Lab Guidelines

1 Goals

Through the Astronomy labs, we expect students to learn how to [based on Barnard's requirements for laboratory classes]:

- Ask questions about the natural world that can be tested by experiments or observations.
- Analyze and synthesize sources of scientific information to assess what is known, or what can be known, about the natural world through the scientific process.
- Practice methods of scientific observation, experimentation, data collection, quantitative reasoning, critical thinking, interpretation, and analysis.
- Develop an understanding of the role of skepticism and uncertainty in science.
- Communicate scientific results and analyses in appropriate visual, quantitative, or written forms.

2 Basic Requirements

- 11 3-hour labs each semester
- "Fall" Lab = Lab 1 = Earth, Moon and Planets / Life in the Universe
- "Spring" Lab = Lab 2 = Beyond the Solar System / Stars, Galaxies, and Cosmology

3 Lab Content

- See the wiki for a list of standard labs.
- Be aware that your students are in different lecture classes that cover different lecture material. In particular, for the spring labs, some students take Stars/Galaxies/Cosmology and some students take Stars and Atoms (with Kathryn Johnston) that does not cover galaxies. Ask your students what lecture class they are in so you know the makeup of your lab. Try not to have more than $\sim$3 labs that are on galaxies/cosmology that Kathryn's students will not have learned about. When you do teach galaxies labs, try to frame it in terms of the broader physics so these students are not lost. i.e. when discussing Hubble's law emphasize doppler shifts, which those students will know about.
- There a number of resources listed on the wiki that you can use to write your own labs or to find labs that are already written but not used by our instructors.

- You can choose the order in which you do labs, but it's helpful to the students if they are organized in some logical way or if you try to link them together.
- Supplies are in the lab cabinets and listed on the wiki. Contact the Head TA if there are materials you think would be useful for the department to buy.
- Students appreciate it when lab material reinforces the lecture material. Instructors could look at syllabi of lecture classes to link the material between lecture and lab.
- Surveys of students suggest that their enjoyment of each lab depends on the lab's topic rather than the activity/method used. Instructors should try to present the topic as interesting and make sure that the students understand the science behind the lab in addition to the method used.

4 Students

- Wide range of levels / interest in science. Be sensitive to this.
- Find out what lectures they are in.
- Some lab instructors hand out a questionnaire to ask year, major, math/science background.

5 Observing Labs

Observing TAs Fall 2012 - Maria and Lauren

- There will be up to 4 observing labs this semester on telescopes, the moon, CCDs, and the moons of Jupiter. Please don't do your own lab on one of these topics unless it is obvious you won't be able to do one of the observing labs.
- Observing TAs will contact all lab sections every Sunday to discuss the possibility of doing an observing lab that week and which lab will be done.
- Lab instructors are responsible for conducting the indoor portion of lab and they are responsible for grading the entire lab.
- Lab instructors will be provided solution sets by the observing TAs.
- When each observing lab is written, we will have a brief meeting during which the observing TAs will demonstrate and/or explain the indoor portion of the lab so that lab instructors can become familiar with the lab. Lab instructors will probably have to devote some time outside of the meeting to preparing for the observing lab.
- Observing TAs will run the outdoor portion of the labs on the roof but lab instructors should be there and ready to assist.

- The first time an observing lab is done, both observing TAs will be there to make sure it goes well. The following day, they will meet with the lab instructor who helped out to discuss how the lab went and how it can be improved.
- After the first time an observing lab is done, only one observing TA will be present for each observing lab.
- Lab instructors should update the observing lab calendar on the wiki if they are canceling a lab.

6 ATAs

- Some lab instructors will have first-year ATAs assigned to help you all semester.
- The other first-years will visit three different labs throughout the semester. I will post assignments on the wiki.

