Astronomy 101: Final Exam Guide
Fall 2007, San Diego State University, 2007.12.04, Prof. Leonard

As stated in the course syllabus (i.e., p. 5 in your Reader), the final examination for this class will occur on Tuesday, December 11, and will take place at the following times and locations:

Section 9 (11 AM class): Tuesday, December 11, 10:30 AM → 12:30 PM, Room PA 216 (normal lecture room).
Section 5 (2 PM class): Tuesday, December 11, 1:00 PM → 3:00 PM, Room NE 60 (normal lecture room).

Details about the content of the final exam are spelled out in this packet, but here are some highlights:

1. The final exam will consist of:
   • 75 multiple choice questions (worth 75% of the exam grade).
   • 1 essay question (worth 25% of the exam grade).

   On page 6 of this handout you will find three potential final exam essay questions. One of the three questions will appear, in the exact form that it is written in this handout, on your final exam.

2. The final exam must be taken at the scheduled time, and no makeup (or early) exams will be given under any circumstances.

3. The final examination is cumulative, and will cover the entire course’s content with roughly equal emphasis.

4. You will have the full 2 hours to work on the exam.

5. As with the midterm exams, you will again be permitted to bring an official “cheat sheet” to the final exam (it is attached to the end of this packet).

Exam Day

When you arrive to class on the exam day, please do not take a seat until told to do so. Copies of the exam, with individual names on them, will be placed on all desks before you may sit down. Thus, before the room is set up, please wait outside the lecture room. Everything should be ready by the nominal start time for the exam.

Please bring the following to the exam:

1. A ParSCORE FORM No. F-289-PAR-L scantron form. These may be purchased at the campus bookstore and are pink in color. To save exam time, you may fill out parts of the form ahead of time. This includes:
   (a) Top of form: The ‘Name’ (Last, First, Middle), ‘Subject’ (Astro 101), Date (Dec. 11, 2007) and ‘Hour/Day’ (T/Th 11:00 AM or T/Th 2:00 PM, depending on your section).
   (b) Right hand column of form: Write and bubble in your RED-ID number in the spaces for ‘I.D. Number’. Leave the ‘Test Form’ and ‘Exam Number’ sections blank. Do not write anything on Side 2 of the form.

2. A number 2 pencil and a good eraser!

3. Your official “Exam cheat-sheet” (to be detached from the end of this packet), with your name at the top, and all the information you want inside the box.

   Note that no calculators will be permitted during the exam.
About this Guide

This guide is intended to assist you with your preparation for the exam. It provides suggestions that I hope you will find useful.

—Disclaimer: This guide is not all-inclusive, and in no way should serve as a substitute for your own, self-directed preparation for the exam.

What Should I Study?

Everyone has their own best method for preparing for an exam. Here is my suggestion for a useful way to prepare for this particular test.

1. Gather together all of the weekly reading assignments, course handouts, and on-line reading quizzes that have been distributed or taken throughout the course. This includes:

   (a) Weekly reading assignments 1 → 15.
   (b) On-line reading quizzes for weeks 2, 3, 4, 6, 7, 8, 11, 12, 13, 14 with solutions.

   If you are missing any of the weekly reading assignments, handouts, or reading quiz solutions, they are all available for download from the course website:
   
   http://sciences.sdsu.edu/~leonard/astro101

   Once you are at the course web-site, simply click on the links for “Weekly Assignments”, “Class Handouts”, or “On-Line Reading Quiz Solutions”, to download and print out the material that you need.

2. Review the Course Reader. Since you may not have time to completely reread the textbook for all of the sections covered during the semester, I would start your review by carefully reviewing the “Selected Powerpoint Slides” that begin on page 18 of the Course Reader and continue through page 125. In general, these slides contain a substantial amount of writing (as opposed to pictures), and often provide a quick listing of the major points/ideas/people/terms that are important to have mastered in that particular subject area. While these slides do not encompass “everything” for which you are responsible, they do tend to emphasize the most important items that you want to be sure to understand. Look these over carefully, and make a note of particular areas in which you feel additional study is needed.

3. Look over the “Key Concepts, Terms, People and Ideas” list, from the course syllabus. Pages 9 – 16 in the course syllabus section of the Course Reader provide a list of key items covered during the whole course, most of which were written on the board at the start of classes, and then covered during the lecture. Being able to define/describe each of these terms is a useful way to be sure you have covered all of the major points of the chapters. As was true with the Powerpoint slides handouts, note down any words with which you are unfamiliar.

