

Physics Department
University of Illinois at Urbana-Champaign

Ph.D. Preliminary Examination in Physics

I. Purpose and Timing of the Ph.D. Preliminary Examination

A Ph.D. Preliminary Examination is required by the Graduate College. Because the Ph.D. is a research degree the general objective of the Preliminary Exam is to determine the competence of the candidate to conduct research in a selected area. *By action of the Physics Faculty, physics graduate students are required to attempt the Preliminary Examination on or before their fourth term with their research advisor.* This firm deadline (see Consequences and Exceptions below) is designed to speed the time to a Ph.D. degree. It means that a graduate student and advisor must be mindful of the rate of progress and research direction *even in the first year of research.*

The Preliminary Examination is not a certification of a guaranteed successful research project. By its nature, research often takes an unpredictable path. Rather, the preliminary examination should be *thought of as a proposal for research*, and the intention of the exam is to determine if the candidate is capable of identifying a significant research problem and is ready to conduct research in a specialized area of Physics. It is not necessary to have obtained research results or data prior to the exam, although the student is expected to have developed some of the essential tools and background needed to conduct research.

The examination committee usually consists of four faculty members, including the student's re-search advisor and another professor in his or her area of research. A copy of the Graduate College Examination Policies and Procedures is appended at the end of this document.

II. Choosing a Prelim Committee and Scheduling the Examination

To the Ph.D. Candidate: If you have worked with a research advisor for a semester and agreed to collaborate towards a thesis topic, make an appointment with the Associate Head for Graduate Programs (227 Loomis). Together you will decide on appropriate committee members for your Preliminary Examination. The Preliminary Examination involves your official proposal of thesis research and must be taken before the end of the fourth semester of consistent research

(usually associated with a Physics 597 Individual Study course) with a particular research advisor. Once a committee has been chosen, it is your responsibility to inform the Associate Head if any substitutions for examiners are required.

In scheduling the preliminary examination, it is your responsibility to contact each one of the committee members and to arrange a firm date and time for the examination. **Once you have settled on a date and time for the exam, give the schedule to the secretary in the Physics Graduate Office (227 Loomis) at least three weeks before the exam.** (The Graduate College requires this lead time in order to prepare the prelim documents and inform the committee members officially.) Do not put off the scheduling of the examination until the end of a semester because faculty schedules get crowded. Do not expect, without considerable prior planning, to take the examination during periods when classes are not in session or during the summer. It is your responsibility to resolve time conflicts that may arise after the exam is initially scheduled.

You must prepare a written research proposal in accordance with the rules described in Section IV of this document. **At least two weeks before the exam** you must give one copy of the written research proposal to each committee member. The secretary in the Physics Grad Office will reserve a room and notify you and the committee members of the official time and location of the exam. The secretary will send a reminder a day or two before the exam and prepare the exam packet for the committee chair.

III. Course Requirements

The Physics Department has few formal course requirements for the Ph.D. degree. You are required to pass any two of the following "breadth" courses—or appropriate substitutes agreed upon in advance by the Associate Head—before taking the prelim exam:

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| 1. Physics 540 | Astrophysics |
| 2. Physics 550 | Biomolecular Physics |
| 3. Physics 570 | Subatomic Physics |
| 4. <u>One</u> of the following: | Physics 560 Condensed Matter Physics
Physics 569 Emergent States of Matter |
| 5. <u>One</u> of the following: | Physics 513 Quantum Optics & Information
Physics 514 Modern Atomic Physics |

Usually the breadth course requirement is satisfied by the time the preliminary exam is taken, but with approval of the Associate Head, the prelim may still be taken if only one of the breadth courses has been taken. Any other exceptions need explicit approval of the Associate Head for Graduate Programs.

The prelim committee is charged with ascertaining whether the candidate has a sufficiently broad technical training in undergraduate and graduate courses to successfully carry out the intended Ph.D. work. A committee has been known to suggest or require additional course work, although normally such possibilities are usually anticipated by the candidate and research advisor.

IV. The Written Prelim Proposal

The student must prepare a brief written proposal on his or her chosen research topic in physics. The preliminary examination proposal *should include* the following elements:

- (a) An introduction that includes: (i) a statement of and motivation for the problem(s) to be solved and (ii) sufficient background material to describe *to a non-expert audience* the proposed research area or topic;
- (b) A description of research in progress by the student;
- (c) A proposal for research with well-defined objectives and methodology, including an explanation of how and why the objectives are expected to solve the problem(s) given in (a);
- (d) An *approximate* timeline estimating the amount of time that the different proposed elements of the proposed research described in (c) will take.

An important function of the examination is to assure that the student is reasonably familiar with prior work in the field of his or her thesis. To this end the candidate must include an appropriate bibliography in the written paper and should be generally familiar with the listed papers.

The choice of material and scope of the prelim paper should be determined in consultation between the student and his or her research advisor. The paper must be typed with 1.5 line spacing and 12-point font or larger, and it must *not exceed 15 pages in length*, including figures and bibliography. This rule will be strictly enforced. **The title page must contain the**

title of the proposed thesis, an abstract, the name of the student and the advisor, and the approximate date of the exam. The student must provide copies of the prelin paper to *each member of his or her committee* at least two weeks before the proposed date of the examination.

