Outline of material that may be on the Final exam
This outline is taken straight for the lecture notes, without thought on the relative amount of time spent on each topic.

**How do we measure the properties of stars?**
1. spectra reveal **chemical composition**
2. spectra reveal **stellar temperature**
3. temperature yields the **flux** of an object (Stefan-boltzmann law)
4. parallax reveals the **distance** to a star
5. taking an image with our telescope directly yields the **apparent brightness** of an object
6. distance + apparent brightness = **luminosity**
7. **Radius - from temperature and luminosity**

**What is a star?**

**What Makes the Sun Shine?**
1. Is the Sun an average star?
2. Some current Solar research.
3. Hydrogen Fusion in the Sun
4. Estimate the lifetime of the Sun

**Where do the elements in my body come from?**
1. Post-Main Sequence evolution of Sun-like stars
2. Low mass stars produce C, N, O in the Universe
   - red giants, planetary nebulae, white dwarfs
3. Massive star death (> 3 Msun)- producers of all elements on periodic table
   - SN II, SN Ia, neutron stars

**Do Black Holes Suck?**
1. How big are black holes? - more massive black holes are larger
3. The gravity of black holes
3. Types of black holes
4. How do we “see” black holes?

**Galaxies and the fate of the universe**
1. HDF lets us observe galaxies throughout the universe
2. Use galaxy counting to estimate the mass density of the universe
3. How much mass does a galaxy contain?
   - Stars and gas and dark matter.
4. Connection between mass density and fate of the universe

**What is a galaxy?**