

## Important Concepts for 1st Exam

- Early beliefs concerning extraterrestrial intelligence
  - Premises of design & plurality
  - Pythagoras' & Atomists' ideas
  - Aristotelian ideas
- Modern thinking
  - Copernican revolution
  - Biological discoveries
  - Astronomical discoveries
- Units in Astronomy
  - Distances & Sizes
  - Masses
  - Energy & Luminosity
- Properties of Radiation
  - Wave vs. Particle
  - Wavelength & frequency:  
 $\lambda\nu = c$
  - Brightness vs. Luminosity
  - Inverse square law:  $B \propto L/D^2$
  - Wien and blackbody laws:  
 $\lambda_{max} \propto T^{-1}; L \propto R^2T^4$
  - Spectra and spectral lines
  - Doppler shift:  $\Delta\lambda/\lambda = v/c$
- Stars
  - Spectral types
  - Range of masses, radii, surface temperatures, abundances
  - Hertzsprung-Russel diagram
  - Structure and lifetime
  - Habitable zones
  - Advanced evolution and death
  - Evidence of evolution
  - Binaries and binary evolution
- Nuclear burning and nucleosynthesis
- Abundances of the elements
- White dwarfs, neutron stars, black holes
- Galaxies
  - Types, structure and sizes
  - Components
  - Structure of Milky Way
- Interstellar Medium
  - Molecular clouds, gas and dust
  - Observing the interstellar medium, spin-flip radiation
  - Inferences from observed molecules
- Cosmology
  - Evidence for a Big Bang
    - Hubble's Law: expanding universe  $v = HD$
    - Background radiation
    - Nucleosynthesis
  - Age of universe,  $t \simeq 1/H$
  - The critical density
  - Closed vs. open universe
  - Modifications: Inflation
  - Universe's timeline
  - Anthropic principles
- Star and planet formation
  - Angular momentum conservation
  - Condensation and accretion
  - Planetesimal formation
  - Kuiper Belt and Oort Cloud
  - Formation of Earth
- Radioactivity
- Dating (including carbon)
- Geologic eons and eras
- Geologic timescales
- Evidence of early life
  - Micro- and chemofossils
  - Stromatolites
  - Banded iron formations
  - Seismology, Earth's structure
- Earth's habitability (might not include all topics)
  - Plate tectonics
  - Earthquakes
  - Greenhouse effect
  - Carbon cycle
  - Magnetic field and atmosphere
  - Snowball earths
  - Extinctions