

Physics 104- Astronomy  
Final Exam Study Guide

The final exam will consist of about 50% old material (recycled from the first two midterms) and 50% new material. There will be 40 multiple choice questions. You will be required to answer 3 out of 4 essay questions. 2 of the essay questions (possibly modified slightly) will be taken from the first 2 midterms. So... **Study the first two midterms!**

I will not ask you to do any math on the exam. You are allowed to bring **TWO** 8.5" by 11" pages of notes (All Four Sides!) to the exam. The exam will cover the topics listed below. The relevant chapters are listed in the syllabus.

### **The Sun**

- Why does the Sun shine?
- What is the basic process of energy production in the Sun?
  - What is fusion and what is the Sun fusing?
  - Why couldn't the Sun be combusting?
- How do we know the Sun's temperature?
- How do we know the Sun's composition?

### **Stars**

- What is the difference between luminosity and apparent brightness?
- What determines the luminosity of a star?
  - Know the relationship between the luminosity, temperature, and radius.
- What determines the APPARENT brightness of a star?
- How does the magnitude system work?

### **Stellar Evolution**

- What is a Main Sequence star?
- When does a star leave the main sequence?
- What is a Red Giant? What is its internal structure?
- What is a Horizontal Branch star? What is its internal structure?
- How does the evolution of low mass stars differ from that of high mass stars?
- What is the end stage of low mass stars?
- What is the end stage of high mass stars?

### **Distances**

- What are the major distance measures that we use and how do they work?
  - Radar ranging, parallax, Main Sequence Stars, Cepheid variables, Super Nova Explosions
- What distance scale is each one useful for?

## **Dead Stars**

What are these objects and how do they form?

White Dwarfs

Neutron Stars

Black Holes

What is degeneracy pressure, and how does it relate to the above objects.

What is a Pulsar?

Black holes

What is the connection between Einstein and black holes?

Why is a black hole black?

What is at the event horizon?

What happens when you fall into a black hole?

Time Dilation

Red Shift

Tidal forces

## **Milky Way**

What was the Kapteyn/Shapely argument all about?

General Structure (three main components)

Composition, metallicity, stellar population, and orbits of each component

Star Formation:

Where is star formation in the galaxy occurring today (and why)?

Why are young star clusters blue and old ones red?

Rotation Curve

What IS a rotation curve

What is the rotation curve of the Solar system?

What is the OBSERVED rotation curve of the galaxy?

What is the PREDICTED rotation curve of the galaxy?

Be able to explain the rotation curve discrepancy and what it implies.

## **Galaxies and Galaxy Evolution**

What are the three basic types of galaxies?

What are their primary distinguishing characteristics?

What are the two major theories of galaxy formation?

Describe the stellar populations of each galaxy type.

## **Cosmology**

Why did Einstein introduce the cosmological constant?

How did Hubble destroy it?

What observation did Hubble make that ruined Einstein's static Universe?

What does Hubble's observation imply about the Universe?

How do we determine the age of the Universe?

Why is the Universe 25% Helium?

What were the 'Dark Ages'?

Why were they dark?

What is the Cosmic Microwave Background?

Why is it significant?

Dark Matter

How did Newton fix Kepler's third law?

What is the evidence for Dark Matter?

What are the leading explanations?

What determines the shape of the universe?

What is its current apparent shape?

What are the possible fates of the Universe?

What determines its fate?

What did the Hubble project discover about the fate of the Universe?