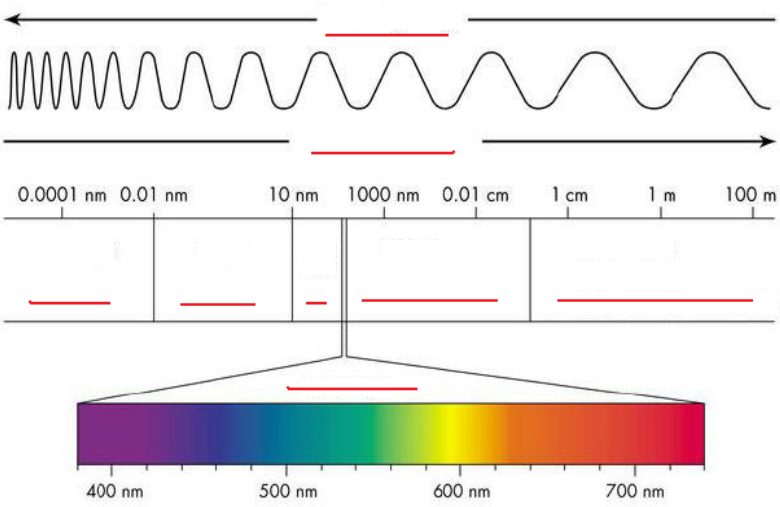
ASTR100 Spring 2010: Exam #2 Review Sheet
EXAM is Tuesday, April 20th, Chapters 5-10
Review Session April 19th, at 7:00pm in Phys 1412

Warning! This Review Does NOT Cover Every Topic on Exam

Other Resources available:
A] http://www.astro.umd.edu/~hamilton/ASTR100/
B] **READ THE BOOK!** Try the problems at the end of each chapter (MC solutions in the back)
C] Email your TA if you have any specific questions I could answer online
D] Come to TA Office hours (see webpage)
E] Come to the review session on **April 19th, at 7:00pm** in Phys 1412

Light:

1) What type of EM radiation has the longest wavelength? Highest frequency?
2) What color of visible light has the most energy? Why?
3) Name the four ways light interacts with matter.



4) What type of spectrum will a neon light produce? A regular filament light bulb? A star?
5) Why do atoms absorb/emit only certain values of energy?
6) If you double a star's radius and change nothing else, how will the luminosity change?
7) If a star has twice the peak wavelength of emission as our Sun, is it hotter or colder at the Surface? By how much? What is Wien's Law?
8) If a star's spectrum is blueshifted, is it moving towards or away from us? What is the Doppler Effect?
9) What are some advantages of putting a telescope in space?

Solar System:

1) What are some clues that help us figure out how the Solar System formed?
2) List the planets in order from closest to the sun, to furthest.
3) Explain the difference between Terrestrial and Jovian planets.
4) Explain the difference between Oort Cloud, Kuiper Belt and Asteroid Belt.
5) Describe the Solar Nebula Hypothesis.
6) How do we find extra-solar planets? Explain each technique's advantages and disadvantages.
7) Why is Pluto no longer categorized as a planet? What are planetesmals?
8) What is the frost line, and what does it separate?

Earth and Terrestrial Planets:

1) There are four main factors that affect surfaces. Name them: _____, _____, _____, _____
2) Which of these processes are found on Venus?
3) Name some unique features of Earth that help it support life.
4) Describe the CO2 cycle on Earth_____
5) Describe the inner structure of the Terrestrial Planets and how larger planets take longer to cool.
6) Explain the tidal forces that act between the Moon and the Earth.
7) Describe the Runaway Greenhouse Effect. On which planet has this occured?
8) What happened to all of the CO2 in the Earth's early atmosphere?

Jovian Planets:

1) What is the composition of each Jovian Planet? How do these explain the Jovian atmospheres?
2) Why do Neptune and Uranus look blue? Why does Jupiter have Red and White stripes?
3) What causes Io to heat up enough to be volcanically active? How are the other Jupiter Moons different?
4) Which planets have rings, and what are they made of?
5) How did these Jovian Planets get so many satellites? How did they form?

Comets and Asteroids:

1) Where do Comets spend the majority of their time? (Oort or Kuiper / Aphelion or Perihelion)
2) Describe the difference between Meteor, Meteorite, Meteoroid and Asteroid.
3) There are two tails on a comet. What is each made of, and why do they point in different directions?
4) Name different types of impacts, and how they can change the structure or composition of a planet.
5) What are Trojan Asteroids? Why can we not see them?
6) Describe the difference between Oort Cloud and Kuiper Belt objects. Where did these objects form?
7) Why do we have meteor showers at different times of the year? What are they caused by?

