

Instructions and Information on the Qualifying Examination

The Physics Department requires students to pass the Qualifying Exam by the end of their third year. Not completing the exam by the end of the third year may have financial consequences. The department will not pay non-resident tuition for international students (about \$5000 per quarter) after the third year. Domestic students generally will not be awarded departmental fellowships and will have reduced priority for TA support including summers.

To pass the exam on schedule, you should pick out a research advisor by early in your second year. After a few quarters in the research group you should know the general area for your thesis research, although not necessarily a specific project. Your next step is to consult with your advisor about choosing five members for your qualifying exam committee, including one who will chair the committee. One committee member must come from outside the physics department (math, engineering, and chemistry are popular choices), and normally one member from the department should be outside your area of concentration. University policy prohibits your research advisor from being the chair of your oral exam committee, and department practice is that your advisor should not be on the committee at all. If you're a theorist, the committee should include at least one experimentalist; if you're an experimentalist, it should include at least one theorist.

Choose a two-week window for your exam. At least two months in advance, talk to your five picks to be sure they are willing to be on the committee and will be in town during your planned exam window. Then email the list to the Graduate Coordinator for approval by the Graduate Vice Chair. The form is available at <http://gradstudies.ucdavis.edu/forms/index.html> and must be turned in to Grad Studies at least a month before your expected exam date.

The next hurdle is scheduling a 3-hour block of time for the exam where all your committee members are available. Some students do this before turning in the QE Application form, although that is not strictly necessary. One way to find a time is to ask the Graduate Coordinator for people's teaching schedules and look for 3-hour blocks that have no conflicts. Typically this will leave at most one or two non-overlapping times per day. You can then set up a Doodle poll or equivalent for a two-week window, listing the plausible 3-hour exam times. Reducing the options to just one or two per day is crucial; everyone hates Doodle polls with hundreds of half-hour intervals to mark off! To provide some flexibility, you can let people use a "maybe" option if they can be present for almost all of the 3 hours, or if they could do it with a 30-minute or 1-hour shift of a listed time. Alternatively, use when2meet instead of Doodle. If some committee members don't respond within a day or two, send them individual emails.

Once everyone has agreed on a time, **immediately** send them all a confirmation e-mail so that your exam gets onto their calendars. Also let the Grad Coordinator know the time so that she can reserve a room.

You should give the committee a short (roughly three page) introduction and outline of your research, along with a bibliography of a few (roughly five) items. Do this at least two weeks before the exam. The committee has the right to ask for revisions and for additions to the bibliography—for example, adding review papers and book chapters they consider indispensable.

Do not bring refreshments to the exam. Focus on preparing for the exam instead.

The structure of the oral exam can vary, depending on the chair. You should consult the chair of your exam committee for details. In general, though, here's what to expect:

You should plan on giving a 30-minute talk at the beginning. Your committee chair will decide whether this should be a blackboard talk or whether you can use something like PowerPoint. Your talk need not present new results—you're not required to have completed original research yet—but it should cover the background of the area in which you will be working and should discuss open questions that you might be able to answer. Expect to be interrupted, at least with questions of clarification; some committee chairs also allow interruptions for deeper or more substantial questions.

While your talk is not quite the same as a conference talk, there are a lot of similarities. You might want to look at Robert Geroch's "Suggestions for Giving Talks," at <http://arxiv.org/abs/gr-qc/9703019>, and at some of the resources at [phds.org](http://www.phds.org),

<http://www.phds.org/graduate-school-success/essentialskills/communication-skills/>.

Many of the questions your committee asks will grow out of your presentation. Make sure you know the precise meaning of any terms you use. If you show data from the literature, know what all the axes are and something about how the data were obtained. Indeed, you might want to go through your talk pretending to be a committee member and ask yourself at each stage what questions would naturally come to the audience's mind. Then be ready to answer them.

Practice your talk. Minimally you should give two practices, one to your research group (an "expert" audience) and one to some of your fellow graduate students (a "layman" audience).

After you have finished your talk—or your committee has decided that you've spent enough time on it—you will be questioned by members of the committee. They can ask about almost anything: material in required courses (including your "cluster" courses), your talk, the background of your field, what's already known about the questions you want to investigate. The committee will have a copy of your transcript and your Preliminary Exam. If your record is especially weak in some area—if you

skipped all the questions on E&M in the Preliminary Exam, or got a C in a core course, say—you can expect questions in that area, particularly if it's relevant to your research. If you're a theorist, expect questions about experimental tests in your field; if you're an experimentalist, expect questions about the theoretical background.

It is not always true, but it is often the case that if you give a good and exciting talk, most of the committee's questions will be about the talk and your research plans. It is almost always true that if you give a bad talk—especially if you can't answer basic background questions clearly—you will be given a harder time during the questioning. Regardless of how well you know the specifics of your talk and your particular research plans, you should be prepared to answer questions on a wide range of topics, including in particular the fundamental physics that underlies the field in which you intend to work. Your committee is supposed to decide whether you are likely to succeed in the Ph.D. program; it's up to you to convince them you can.

Once the questioning is over, the committee will ask you to leave the room, and will discuss what to do. The committee makes a decision based on “the relevant portions of the student's previous academic record, performance on specific parts of the examination, and an overall evaluation of the student's potential for scholarly research as indicated during the examination.” You will normally be given an answer fairly quickly—often within ten minutes, though some committees are slower than others. Some committees decide they need a bit more information and will ask you in for a few additional questions.

There are three possible outcomes: “pass,” “not pass,” and “fail.” If you pass, there is still some paperwork, but you're essentially admitted to candidacy for the Ph.D. If you fail, you're out. A “not pass” is more complicated and comes with conditions specified by your committee—you may be told to retake the exam within a specified time period (usually with advice like, “You'd better know a lot more about X”), or to meet other conditions (taking a course, writing something, learning some material and meeting with the committee chair, . . .).

You can find more information at Grad Studies website:

<https://grad.ucdavis.edu/doctoral-qualifying-exam>