7 Courseworks (courseworks.columbia.edu)

- FIRST WEEK OF CLASSES: Email students telling them what they need to bring to class, when/where classes start.
- Check the list of your students periodically to make sure that everyone registered is attending your class and that everyone attending your class is registered. This is harder to fix later on in the semester. Alert the Head TA if there is a discrepancy.
- Pictures of students can be found on Courseworks (this is helpful for memorizing their names).
- Update the front page of Courseworks with a brief introduction and location of lab.
- Use Courseworks to email your students during the first week of classes to tell them when/where lab begins and what they need to bring to class. They should bring writing implements, lab notebook, calculator (we don't have enough for two full labs each night), and maybe a ruler.

8 Grading

8.1 Basics

- Lab grades are separate from lectures grades and count for only 1 credit so they have a minimal impact on GPA.
- Each lab section should have an average grade of A- / B+
- No more than 75% of the class should have an A or A-. (25% should have below an A-.)

- Each lab instructor should drop each lab student's lowest grade from the final grade. This means that students who have attended every week will have their lowest lab grade dropped. If a student misses one lab, that counts as a zero and that is the grade that is dropped.
- It is university policy that we must fail any student who is absent three times. It is good to remind students if this if they have already missed two labs. Alert the head TA if a student is in danger of failing.
- Students generally appreciate being given their lab average at midterm.

8.2 Grading Options

- Lab notebooks usually count for the majority of the grade.
- Tell your students how you will grade their lab notebooks and specifically what you are looking for.
- Some lab instructors choose to include a grade for participation based on some combination of preparation, timeliness, oral participation, and attitude.
- Some lab instructors give brief quizzes in the beginning of class.
- Some lab instructors require students to give presentations on topics of their choice the last day of lab. If you do this, you must give your students one week off from lab to give them time to prepare the presentation (so that the total time spent on lab is not greater than 33 hours per semester).
- Be sure to include in the syllabus a detailed description of how you will grade your students, and stick to it all semester.

9 Attendance

- Since we drop the lowest grade, students may miss one lab without consequence.
- Students will fail the course if they miss three labs.
- Official policy is to *not* allow makeups if they are absent, though instructors may use their discretion if students have a good excuse.
- If a student misses lab due to a religious holiday, instructors *must* let them make up the lab.
- If a student misses lab and you are notified by the dean of extenuating circumstances (family emergency, health issues), you must let them make up the lab.
- Makeup options: attend another lab section (this is usually the most difficult option because of scheduling issues), do a lab at AMNH, watch and write a report on a NOVA episode or news story, do a lab at home that doesn't require any special equipment. I find it's easiest to have them watch a NOVA episode or do a lab at home on their own.

10 Suggestions for Running Labs

- Students generally work in pairs. Sometimes it's nice to make them work with a new lab partner each week so they get to know different people in the class.
- It if often helpful to start each class with an introduction to the material so everyone is on the same page. Remember that all students are not in the same lecture classes and do not have the same background material (or *any* background if they have not covered the topic in lecture yet).
- It is helpful to bring the class together as a whole throughout the lab to discuss any problems together.
- It could be nice to end with a discussion of the results, but this is hard to do when students work at different paces.

11 Wiki - lab.astro.columbia.edu

- Keep it updated, especially if you have written new labs or substantially revised old labs so that everyone else has an opportunity to use them.

12 Supplies

- In the supply cabinet in 1402.
- Let the head TA know if you would like to purchase any additional supplies.
- Computers, dongles, extra eyepieces, roof keys, and video camera available in the filing cabinet in my office. Please sign out everything you borrow and sign it back it when you return it.
- Who needs a key to access the lab laptop?
- Computers in 1402 are meant to be used for lab. TAs teaching in the classroom can switch rooms during a night that the want access to these computers.
- TAs teaching in the classroom can also ask students to bring in laptops for any labs that require them. Remember that not all students will have laptops though.
- Let me know if the location of the couches and screen in 1402 isn't working well for lab. I can complain to the re-decorating committee about it if it's a problem.

13 Telescope Training

14 Other Responsibilities

- Grading midterms / finals.

- Expect about 10 hours each semester.
- Proctoring for Jim's exams will count for grading. Anyone interested?
- Let the Head TA know if you plan to be out of town for finals.