Astronomy 161 – Introduction to Solar System Astronomy
Winter Quarter 2010 – Prof. Martini

Quiz 2 Study Guide

Please Note: While this guide lists the material I consider to be the most important, some of the other material I cover in class will still be on the Quiz.

General Advice:

Please read through the "Course Objectives" on the syllabus. These objectives are the guidelines I follow to determine the material we cover in this course, as well as the material I will use to evaluate you.

Quiz 2 will cover all of the material I have covered in class from the previous quiz. This corresponds to Lecture 10 (Planetary Motions) through Lecture 17 (Orbits).

As a general rule, I strongly recommend that you are familiar with all of the concepts I list on the "Key Ideas" slide and the "Warm Up Questions" I show at the beginning of class. The "Key Ideas" slides are also part of the lecture outlines available on the class website. I strongly encourage you to become familiar with these topics and understand why each is important.

Planetary Motions

Complex paths of the planets, including retrograde motion

Inferior and Superior planets, conjunction and opposition

Greek Astronomy

Aristarchos of Samos, his distance measurements, and his heliocentric theory

Development of the geocentric model, including the deferent, epicycle, eccentric, and equant

Copernican Revolution

Heliocentric System, including Copernicus' motivation for modifying Ptolemy's system

Opposition to a moving Earth and the influence of Aristotle on Copernicus

Brahe & Kepler

Brahe: Great observer who collected 20 years of precise planetary data

Kepler: Great theorist who analyzed Brahe's data, the importance of the motions of Mars

Kepler's Three Laws of Planetary Motion and why they are empirical laws

Galileo

Major discoveries with the telescope and their implications:

1) The Moon has craters and mountains, so is not a perfect sphere
2) Sunspots show that the Sun is rotating, so more plausible that the Earth is too.
3) Phases of Venus: inconsistent with Ptolemy's model, but not Copernicus'
4) Moons of Jupiter: Earth (or Sun) is not the only center of motion

Newton

Newton's Three Laws of Motion and why they are physical laws

Gravity

Galileo's Law of Falling Bodies

Newton's Law of Universal Gravitation: $F = G M_1 M_2/R^2$

In words: *The force of gravity is directly proportional to the masses of the two bodies and inversely proportional to the square of the distance between them.*

Orbits

Newton's generalization of Kepler's Laws

Closed orbits, open orbits, conic sections, and center of mass

Prediction of the Return of Halley's Comet

Some thought questions:

1. What observations made Aristarchus think that the Earth must orbit the Sun?
2. What role did epicycles have in the geocentric model? In Copernicus' model?
3. What drove Copernicus to reconsider Ptolemy? Why is he still considered an Aristotelean?
4. What is the distinction between a phenomenological model and a physical model?
5. What were some scientific objections to Copernicus? Religious objections?
6. Why is Galileo considered the first modern astronomer?
7. How did Newton restate each of Kepler's laws? Why are Newton's laws more fundamental?
8. Why is the *Principia* considered one of the most important books in history?