Our Sun:

1) What is the visible surface of our sun called? Is it the hottest/coldest region? Why?
2) Describe the steps of the proton-proton chain. (More than just Hydrogen = Helium + Energy)
3) Draw and label each zone of the sun (Corona, Radiative Zone, Convection Zone, Chromosphere, etc)
4) What happens in each of these zones? How long does it take for energy to reach the surface?
5) What phase of its life is the Sun in right now? What will happen in 5 billion years? And after that?
6) How did the Sun form, and what will it end up as?
7) What is the surface temperature of the sun? What is the temperature at the core?
8) Explain how the Gravitational Contraction and Gas Pressure balance keeps the sun from collapsing.
9) Why does the temperature need to be so high for fusion to occur?
10) Why is there more Helium in the core of the sun now that when it was formed? What about outer layers?
11) When the Sun start to run out of fuel why will the temperature start to rise?

Other Stars:

1) Suppose we know two stars have the same Luminosity, but one looks four times brighter than the other. How much closer is it? (Use the inverse-square law and ratios)
2) What are spectral classes? Which spectral class is our Sun?
3) What color are K and M stars? Are they colder or hotter than O and B stars?
4) What type of spectral class stars have the shortest lifespan?
   KNOW THE HR DIAGRAM!!!
5) Along the Main sequence of stars where are the highest-mass stars found?
6) What is the range of masses of newborn stars? _____Msun - _____ Msun
7) Be able to draw a line describing the life path of low mass stars and high mass stars on the HR diagram.
8) What is the minimum mass an object must have to be considered a Sun? Why?
9) What types of stars burn their hydrogen via the CNO cycle?
10) How can we determine the age of a star cluster? How does its position on the HR diagram look?
11) After a large star completes its hydrogen burning phase in the Main Sequence, explain the process in which more energy is created. How much longer will this process last?
12) What is the heaviest element a star can create in its core? What occurs in the core's outer layers?
13) Once the star is complete out of fuel, what happens?
14) What is the difference between Planetary Nebula and Supernova?

Stellar Remnants:

1) What is the difference between White Dwarfs, Brown Dwarfs, Neutron Stars, Pulsars, and Black Holes?
2) What are the upper limits to the mass contained in each of these objects?
3) What are the relative sizes of each of these objects?

4) When a White Dwarf reaches this limit what happens? Why is this so important?
5) What is a regular Nova? Why can White Dwarfs can many Novae?
6) What is the Event Horizon around a Black Hole?
7) How do Electron and Neutron Degeneracy pressure support White Dwarfs and Neutron Stars?
8) What is a binary system of stars? How many is too many to be stable in the system?
9) What is an Accretion Disk? What is an X-Ray Binary?

Example Math Problems that you might see on the exam!

1) If we found a star that was twice as large, and ten times as hot, how many times brighter is it?

$$L = 4\pi R^2 \sigma T^4$$

2) If that star is 10 times as hot, what wavelength would its peak radiation be?

$$\lambda_{max} = \frac{b}{T}$$

b = 2897768.5 nm·K
(all equations and constants will be given)

3) Imagine an exoplanet with mass 0.001 Msun orbiting a star with the same mass of the Sun = Msun. If we observe a Doppler pattern that repeats ever 1/8 years what is the separation between the star and the planet? Remember Newton's Version of Kepler's Third Law.

$$\mathbf{M_1 + M_2 = A^3 / P^2}$$

4) Now assume we measure the orbit of a binary star system and find that the Period is P = 3 years, and the distance A = 3 AU. If the mass of one star is 2 Msun find the mass of the other star.

5) Now image that both stars in a different binary system are spectral class K9 V. Their orbit is found to have a distance A = 100 AU, and period P = 1000 years.
Find the Mass of both stars.

6) If the wavelength of orange light is 600 nm or 6 x 10 ^ -7 meters, find the frequency:
Remember that the speed of light is c = 3 x 10 ^ 8 m/s

$$\lambda = \frac{v}{f},$$

7) Find the shifted wavelength that we would observe if the radial velocity of the object is 1/3 the speed of light and the rest wavelength is 300nm.

$$\frac{v_{rad}}{c} = \frac{\lambda_{shift} - \lambda_{rest}}{\lambda_{rest}}$$

FILL IN THE BLANKS