## **STUDY GUIDE FOR FINAL**

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Final is schedules for Monday, December 14, 9:00 to 12:00 (noon) in our class room WEL 3.502.

The final exam has 30 questions in Part A and 14 in Part B.

You will be asked to answer all questions in Part A and to attempt TWO of the Part B questions.

ALL questions have been taken from Homeworks 2-6 and Quizzes 1-3. In a few cases, minor changes of wording have been made. In a few cases, Part B questions combine parts of previously different questions. Some questions involving simple arithmetic have been recast with different numbers. Previous questions based on Chapters 1, 2, 3 and 4 of Seeds & Backman have not been selected.

Introduction

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## Part A

Newton's Law of Gravity and his Laws of Motion?

The principal regions of the electromagnetic spectrum as ordered by wavelength and frequency? Which regions are not blocked by the Earth's atmosphere?

How do the light gathering power and the resolving power of a telescope depend on diameter of the principal mirror, wavelength and the Earth's atmosphere?

What form of spectrum is emitted by a blackbody? Wien's law? Stefan-Boltzmann law?

Understand that the luminosity of a star depends on surface temperature and radius: L proportional to radius-squared times temperature to the fourth power.

Understand the sequence of spectral classes (OBAFGKM) and luminosity classes (I to V), and the color-temperature sequence (in the absence of dust)

What is the relation between Doppler effect and the radial velocity of an astronomical object?

Know the mass range of stars, the mass-luminosity relation of main sequence stars and the lifetime of main sequence stars

Know radii of typical stars: main sequence, red giants, white dwarfs and neutron stars

What distinguishes visual, eclipsing and spectroscopic binaries?

What are the major differences between Type Ia and Type II supernovae?

What are the major evolutionary stages experienced by a 20 solar mass star?

Why are Cepheid variables so valuable to astronomers? What is their period-luminosity relation?

How did Shapley determine our distance from the center of the Galaxy?

How did Hubble show that the Andromeda nebula was very distant?

What is the principal source of helium in the atmosphere of a main sequence star?

What is the cosmological principle?

What is Hubble's law for the expansion of the Universe?

Know the relative sizes of representative objects

## Part B

What determines the superiority of mirrors over lenses in constructing large optical telescopes?

What external factors negatively affect the performance of ground-based optical and radio telescopes?

Why put a telescope on the Moon?

Describe and explain the Doppler effect.

What led Newton to argue that the Moon was pulled toward the Earth?

How was Neptude discovered?

What was so puzzling about the orbit of Mercury?

Hydrogen is the most abundant element in all but a true minority of stars yet Balmer lines of hydrogen are not always present in the spectrum of a star. Why?

How do we 'know' that the Sun has a very hot core in which energy is being generated?

Why does nuclear fusion not occur in cold gas?

How rapidly is energy from the Sun's core transported by radiation to the Sun's surface?

What is the mass-luminosity relation for main sequence stars and its consequences for the lifetime of such stars?

How does a main sequence star adjust to the exhaustion of hydrogen in its core? What is helium burning?

What is a neutron star and its relation to pulsars?

How a black holes detected and their mass estimated?

Why are Cepheid variables useful for measuring distances to other galaxies? Why and how has the Hubble Space Telescope been so useful in distance measurements?

What is meant by 'metal-rich' and 'metal-poor' stars?

What is the 21-cm line of hydrogen? Why is it so useful in exploring velocities within galaxies?

What was Hubble's tuning form diagram for E, S and SB galaxies?

Does the diagram represent an evolutionary trend?

What is Hubble's law for the expansion of the Universe?

How are expansion velocities and distances to distant galaxies measured?

How are Hubble constant and age of the Universe related?

What are quasars? How do we know that they are as small as a few light days across? And nuclei of galaxies?