Astronomy C10 - Midterm 1 Review Sheet

Distance and Time

- speed of light: $c = 3 \times 10^8 \text{ m/s}$
- finite speed ⇒ we see things as they were in past
- light year (9.5 trillion km): one year's light travels in one year

Light

- light = "electromagnetic radiation" (oscillating electrical/magnetic fields)
- acts as waves/particles, depending on the circumstances

- light is usually composed of many different colors/wavelengths

- "blackbody" = an opaque object that reflects no light (can emit light)
  - spectrum looks like:
  - note: don't have to have a perfect blackbody to get a "blackbody" spectrum;
  - may need other sources.

- spectral lines:
  - emission: electron goes down on energy level, emits photon
  - absorption: electron goes up on energy level, absorbs photon

- doppler effect:
  - effect of moving emitter
  - $\Delta \lambda = \frac{V \cdot \lambda}{c}$
  - Doppler effect:
    - $\Delta \lambda = \frac{V}{c}$
    - $\lambda$: wavelength
    - $V$: velocity
    - $c$: speed of light

- telescopes:
  - primary purpose: collect more light
  - light-collecting power depends on area
    - large (or more) = better resolution
  - also: large telescope ⇒ better resolution
  - atmosphere distorts image unless you use adaptive optics
  - types of telescopes:
    - refracting: clear sky, no problems
    - reflecting: mirrors and optical systems

- sky/sunsets:
  - blue light scatters in air to blue sky
  - sun is white - bit of sunset, air scatters (and dust scatters) to blue light away so it looks yellow/red
Moon Phases, Eclipses, Sky & Celestial Sphere

Celestial sphere - imaginary sphere stars are "glued" to

Right sky - changes depending on time of year

Eclipses: normally no eclipse each month. Since Moon/Earth is tilted from Earth, 1/3 sometimes they line up.

Solar eclipse - moon blocks light of Sun

Seasons - tilt of Earth axis

Solar system / Orbits

Ptolemy: geocentric planets orbit Earth...

Kepler: improved heliocentric

1. Orbits are ellipses, Sun at one focus.
2. Planet moves faster when closer to Sun.
3. $p^2 = kR^3$ (period time)$^2 \propto \text{distance}^3$

Newton: laws of physics, even more improvements:

1. Inertia's velocity is constant unless there is a force.
2. $F = ma$
3. Forces come in equal opposite pairs
4. $F = \frac{Gm_1m_2}{d^2}$ (mutual forces acting between two objects)

Planets

Mercury
- No atmosphere
- No moons
- Very hot during day, cold at night
- Hard to study due to close distance

Venus
- No atmosphere
- No moons
- Hot on both sides

Earth
- Thick CO$_2$ atmosphere
- 1 moon
- Life could not exist

Mars
- Thinner CO$_2$ atmosphere
- 2 moons
- Life not possible

Jupiter
- Largest planet
- Many moons
- Storm spots

Saturn
- Ring planet
- Wind storms

Uranus
- Wind storm
- Very cold

Neptune
- Eighth planet
- Storm spots

Pluto
- Distant planet
- Storm spots

Terrestrial planets: small, rocky, rocky

Jovian planets: large, mostly gaseous

Comets:
- Similar to Jovian planets
- Made of ice and rock
- Some carbon-rich compounds

Solar system facts:
- Sun is 330,000 times larger and 93 million miles away
- Sun is 99% hydrogen, 7% helium
- Sun's energy output = 5.4 x 10$^{26}$ watts