Astronomy 2291 – Exam 3 Study Guide

This exam will cover material in Chapters 6 and 8 through 11. The following are the topics we will cover on Exam 3. Note that not all topics on this sheet will necessarily be on the exam. Also, because we are talking about planets, you do need to know some basics of planetary orbits that we've been using throughout this section of the class, as described.

Telescopes:

- Diameter, Focal Length, & Image Scale
- Diffraction Limit – definition and applications
- Angular Size of an object ($\theta=2R/d$; R=radius, d=distance)
- Detection: signal-to-noise ratio, background- and source- noise limited regimes

Planetary Orbits:

- Given basic parameters of an elliptical Keplerian orbit (P, a, and e) be able compute the aphelion and perihelion distances.
- Kepler's Third Law for bodies orbiting the Sun with period P in years and semi-major axis a in AU.
- Newton's form of Kepler's Third Law for any two bodies with masses M_1 and M_2 in the limit that $M_2 << M_1$. Given two out of P, a, and M_1, be able to compute the third (e.g., given M_1 and a, compute P).

Generic Planetary Properties:

- Mean Density, including the approximate mean densities of different composition bodies (rock, ice, gas, and mixes of the two)
- Equilibrium Temperature in the rapid and slowly rotating case
- Definition of Albedo, and value in the blackbody case
- Central Pressure in the uniform-density approximation
- Gravitational Binding Energy (U) of a planet

Terrestrial Planets:

- Exponential atmosphere and definition of the pressure scale height.
- Atmospheric retention (smallest mean molecular weight retained)
- Interiors of Terrestrial planets (differentiation, cooling of interiors)

Jovian Planets:

- Hydrostatic Equilibrium
- Types of Gas Planets (Gas Giants and Ice Giants)
- Excess energy emission and gravitational contraction energy
- Interiors of Gas Planets

Small Bodies:

- Role of material strength in determining if a small body is spheroidal or irregular
- Compressive Strength (S), and use to estimate R_{sph} for the smallest spherical body
- Mean density of a body as a clue to composition (rocky, icy, rock+ice)
- Cratering density as a clue to young or old surface ages
- Reservoirs of small bodies in the solar system (comets, asteroid belt, TNOs, Oort Cloud)

Planetary Rings:

- Roche radius and relation to zone where rings form
- Ring gap moons and shepherd moons
- Composition of ring materials

Problems:

- Chapter 6: 6.1
- Chapter 8: 8.1, 8.3, 8.4, 8.5, 8.7
- Chapter 9: 9.9
- Chapter 10: 10.6, 10.8, 10.9
- Chapter 11: 11.1, 11.2, 11.7a, 11.7c