

## Astronomy Exam 3

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### Properties of Stars

- Spectral type is luminosity compared to temperature
- As wavelength goes to the right, temperature goes to the left
- Power law dependence between mass and luminosity
- The larger the star, the more luminous it is

### Video

- Layers of the sun
  - Does not have well defined regions of layer
  - Core- temperature exceed 10000000 degrees- thermonuclear reactions happen here
  - Radiative zone- energy from
  - Convective zone- goes all the way to the visible surface of the sun
  - Photospheres- are different depths of the visible surface of the sun
  - Granules are the convective bubbles
  - Chromosphere- much less dense than the visible surface of the sun- can be seen during solar eclipses- several thousand degrees hotter than the surface
  - Solar transition
  - Solar corona- very low density (a billion times less than the photosphere) cannot emit the energy
  - Corona can become the solar wind
  - Solar wind- ions are no longer gravitationally bound- they are liberated from the sun
  - Galileo found spots on the sun
  - The sun spots move around
  - They come and go
  - The suns rotation is 27 days
  - Every 11 years, the sun spots change in number
  - The spots are intense concentrations of magnetism
  - Solar flares are mass that has been ejected from the sun
  - Sun spots are enhanced by the differential rotation of the sun

### The Sun

- The surface is 6000 K
- Convective circulation near the surface
- Core, Convective zone, Radiative zone
- In the core- Nuclear reactions
- Fusion- protons fuse- it's because it's very hot
- Protons and electrons on the sun dissociate
- Positive and positive repel each other- Coulomb repulsion
- 1 Fermi distance- 1 Angstrom
- Protons turn into neutrons by emitting a positron and a neutrino
- A positron is antimatter
- Neutrino has no mass
- Neutrino is released because spin has to be conserved

- Charge has to be conserved
- Light comes from the interior of the sun
- Gamma rays on the inside of the sun
- Gamma rays come from fusion
- The gamma rays get transformed into visible light
- Granules can be the size of a US state
- Majorana particle- a particle that is it's own antiparticle
- Why are sun spots dark- they are cooler relative to the surrounding
- You can't cut a magnetic field
- Magnetic fields have to close
- The magnetic field of the sun extends far outside of the solar system
- The sun goes around the galactic center
- Gravity keeps us in orbit around the galactic center
- Chromosphere is violet
- We see the photosphere