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

Unit 3: The Revolutions of the Heavenly Orbs
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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
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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)