Astronomy 1143: Review Guide For Midterm

The midterm exam will be Friday, October 5, in class. The exam will consist of multiple choice questions, and perhaps a short essay. It will take the whole class period.

You may bring one page (both sides) of *handwritten* notes, and a calculator.

There will be two Q&A review sessions, both optional, but likely to be helpful. The first will be during my usual Wednesday office hours, i.e., right after Wednesday's lecture (10/3). If possible, we will just stay in the classroom, but there may be another meeting moving in at 4:00, in which case I will try to get a nearby room. Thus, *I will announce the location of the review in class on Wednesday 10/3.*

The second review session will be run by Dan Stevens, on Thursday, October 4, in McPherson Lab, room 4054, 6:15 pm - 7:15 pm.

Both of these reviews are Q&A, so it's up to you to bring in questions, which can be on any aspect of the material, problem sets, etc. We won't answer "will this be on the exam?" questions, but we'll try to give useful guidance to the importance of topics and levels of detail.

The topics for the midterm are sections 1-5 of the course: Introduction; Measuring Distances; Electromagnetic Radiation, Redshift, and the Expanding Universe; Hubble's Law and Its Implications; Newtonian Gravity. For Newtonian Gravity, we will go through "Measuring Mass with Orbiting Objects," but not the final section on "Successes of Newton's Theory."

Lecture notes will probably be the most useful source of material to review. Even if you take your own lecture notes, I highly recommend looking at the online lecture notes as well, and trying to remember what we actually did in class when we covered these topics. In addition, you should carefully review the first two homework sets and their solutions (the solution set to Homework 2 will be handed out on Wednesday, 10/3). In the textbook, the midterm covers chapters 1-3, section 4.1, and sections 5.1 and 5.2. If you've read this once, you probably don't need to re-read it except when there is something in the notes or homework solutions that you are finding difficult, in which case referring to the textbook may be useful. If you've missed some of the reading, now would be a good time to make it up. Finally, this would be a good time to *reread the syllabus* to remind yourself of the overall structure and goals of the course.

You should be familiar with the key equations we have been using so far in the course: what quantities go into them, what principles they express, and how they can be applied. Thus far, our most important equations have been $f = L/4\pi d^2$ and $v = H_0 d$, plus the various rearrangements of those two equations.

Other equations from sections 2-4 that you should be familiar with are the angular size formula $\theta = l/d$, the Doppler shift formula $\lambda_o = \lambda_e \times (1 + v/c)$, and the photon energy formula $E = hc/\lambda$.

Finally, there are a few new important equations that we are encountering in section 5: $F = ma$, $F = GMm/r^2$, $a = v^2/r$, and $M = v^2 r/G$. We haven't used these in homework assignments yet, so I don't expect you to have mastered them as much as the earlier ones, but you should know what physical ideas they convey, especially $F = ma$.

You should know who Edwin Hubble and Isaac Newton are and why they are important to our story. Also, while their roles are more limited, you should know what Christian Hugyens and Henrietta Leavitt did.

Example Questions For A1143 Midterm

These are just intended to give you the flavor of the kind of questions that will be on the midterm, not to illustrate all of the content that will be on the midterm; it's not a full-up "practice test."

1. During a lunar eclipse, the earth casts a circular shadow on the moon. Ancient Greek philosophers used this observation
(a) As a way to measure the circumference of the earth.
(b) As evidence that the earth spins on its axis.
(c) As evidence that the earth is spherical.
(d) As evidence that the earth revolves around the sun.

2. Recall that the flux of the sun at earth when it is directly overhead is about 1400 watts/m^2. Mars is approximately 2 AU from the sun. If you were standing on Mars and the sun were directly overhead, its flux would be roughly
(a) 5600 watts/m^2
(b) 2800 watts/m^2
(c) 1400 watts/m^2
(d) 700 watts/m^2
(e) 350 watts/m^2

3. Which of the following is *not* a form of electromagnetic radiation?
(a) X-rays.
(b) Infrared light.
(c) Radio waves.
(d) Gamma rays.
(e) All of them are forms of electromagnetic radiation.

4. Hubble's law states that a galaxy at distance d has velocity $v = H_0 d$. If we think that galaxies were moving significantly faster in the past than they are moving today, we can conclude that
(a) The age of the universe is less than $1/H_0$.
(b) The age of the universe is very close to $1/H_0$.
(c) The age of the universe is larger than $1/H_0$.
(d) Matter must be continually created to allow Hubble's law to hold today.
(e) The age of the universe is probably infinite.

5. On a good day, I weigh 170 pounds. According to Newton's law of gravity
(a) I pull on the earth with a force of 170 pounds.
(b) The earth pulls on me with a force of 170 pounds, but I do not pull on the earth because I am not massive enough.
(c) The earth's gravity exerts a force on me, but only when I am in the air and able to be accelerated.
(d) If I were on the moon, my mass would be six times smaller than it is on the earth.