Physics 107 (astronomy): Exam 3 review sheet: Mostly Ch 5&6, plus Newton (e.g. Ch 3.2,3.3)

understand Newton's laws of motion as they apply to planetary motion

- in particular why must there be a force in order for an object to travel in a circle
- how Kepler's third law is extended by the understanding Newton brings to how objects move and how to use this form: $P^2 = \frac{4\pi^2 a^3}{G(m_1+m_2)}$ where P is the period in seconds, a is the semi-major axis in meters, m1 and m2 are the objects orbiting each other in kg.
- Understand what the circular orbit speed and escape speed are and how to calculate them

understand and be able to use Newton's law of gravity in simple cases: $F = \frac{Gm_1m_2}{r^2}$; where F is the size of the mutual attractive force, m1 m2 are the masses involved, G is Newton's gravitational constant and r is the center-to-center distance between the objects.

be able to successfully convert between any units necessary (conversion factors provided)

understand basic wave properties: wavelength, frequency, period, wave speed

understand how these wave properties are related to each other and the relation $v = f\lambda$

understand electromagnetic waves as resulting from accelerating charges

understand the idea of the electromagnetic spectrum

understand the qualitative relationship between wavelength and color in the visible spectrum

understand that the atmosphere is not transparent to all electromagnetic radiation

understand that an object at any temperature (other than absolute zero) emits electromagnetic radiation

understand that the thermal radiation emitted by a perfect absorber and emitter of radiation (a black body) has a continuous (smooth) distribution of intensity as a function of wavelength or frequency

understand these laws of thermal radiation and how to use them and where they apply:

- Wien's law: $\lambda_{Imax} = \left(\frac{3\times10^6}{T_{Kelvin}}\right) nm$
- Stefan's Law: $Flux = \sigma {T_K}^4$
- Power emitted = (Flux)x(area emitting)

understand the basics of spectroscopy:

- The ideas of the photon model of light and the relationship $E_{photon} = hf$

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- how the energy level structure of an atom leads the atom only being able to interact with certain wavelengths of light
- how an emission line spectrum is formed
- how an absorption line spectrum is formed

understand the Doppler effect qualitatively and quantitatively via $\frac{\lambda'}{\lambda} = \frac{f}{f'} = (1 + \frac{v}{c})$

understand the basic types of telescopes (retractors and reflectors) and some of the relative advantages/disadvantages

understand what determines the light gathering power of a telescope

understand what determines the angular resolution of a telescope and how to quantitatively use the relationship $\theta_{resolvable,radians} = \frac{\lambda}{D}$

understand the benefits of looking at the sky in other wavelengths of electromagnetic radiation

- improved visibility
- sensitivity to different energy scales

understand how the brightness of something like a star varies with distance qualitatively and quantitatively according to $Intensity = \frac{Power}{4\pi R^2}$ where Power is the total power emitted uniformly in all directions, R= distance between observer and emitter. Note that intensity has units of watts per square meter.

Study Suggestions:

Go through old HW (online and hand-in) and in-class exercises: make sure you understand WHAT they are about and HOW to do every one: the best way is to re-do them. For any item you didn't get right, make sure you know why and make sure you know how to do it correctly. Once you are sure what an item is about, try to imagine variations on the question. For example, for a quantitative problem involving a relationship among 3 quantities where I asked about quantity1 when quantity2 and quantity3 are known, imagine how you might phrase a question about quantity2 if quantity1 and quantity3 are known

Find problems similar to HW in the problems at the ends of the relevant chapters and work them.

Review the relevant parts of the textbook and my notes.

Come see me about anything you are unsure of—both "what's it about?" or "how to do a problem" issues, or anything else.

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