Midterm 1 Material (25% of Exam)

Light
- Electromagnetic Spectrum
- Energy, wavelength, and frequency relationship

Spectral Lines and Spectra
- Absorption vs. emission vs. continuum spectra
- Discrete energy levels

Black body radiation
- Color as a measure of temperature
- Wien's Law
- Hotter = brighter everywhere (at all wavelengths)
- Luminosity, temperature, radius equation (Stefan-Boltzmann Law)

Telescopes
- Collecting area as light gathering power
- Better resolution (clarity) with bigger telescopes and smaller wavelengths
- Chromatic Aberration

Moon and the Phases, Earth-Moon Geometry
- Class 59b in entirety -- when and where the Moon rises and sets
- Eclipses and geometry to make an eclipse
- Seasons as a result of axial tilt

Motion of Planets
- Prograde vs. retrograde motion
- Ptolemy (geo-centric model) vs. Copernicus (heliocentric model)
- EXAMPLE: Phases of Venus correctly predicted with heliocentric model, not with geocentric model

Kepler's Laws:
- Orbits are elliptical
- Equal areas swept out in equal times
- P^2 proportional to a^3 ($P^2 = k\, a^3$, where k *is not actually a constant)*

Tides
- Differential gravitational force on a body (i.e., the Moon on Earth)
- TWO tidal cycles every day (high-low-high-low tide cycle)

The Planets
- Greenhouse effect: Atmospheres that let in solar radiation and prevent infrared from escaping mean DOOM for the planet in terms of surface temperature
- Frost line and the formation of the Jovian planets (gas giants) aided by the crystallization of water
- Roche Limit: radius inside of which smaller bodies (i.e., moons) are ripped apart by host body (i.e., large planet), leading to the formation rings
- Demotion of Pluto as a planet

Exoplanets
- Transit method vs. Doppler Wobble
- Orbits around a center of mass
- Calculating masses and radii from data
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Midterm 2 Material (25% of Exam)

Everything about the Sun
Spectra of Stars
Distance measurements
- parallax
Brightness and Luminosity
Mass - Luminosity Relation
HR Diagram
Stellar Evolution (leading up to its death)
- Difference between low, medium mass, sun-like star vs. high mass star
- Pre-Main Sequence, Main Sequence, Post-Main Sequence
Compact Objects
- White Dwarf
- Neutron Star
Supernovae
- Difference between nova and supernovae
- Type 1a Supernovae
- Type 2 supernovae
Black Holes
- Tidal forces,"Spaghettification"
- Gravitational Waves
- Swarschild radius
- Photon sphere
- Ergosphere
Different types of Galaxies
- Shapes
- Interaction with light (emission, absorption)
- Distance Measurement (Cepheid)
- Galactic Redshift (Hubble-Lemaitre law)
Composition of the Universe
- Dark Matter
- Candidates
- Proof of dark matter
Relativity
- Special and General Relativity Basic Concepts
Active Galaxies (AGN) & Quasars

Post Midterm 2 Material (50% of Exam)

Olber's Paradox
Hubble-Lemaitre Law
- Hubble's constant and Hubble tension
- Calculating the age of the universe using Hubble's constant

Cosmological Principle
- Cosmological constant
- Density parameter
- Curvature of the Universe

Accelerating Universe
- CS-287 and the expansion histories
- Measurement of 1a SNe spectra

Big Bang Theory
- Nucleosynthesis and formation of H and He
- Recombination and the CMB
- Horizon Problem
- Flatness Problem
- Inflation
- Grand Unified Theory

Cosmic Pie Chart
- 5% matter, 20% dark matter, 75% dark energy

Multiverse + Extraterrestrial Life:
- Reasons to speculate a multiverse
- Ultimate free lunch
- Drake Equation
- Fermi Paradox
- Energy Problem + Interstellar Travel