I will mostly use the Kelvin scale.

e. Review Powers of 10. Addition, subtraction, multiplication and division of exponents.

f. Know the prefixes for the metric system. How big is a nanometer? A Megameter?

2. Chapter 1. The Scale of the Cosmos

a. Review scientific notation. How do we work with things like 3×10^3 times 0.00012 and so on.

b. As you read this chapter, make sure that you know the meanings of all the words that are in **bold-face** type. For example, what is an Astronomical Unit? How big is a light-year? What is a light year?

c. Read the Review Questions - try to do the problems. Make sure that you know the meanings of most of the items in New Terms. This is true for every chapter and so I won't repeat this item.

d. Look at the Boxes: The Scientific Method; Scientific Arguments

3. Chapter 2. The Sky

a. What are the constellations? Asterisms? How are stars named in each constellation? What is meant by Alpha Orionis? Beta Orionis? Delta Cephei?

b. Skip the part on The Brightnesses of Stars (we do this in AST 112)

c. Look at the material on pages 18-19. Look at the Figures and read the figure captions. Where is Polaris?

d. What are latitude and longitude? What is the latitude and longitude of Tempe? What is the Celestial Sphere, angular measurement. Where is the horizon? Where are the zenith and the nadir?

e. What is a circumpolar star? How does the sky appear to change as we move north and south? What is the North Celestial Pole? South Celestial Pole? Celestial Equator?

f. Know about degrees, minutes of arc, and seconds of arc. Know why the angular diameter is different from the linear diameter.

g. What causes Precession. Which star is now the Pole Star? What star will be the Pole star in 12,000 years?

h. What is meant by the Ecliptic? Which stars and constellations are overhead at midnight through the year? Why do they change during the year? (Look at Figure 2-9)

i. What is the inclination of the Earth's Poles to the ecliptic? What is meant by the Vernal and Autumnal Equinoxes? The Summer and Winter Solstices? The Equinoxes and Solstices occur on about what dates?

j. Be familiar with the material on pages 22-23.

k. What causes the Seasons? How does the rising and setting locations of the Sun (with respect to the horizon) change through the year? Where, approximately, does the Sun rise or set at the Summer and Winter Solstices?

l. Remember that the planets move along the ecliptic.

m. Read about the Milankovitch hypothesis. It may be correct.

4. Chapter 3. The Cycles of the Moon.

a. Know the phases of the Moon and how they change during the month. Know when the moon, in a particular phase, rises or sets or is on the meridian. (Look at page 34-35)

b. What is the length of a sidereal and synodic day or month? Which is longer and why? What is the rotation period of the Moon? What must it be to always keep the same face toward the Earth?

c. What are the Umbra and Penumbra of the shadow of the Earth or the Moon? What is a lunar eclipse? A Solar Eclipse? An Annular Eclipse? How often do they occur? Why don't eclipses occur at every Full or New Moon? What is the color of the Moon during a Lunar Eclipse and why?

d. What must be true about the angular size of the Sun and the Moon in order for solar eclipses to occur? When will the next solar eclipse occur that is visible from the US? Note that he defines perigee and apogee in this chapter. What are they?

e. What part of the Sun is best seen from the ground during a total Solar Eclipse.?

f. What is an eclipse season? What is the line of nodes of the Moon's orbit around the Earth? Note that the intersection of two planes is a straight line.

g. The Saros cycle is an "about" 18 year cycle caused by the orbit of the Moon precessing - just like the Pole of the Earth but faster around the plane of the ecliptic.

5. Chapter 4: Origins of Modern Astronomy

a. Where is Stonehenge? What was it used for? Where are some other astronomical alignments located (mentioned in class)? What is archeo-astronomy? What does it tell us about primitive people?

b. Look at the contributions of the Greeks. What was their world picture? What did Aristotle do? What did they believe about the Earth? Who was Aristarchus and what did he propose?

c. What is Parallax? Why did the fact that stars did not show any Parallax motion convince the Greeks that the Earth was not moving? Why were they wrong? (Look at pages 56-57)

d. What did Eratosthenes measure? How did he do it?

e. What is retrograde motion? What did Ptolemy invent to explain retrograde motion (incorrectly, of course)? How accurate were his predictions? The name of the circles upon circles model is the epicycle model. The circles are epicycles and they revolve around the earth on deferents.

f. Who were Copernicus, Tycho, Kepler, and Galileo and what were their contributions to studies of the motions of the earth and planets? How did Copernicus change the solar system in his attempt to understand retrograde motion? What did Tycho do? Where did he do it? The name of his observatory was Uraniborg.

g. What did Kepler do? Where did he obtain the observations that he analyzed?

h. What did Galileo do? Where did he live? What evidence convinced him that Copernicus and Kepler were right? What did he see through his telescope? What did he invent?

i. Who discovered the Galilean moons and how? Know that Venus goes through phases just like the Moon. What does this tell us and told Galileo - about the structure of the solar system?

j. Read about the trial of Galileo.

k. Know Kepler's 3 Laws of planetary motion. What is an ellipse? The Focus of the Ellipse, The semi-major axis of the ellipse. How do we calculate the semi-major axis?

l. Look at Figure 4-21. Try to understand when, in time, the various astronomers contributed to the development of astronomy.

m. What are the various parts of the scientific method?

6. Chapter 5. Newton, Galileo, and Gravity (Skip Einstein)

a. When was Newton born?

b. Know about Galileo and the experiments that he performed. He learned that falling bodies are accelerated, that the amount of acceleration did not depend on the mass of the object, and that motion was as natural as standing still.

c. Know Newton's 3 laws of motion. What is momentum? Why is velocity not the same thing as speed? What is acceleration?

d. What does F=ma mean? What happens if we apply the same amount of force to objects with different masses? Be familiar with Table 5-1

e. Know the Law of Gravity. What is an inverse square law? How is the recoil of a rifle explained by Newton's third law? What about a rocket launch?

f. Why do we talk about an orbiting space craft as being in Free Fall?

g. What is the circular velocity of an object in orbit? Remember that 'r' is the distance from the center of the earth, sun, etc to the satellite.

h. What is the distance from the center of the Earth to an object in Geosynchronous orbit? Why do we care about Geosynchronous orbits? (Pages 84,85)

i. The different kinds of orbits in an inverse-square-law force are ellipse, circle, parabola, hyperbola, straight line. Some are closed and some are open.

j. The escape speed is that speed that allows a space craft to escape from a planet. That does not mean that it has escaped from the gravity of the planet. Just that, if it is traveling at that speed or faster, it will never fall back to the planet.

k. Read how Newton re-discussed Kepler's laws and explained them. What does Kepler's Third law look like after Newton worked on it. How can we use it to determine the mass of the Sun, of Jupiter, the Earth, binary stars, ... (discussed in class)?

l. Read about the tides. Why is there a tide on the opposite side of the Earth from the Moon?

m. What are spring tides and neap tides?

n. SKIP 5-3

o. Try to do problems 1 and 3 on page 96.