

# Study Guide for Final Exam

Astronomy 105G: The Planets  
Spring 2009

**Exam date: Thursday, May 7**  
**BX 102: 8am – 10am**  
**Review Session: Wednesday, May 6, afternoon**

The final exam will cover all of the material from this course. From the textbook, that includes Chapters 1-11 and 14. It also includes all of the 26 lectures, as well as the 13 labs. Moderate emphasis will be put on the material you have not yet been tested on, which is roughly chapters 10, 11, 14, lectures 20-26, and labs 11-13. Since this is a cumulative course, you are responsible to be familiar with **all** the topics that were covered. This first few sections of this study guide is intended to outline what is important in the areas for which you have not yet been tested. The rest of the study guide contains the sections from the guides of the previous exams. Remember that *if some broad topic from these sections is not listed here on this study guide, it probably will not show up in the exam.*

Another helpful study tool for you would be to go back and look at all of your homeworks. The solutions to every problem is online on the webpage, so you can check your answers to the correct ones. Any questions you come up with you can bring to the review session. Also, the previous quizzes and exams are online with solutions provided.

The format of the final exam will not deviate much from the first two exams: some combination of multiple choice, true false, short answers, labeling figures, and short quantitative problems. Bring a calculator, if you don't have one don't worry. Most or all of the problems you can do without one.

Below is a list with some explanation of the things you should be familiar with. You will not have to memorize complicated equations or constants. These will be provided if necessary. The numbers and headings below do not necessarily correspond to the numbering or labeling scheme used in your textbook. **Note:** Since homework about the Sun (chapter 14) will not be assigned, I've included a section of recommended problems you should be able to solve from the end of that chapter. It is advised that you spend some time going over these problems and ask about any difficulties **before** the day of the final.

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## I Suggested Problems for Chapter 14 about the Sun

You should be comfortable answering and solving the following problems:

- 2, 5, 10, 13, 17
- 20, 21, 24, 25
- 30, 31, 33, 34, 38
- 40, 48, 51, 53

## II The Sun

1. How does the Sun continue to burn brightly after 4.5 billion years? How does nuclear fission work, and why doesn't it occur on Earth?.
2. What are the different outer **and** inner regions of the Sun? What distinguishes these regions? What is a photon's life like once it's generated in the core?
3. What are the various ways we can "see" inside the Sun, i.e., how does helioseismology basically work?
4. What forces are balanced to keep the Sun together?
5. What do magnetic fields do on the Sun? Are the magnetic fields dangerous to humans? In what ways? How do we know there are magnetic fields?
6. What are the long term trends of the Sun with respect to its magnetic activity? How do sunspots migrate over the life of a solar cycle?
7. Age of the Sun and its expected lifetime
8. Understand some of the interesting features on the solar surface like sunspots, limb darkening, and granulation. What causes these phenomena?

## III Jovian Planets

1. Even though the Jovian planets are very similar, there are still big differences. Understand the different **compositions**, heating mechanisms (or lack thereof), atmospheric stratifications, and magnetic properties.
2. What are Jovian rings made of and how are they formed and maintained?
3. The properties of the long-lived "storms" observed on some Jovian surfaces.
4. Why do Jovian atmospheres look the way they do (color, structures like belts and bands)? What are the 4 atmospheres made out of?

## IV Jovian Moons

1. Why are some Jovian moons so volcanically active? Why are they more active than terrestrial planets of similar size (remember how important size is)?
2. Some of the moons are believed to have sub-surface oceans of liquid water. How do we know this? What evidence exists to conclude this crazy idea?

## V Atmospheres and Weather of Terrestrial Planets

1. Understand the details of the greenhouse effect, which substances play a role, how radiation comes into play, and the runaway greenhouse effect.
2. What are the different interactions of radiation with different layers of the atmosphere, in general?
3. Why is Earth so interesting with respect to its atmosphere? What supplied it with oxygen? Where did the carbon dioxide go?

4. What happened to Venus to make it so different than Earth even though their sizes are so similar?
5. What missions are currently improving our understanding of Mars?
6. Understand the different layers of the Earth's atmosphere. Where do the greenhouse gases lie? Where is UV absorbed? What does the temperature profile look like in each region?

## **VI Overview of the Solar System**

1. Relative sizes and temperatures and order of the planets and moons
2. Similarities and differences among all solar system objects

## **VII Formation of the Solar System**

1. Understand the concept of radiometric dating and how to apply it
2. The reasons why the terrestrial planets are where they are and why the Jovian planets are where they are.
3. Locations of the comet and asteroid belts.

## **VIII Geology of Terrestrial Planets**

1. Why are the surfaces of terrestrial planets the colors that they are, especially Mars?
2. Be familiar with some of the major missions to terrestrial planets.

## **IX Basics of the Earth, Sun, Moon System**

1. The reasons for seasons on Earth and how they change over the course of a year.
2. How the Earth orbits the Sun. Is it circular? What is the orbital plane like?
3. Phases of the Moon.
4. Orbit and rotation of the Moon.
5. Solar and lunar eclipses, what positions lead to these occurring?
6. Where did the Moon come from?

## **X Radiation and Matter**

1. The wave properties of light. How are frequency and wavelength related?
2. Understand the basic idea of the electromagnetic spectrum, that it shows a range in frequency and wavelength, where visible light fits in.
3. Why are we studying light in an astronomy class?
4. Understand Wien's Law and the Stefan-Boltzmann Law telling us how light frequency is determined by the temperature of an object.