4. Review the textbook and Course Reader readings. Here are the sections of the text, and readings from the Course Reader, that we have covered during this course, and for which you are explicitly responsible:

   1Note that there were a few slides that were skipped during the course. The slides that were NOT covered during our course include those on the following pages: 79 (bottom slide), 80, 92 (bottom slide) – 100 (top slide), 103 (bottom slide), 104, and 105 (top slide). These “skipped” slides were replaced with “summary” slides containing the information that you are responsible for knowing. As a convenience, they are reprinted on page 4 of this handout.

   2Note that a few of the terms were not covered during the course, and so you are not responsible for knowing them. These include: “Principle of equivalence”, “space curvature”, “gravitational time dilation”, “gravitational redshift”, “spacetime diagram”, “gravitational waves”, and “period-luminosity (P-L) relation”, on page 15.
For a few topics that we only briefly covered in class, textbook readings were not assigned. For these topics the information for which you are responsible is contained entirely on the following Powerpoint Slides:

Chapter 5: Only material contained on the slide entitled “Chapter 5: Astronomical Instruments”, found on page 60 of the Course Reader.

Chapters 8 – 12: Material contained on slides entitled “Chapters 8 – 12: What You Need to Know”, found on pages 70 – 72 of the Course Reader. (Note that this material is in addition to the short reading passages that were assigned from these chapters – see above listing.)

Given time constraints, it may not be possible to completely reread all sections of the textbook that were assigned (although this is, of course, recommended!). You should focus your efforts on those particular topics that you previously identified as being in need of review.

5. Prepare for the essay question. As stated earlier, there will be one essay question on your final exam, and it will be one of the three essay choices that is given on page 6 of this handout. Thus, you know the possibilities for the exact essay question that will appear on your final. Spend some time now organizing your thoughts for each of the potential essay questions. The key to doing well on the essay is to write your response as though you are teaching the reader about the subject. In other words, do not write as though it is your astronomy professor who will be reading your answer. Rather, take the approach in your response that you are explaining your answer to another student who has not had the benefit of Astronomy 101. So, answer the questions carefully, with as much detail as you feel is necessary to thoroughly explain your answer.

6. Review/retake the on-line reading quizzes. Now that you have completed your review of the material, test yourself by retaking the old on-line reading quizzes. Questions that you get wrong should be investigated to make certain you understand why you incorrectly answered it.

7. Take the sample exam multiple choice questions. A sample of 5 questions is included on p. 5 of this guide, and are indicative of the difficulty and content of the actual exam (in fact, an exam with 80 questions was written, and then 5 questions were randomly picked out of it to form the sample questions in this guide, with the remaining 75 serving as the exam itself). While 5 questions can not encompass the full scope of the test, they should give you a sense of the types and level of difficulty of the questions that will be asked.
Where Can I go for Help?

Help is available before the exam through:

- **My office hours**: Tuesday and Thursday, 3:30 – 5:00 PM (Rm. 238 physics building).

- **TA help room hours** (Rm. 215, physics-astronomy building):
  
  **Monday**: 12 – 2 PM; 5 – 6 PM  
  **Tuesday**: 12 – 2 PM; 5 – 6 PM  
  **Wednesday**: 12 – 2 PM; 5 – 6 PM  
  **Thursday**: 12 – 3 PM  
  **Friday**: 11 AM – 12 PM; 1 – 2 PM  

  → Meeting with any of the teaching associates will be helpful. Note, though, that the two teaching associates who are specifically involved with your section of Astronomy 101 are in the Astronomy Help Room at the following times:

  Azalee Bostroem: Monday 1 – 2 PM and Thursday 1 – 2 PM  
  Emilio Enriquez: Thursday 12 – 1 PM and Friday 11 AM – 12 PM  

  Since Azalee and Emilio are affiliated with your course (and have attended the lectures), they will likely be able to provide more specific guidance than the other teaching associates, so definitely seek them out. But, you are of course encouraged to go to the Help Room whenever it is convenient for you!

  → There will be no TA help available after the last day of classes, Friday, December 7.

- **Last-minute question-and-answer session.** On Monday, December 10 (the evening before the final exam), an extra help session will be held in Rm. 216 of the physics-astronomy building (i.e., the regular classroom for the 11 AM class) from 7:00 – 8:30 PM. I will be there to answer any questions that you may have; note that this is NOT a formal “review session”; no additional information about the exam or its contents will be given at this session. Rather, it is provided solely as last-minute help to answer any questions that may have cropped up during your studying.

Summary Slides for Skipped Sections of the Course Reader
Astronomy 101 – Final Examination: Fall, 2007

Multiple Choice/True-False (75 points – 1 point each)

Select the best answer for each of the following questions, and indicate your choice by filling in the appropriate bubble on your SCAN-TRON form. Be sure to read all answers before making a selection. For true-false questions, mark bubble A if the statement is true, and bubble B if it is false.

