Qualifying Exam

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Outline

- Why do have a qualifier?
- What's the history of the qualifier?
- What are we expecting you to do?
- Finding a mentor, role of mentor

Why do we have a qualifier?

- From the Graduate School Handbook
- The qualifying examination is given to determine whether a student has acquired sufficient mastery of the field of concentration to warrant admission to candidacy for the Ph.D. degree. The exam should be taken as soon as a student has completed the major portion of the course requirements. It should be taken not later than four years after the student first registered in the Graduate School -New Brunswick and not later than two semesters before taking the final dissertation examination.
- The qualifying examination, conducted by a committee of at least four members (the chair must be a member) or associate members of the program's graduate faculty, may be written or oral or both. Once a student has fulfilled the language requirements, if any, and other relevant program requirements, and has passed the qualifying examination, he or she is admitted to candidacy for the doctoral degree. The student's program will certify the results of his or her language examination on the application for admission to candidacy for the doctoral degree. The student must obtain this application from the Office of the Graduate School and submit it to the chair of the committee at the time of the examination. It should be properly signed by the four members of the candidate's committee and the graduate director and then returned to the Office of the Graduate School. Once a student has passed the examination, he or she must remain registered--for courses or research--or lose his or her status as a candidate. An exception to this rule may be granted to recipients of the master of philosophy degree (see the section concerning that degree later in this chapter).

History of the Qual

- Beginning of time to ~1998
  - 3 days written (CM &EM, QM&Thermo, Other topics)
    - » 4 difficult questions each day, 3 hours per day
  - Two oral exams, each 1 hour, one “classical”, one “modern”
- 1998-Jan 2004
  - Time increased to 7 hours, same number of problems
- Aug 2005-2009
  - Eliminate 3rd day and one oral
  - 4 questions per topic, with range of difficulty
  - Add distribution requirement – 2 courses in 2 other areas, not in research area

History-continued

- 2009 – the current system
  - No written exam
  - Course requirement instituted (B or better in core courses)
    - » Challenge exam, retake course
  - Paper on current topic, oral presentation, oral exam
  - Still require distribution courses

Why the change?

- Dissatisfaction, esp. by experimentalists, with old system
- Did not correlate well with success later on
- Biased toward theory students
- Distorted by students entering with advanced studies
- Did not test other important qualities of successful students
- Earlier involvement with faculty and research was desired
- Hope this will be a better judge of student's abilities and in particular ability for independent learning, which is critical for success in physics

What do we expect from you?

- Based on your area of interest, seek out a mentor and notify me of the mentor's name by May 1
  - The mentor will guide you in picking a particular topic, suggest reading materials, monitor your progress in learning the topic
- By Sept. 1, you should submit a 1 page paper to me summarizing the topic you will be talking about
- Presentation/exams will be scheduled for November (possibly into early December). You may ask for an earlier exam if you feel you are ready.

Paper

- The paper should be 10-12 pages in length (11 pt font, 4 lines per inch)
- The paper should consist of at least three parts
  - Introduction giving an overview of the topic, giving general background, explaining its importance, and the current problems. [Example – discussion of the Standard Model of particle physics, its assumptions, and missing elements]
  - A more detailed discussion of a particular subtopic and how it helps the field [Example – Supersymmetry]
  - A final discussion on a how to address the subtopic in order to advance the field. This might, but does not have to be, part of your thesis .[Example – search for a particular supersymmetric particle at the LHC]

Presentation

- The presentation should be a professional style presentation (probably powerpoint or the like) lasting no more than 25 minutes. I will give a warning at 20 minutes, and stop you at 25.
- It should cover the elements of your paper in the same manner as you would present at a conference.

Oral Exam

- The oral exam will test your understanding of the topic and the essential physics behind it. You should be prepared to answer questions about anything discussed in your paper.
- Questioning may cover more basic topics and will be guided by the quality of responses to questioning. Poor answers may lead to questions about more basic material.
- For an experimental topic, you will be expected to have an understanding of how the detectors you discuss work. [Example: If you talk about a scanning tunneling microscope, you would be expected to understand quantum mechanical tunneling.]

Theory Students

- We have less experience with theory students (and more skepticism from theory faculty about this process). Previous exams have been in astro and HEX, with only one phenomenology student.
- My expectation is that the oral exams will concentrate more deeply on your theoretical understanding. Even if you pass, your performance will be noted and professors may use that as part of their decision on whether or not they will accept you as a PhD student.

Projects

- A research project is not required for the qualifier. However, in many areas it may be appropriate to do a project. In this case, your paper should discuss the objectives of the project and any preliminary findings. However, you must still give the background and general problems for the topic as before. You should not give a talk on the fine details of the project (Example: do not talk about tracking algorithms at the LHC).

Mentor

- The mentor's role is to guide you in a project by suggesting a particular subtopic, suggesting references and papers to read, or basic topics (the stuff in textbooks) to be studied more in depth.
- The mentor should check on your progress and answer questions BUT he/she is not expected to be spending many hours a week trying to teach the material to you. You are expected to do most of the work on your own.
- The mentor has no obligation to take you on as his/her PhD student if you pass, and you have no obligation to choose your mentor as your thesis adviser.

What if I fail?

- You may be asked to repeat all or some of the exam. For example, you may be asked to repeat only the oral exam, without re-writing the paper or giving a new presentation.
- You will be given one chance to repeat the exam, which should be done before the end of the following semester.
- Even if you pass the exam, you cannot be advanced to candidacy until you have successfully gotten B's in the core courses or passed the appropriate challenge exam.
- Even if you pass the exam, you may be advised to try another area of research

What happens when I pass

- Your life becomes better!
- You must choose an adviser and have a first committee meeting within one year after passing the exam (extensions possible if you are making progress)
- You must finish within 7 years, try for 6 or less.
  - Extensions possible up to 10 years
  - Remember – no extra credit at the end of your life for extra time spent in grad school