April 8th , 2004 **Astronomy 100** Dr. Warner

Review for the 3rd midterm exam

DISCLAIMER: THESE NOTES SHOULD HELP FOR THE PREPARATION OF THE THIRD MIDTERM EXAM. THEY INDICATE HOW TO DISTINGUISH THE ESSENTIAL FROM THE LESS ESSENTIAL MATERIAL. HOWEVER, THEY ARE NOT MEANT TO BE A COMPLETE LIST OF THE ESSENTIAL MATERIAL. **CAVEAT EMPTOR.**

Material appropriate to midterms 1 and 2 will not be specifically examined on midterm 3, **with the exceptions: (i)** of earlier material that is relevant, or built upon in the chapters that we have studied since midterm 2, and **(ii)** of material in chapter 7 that is pertinent to the formation of the solar system and stars in general.

Your best guide to what will be on the midterm is a combination of this sheet, the handout called ***Notes on Stars***, homework 3, the old midterm and of course your lecture notes.

Loose ends in planetary astronomy; the debris, Pluto-like objects and chapters 16,17.

Planetary magnetic fields. Resonance, ring structure, orbital resonances. Asteroids: where found, typical size and number. Kirkwood gaps. Icy planetesimals, Pluto, Charon, Triton and Plutinos. The Edgeworth-Kuiper belt and the Oort Cloud. Meteoroids (and what becomes of them): become familiar with the most important terminology. Comets: what they look like from Earth, and what causes their tails. The role of comets in seasonal meteor showers. Effects of major impacts with Earth and probable relation to Dinosaur extinction.

Chapter 18: The Sun

Size, density, composition. Basic structure: photosphere, chromosphere, corona and interior - the characteristics of these regions. The role of convection and radiation. The ideas of thermal and hydrostatic equilibrium. Sunspots and the solar cycle. The basic observational features of the solar cycle. What is the source of energy, how long will the Sun still shine. Thermonuclear fusion in general, and why it requires very high temperatures and pressures. Release of energy via fusion or fission: the stability of iron. The solar neutrino problem.

Chapter 19 -21: Stars in general

How distances to stars are measured - parallax, and its limitations. The parsec and the light year as important units of distance (it might be in order to learn their values). Proper motion (and their typical values) and how it relates to tangential velocity. The idea of luminosity, and its connection to temperature and surface area, and thus radius, of the star. (A review of the relevant parts of chapter 5 might help here.) The connection between (apparent) brightness, luminosity and distance (inverse square law). The meaning of apparent and absolute magnitude - how steps of magnitude relate to brightness. Color and their relation to stellar temperature. Again, a review of the relevant parts of chapter 5 might help. Learn the principal spectral classes OBAFGKM(LT) (the famous mnemonic), and how they relate to color and temperature and spectral lines. The Hertzsprung-Russell (HR) diagram: it is not a random scatter diagram, but that it has a very definitive structure. Learn the principal features (main sequence, red giants, horizontal branch, asymptotic giant branch, white dwarfs). How spectroscopy (luminosity class) helps to resolve ambiguities about where a star of a given color is in the HR diagram. How this knowledge, and the apparent brightness

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can be used to determine distances to stars (spectroscopic parallax). How we estimate interstellar reddening ("the crud"). Stellar masses: the role of binary stars in determining masses. The mass-luminosity relation. Stellar lifetimes.

Chapter 22 - 24: Deaths of Stars

You should refer to the handout "Notes on Stars." You should know the basic features of the birth, life and death of stars, and you should be able to track this on the Hertzsprung-Russell diagram. Birth from interstellar clouds. The mass ranges of viable stars. Brown Dwarfs. The key steps in the life and death of star: Core burning and shell burning of Hydrogen, Helium, ... The effects of different fusion phases on the luminosity and temperature of the star as seen on the HR diagram: Main sequence, red giants, horizontal branch stars, asymptotic giant branch stars, red supergiants and white dwarfs. How low mass stars live and die and the origins of planetary nebulae and white dwarfs. How high mass stars die: Core collapse and type II supernovae. Binary systems, novae and type Ia supernovae. The synthesis of elements and effects of supernovae. H-R diagrams of star clusters.

Stellar remnants:

The basic types of stellar remnant: White dwarfs, neutron stars and black holes. How white dwarfs and neutron stars form and what they are. Degeneracy pressure; Chandrasekhar limits; Pulsars, how they were found and what they are. The exam will not cover black holes in any detail (except possibly for how they are formed and the associated Chandrasekhar limits), and so I will save more detailed questions about black holes for the final....