1. T or F. The average distance from the Earth to the Sun is less than one light year.

2. San Diego has a latitude of about 33° N. Which of the following statements is TRUE for an observer located in San Diego?
   (a) The south celestial pole is always visible right on the southern horizon.
   (b) All stars rise due East and set due West.
   (c) The north celestial pole is always located about 33° above the northern horizon.
   (d) The north circumpolar zone includes all stars located within 57° of the north celestial pole.
   (e) Stars do not rise or set but, rather, all circle in a counter-clockwise direction around the zenith.

3. A star that is 10 lightyears away from Earth would, if moved to a distance of 40 lightyears, appear to be
   (a) 4 times brighter than before.
   (b) 4 magnitudes fainter than before.
   (c) 4 times fainter than before.
   (d) 16 times fainter than before.
   (e) 16 times brighter than before.

4. The “Hubble Deep Field”
   (a) is a very deep and detailed image of a small patch of sky taken by the Hubble Space Telescope.
   (b) is a marshy swamp located in Hubble, WI.
   (c) is an image of the Andromeda galaxy taken by Edwin Hubble in 1929.
   (d) is a quick “snapshot” of the Milky Way Galaxy taken with the Keck telescope in 2004.
   (e) is the name given to a mysterious force that is causing the universe to accelerate in its expansion.

5. Recent observations indicate that the universe is expanding faster today than it was a few billion years ago (i.e., the expansion of the universe is accelerating.) What kind of observations has led astronomers to this surprising conclusion?
   (a) Observations of Cepheid variables in nearby galaxies.
   (b) The measurement of extragalactic distances using Type Ia supernovae as “Standard Bulbs”.
   (c) The discovery of large amounts of dark matter in the halo of the Milky Way.
   (d) The discovery of many black holes in the Milky Way.
   (e) The fact that galaxies today are getting a lot more speeding tickets than they used to.

(Answers – 1: A (True); 2: C; 3: D; 4: A; 5: B.)
Essay (25 points)

As discussed earlier in this Final Exam Guide, your final exam will consist of 75 multiple choice questions (worth 75% of the exam grade) and one essay question (worth 25% of the exam grade). Here you are given a list of three possible essay questions, one of which will appear on your final exam.

Possible Essay Questions on Final Exam

Please carefully answer the following question in your own words and with as much detail as you feel is necessary to thoroughly explain your answer.

1. A college friend, who has not had the benefit of taking Astronomy 101, comes up to you and says: “I just heard that our Sun will one day ‘run out of fuel’ and die. Is this true? And what happens after it dies?”

Write an essay that gives your complete response to your friend. While you are free to choose the specific content and order of topics for your essay, it should, at bare minimum, include some discussion of the following items: how stars generate the energy by which they shine; evolution of low-mass stars; nature and properties of the object that is expected to remain after the Sun dies. Remember, you are teaching your friend about our Sun’s evolution with your response, not supplying a list of terms and definitions to your astronomy professor! The more complete and well-explained your answer, the better.

2. A college friend, who has not had the benefit of taking Astronomy 101, asks you: “How do we learn about all of the stars that I can see in the night sky? That is, how do we know what they’re made out of, how (or if) they are moving, and how hot they are?”

Write an essay that gives your complete response to your friend. While you are free to choose the specific content and order of topics for your essay, it should, at bare minimum, include some discussion of the following items: The science of spectroscopy and Kirchoff’s Laws; Doppler shift; proper motion. Remember, you are teaching your friend about how we learn about the stars, not supplying a list of terms and definitions to your astronomy professor! The more complete and well-explained your answer, the better.

3. A college friend, who has not had the benefit of taking Astronomy 101, comes up to you and says: “I just heard that our Universe is ‘expanding’. How did we discover this? And, what exactly does it mean that our Universe is ‘expanding’?”

Write an essay that gives your complete response to your friend. While you are free to choose the specific content and order of topics for your essay, it should, at bare minimum, include some discussion of the following items: The Hubble/Humason discovery: When it happened, and how they made it (be sure to include the role that Cepheid variables and spectroscopy played in the discovery); Big Bang cosmology. Remember, you are teaching your friend about the expanding universe with your response, not supplying a list of terms and definitions to your astronomy professor! The more complete and well-explained your answer, the better.
**Official Exam Cheat-Sheet**

Below is a box within which you may write anything you would like to have access to while taking the exam. Please observe the following rules:

• Write your name at the top of this sheet, and detach it from the rest of the packet.

• All information must be written inside the box below. *Nothing else* is allowed to be written on this sheet (except for your name!). *Nothing* may be written on the back of the sheet.

• *All information must be handwritten.* It cannot be typed or zerographically reproduced.

• You will turn in this sheet along with your exam booklet and scantron at the conclusion of the test; it will be returned to you along with your graded scantron.

All writing must be contained within the box above!