Astronomy 161 -- Autumn 2007
In-Class Quiz 2 Study Guide

Unit 3: The Revolutions of the Heavenly Orbs

Aristotelian World View
- Assumptions (uniform circular motion, fixed unmoving earth)
- Early Geocentric Systems
  - Eudoxus, Pythagoras, Aristotle
- Epicyclic Systems
  - Hipparchus & Ptolemy
- Early Heliocentric System
  - Aristarchus of Samos
- Ptolemaic Geocentric System
  - Epicycles
  - Equants
  - Preserving Appearances – esp. retrograde motion & change in brightness of superior planets at opposition.
  - Problems: complex, no way to measure planetary distances

Copernicus
- Motivations & Assumptions (disliked equant, wanted to restore uniform circular motion)
- Copernican Heliocentric System
  - Sun at the center
  - Earth rotates on its axis every 24 hours
  - Earth orbits (revolves) around the sun once a year
  - His use of epicycles and why he used them.
  - Successes:
    a) explains superior & inferior planets
    b) explains retrograde motion
    c) gives a geometric way to measure planetary distances
  - Problems: (a) moving earth
    (b) stellar parallaxes

Tycho Brahe: his observations & their significance

Johannes Kepler: his theoretical work & its significance

Kepler's Three Laws of Planetary Motion
- First Law
- Second (Equal Areas) Law
- Third (Harmonic) Law

Galileo's telescope observations & their significance
- The Moon
- Sunspots
- Phases of Venus
- Moons of Jupiter

Isaac Newton: work and its significance
- Laws of Motion
  - First Law (Law of Inertia)
  - Second Law (F=ma)
  - Third Law (Action & Reaction)

Unit 4: Gravitation, Light, & Matter

Newtonian Gravity
- Inverse-Square Law Force
- Dependence of the gravitational force on masses and distance of the two bodies.

Newton's Generalized forms of Kepler's Laws
- Shapes of Orbits
- Orbit about the Center of Mass
- Circular and Escape Velocity
- Measuring Masses with Newton's form of Kepler's 3rd Law

Tides
- Basic causes of gravitational tides
- Earth Tides caused by the Sun and Moon
- Tidal Locking
- Tidal Evolution of the Moon's Orbit and Earth's Rotation
- Lunar Recession
- Increasing Length of the Day

Gravity in the Solar System
- Gravitational Interactions among objects
- Lagrange Points
- The discovery of Neptune
- Slingshot orbits
- Orbital Resonances (Galilean Moons, Pluto)