V. Procedures for the Oral Examination

Prior to the examination, the committee will review the complete academic record of the student, including,

- (a) breadth of study in undergraduate and graduate physics courses and performance therein, and,
- (b) the student's performance in research leading up to the Preliminary Exam proposal. A key input to this part of the evaluation is the judgment of the faculty research advisor.

During the Preliminary Examination, the student is expected to give a short oral presentation on his or her research area and proposed thesis topic. The presentation, when practiced without interruptions, should not exceed 30 minutes. Committee questions typically lengthen the presentation considerably, and the ensuing discussions usually comprise the main body of the examination.

The candidate should know, and the examination committee should ensure, that the examination is not restricted solely to the details of the candidate's paper. Instead it should range generally over the physics that the committee deems basic to the proposed thesis work.

Considering all aspects of the student's performance, the committee will decide whether the student is qualified to pursue a course of independent study and research as a Ph.D. candidate.

Three decisions are available to the committee:

1. The student has passed the examination and is admitted to Ph.D. candidacy;
2. The student has failed the examination and will not be admitted to Ph.D. candidacy;
3. The student has not passed the examination, but it is recommended that he or she have the opportunity to remove deficiencies in areas of study, or to improve his or her performance in research or research-related activity, and apply for re-examination in the following semester.

There is normally only one prelim allowed. In unusual circumstances, a student may petition the Associate Head to be allowed to continue with a new advisor. The petition must spell out the unusual circumstances, making the case for a second chance.

After passing the preliminary examination students are expected to register for Physics 599, Thesis Research, and should no longer register for Physics 597, Individual Study, without permission of the Associate Head for Graduate Programs.

VI. Consequences and exceptions for exceeding the 4-semester time limit

If a graduate student does not take a Prelim exam by the end of the fourth semester with his or her research advisor, the Department may not renew the student's RA or TA appointment in the following semester. In those cases, the appointment will be restarted (without back pay) after the tardy exam has been taken (pass or fail). Graduate student status is not affected by this action. If the student fails the prelim, or the committee defers its decision, an appointment can be continued until the student's status is resolved, usually within a semester. Exceptions to these rules are as follows:

(i) Students signed up for independent research (Physics 597) in their first year in the Department will not be required to take the Prelim within 4 semesters, but they must do so before the end of their 3rd year of graduate study (subject to other exceptions stated below).

(ii) If a student's advisor strongly feels that there is a valid reason for delay of a prelim beyond the 4th semester of research, then the advisor should notify the Associate Head for Graduate Programs of the reason for the delay.

(iii) Medical issues and other extenuating circumstances are valid reasons to delay the preliminary examination beyond the 4th semester of research with an advisor, but the Associate Head for Graduate Programs should be notified of these situations as soon as possible.

(iv) The Department continues to support flexibility in choosing an advisor. If a student switches advisors, the "Prelim clock" will begin again in that semester, with the approval of the Associate Head for Graduate Programs.

(v) In cases where the Examination Committee finds a deficiency during a Prelim exam, the Department will, with the advisor's approval, continue the student's appointment while the issues are being resolved, usually within a semester.

(vi) If an unavoidable scheduling conflict exists with the prelim committee, the Physics Graduate Office must be notified *early in the fourth semester of research*, and the Prelim must be held at the earliest available date. In this case, the prelim paper must still be submitted to the committee by the end of the fourth semester of research.

Appendix

GRADUATE COLLEGE PRELIMINARY EXAMINATION PROCEDURES

Examination Format:

- Preliminary examinations may be oral or written or both, depending on the unit's policy, and generally evaluate the student's overall and specific knowledge in the field.
- Preliminary examinations also usually include an oral presentation to review the feasibility and appropriateness of a student's dissertation research proposal.
- The doctoral degree program prescribes the scope, format and procedures associated with the examination, including the composition of the committee. The program must clearly communicate information about the format and rules (e.g., closed-book) to all students in advance. The student must be promptly notified of the examination result.
- The student, committee chair, and at least one additional voting member of the committee must be physically present for all oral components of the examination (i.e., presence by video or teleconference is not acceptable). If the committee has more than one chair, all chairs must be physically present; in these cases, no additional voting member is required to be physically present.
- All voting members of the committee must participate in the oral examination, the deliberation and determination of the results of the oral examination.
- Remote participation of the student or committee member(s) is permitted under the following conditions:
 - Technology must allow all participants to communicate throughout the examination and to access all materials presented. Video technology is encouraged for remote committee members and required for a student participating remotely.
 - The chair (or co-chair) and at least one additional voting member must be physically present in the examination room on campus. The chair is responsible for coordinating the use of any technology and for recessing the examination if technical problems prevent full participation and making arrangements to resume the examination promptly.
 - In extraordinary circumstances, the student can petition to participate remotely. Approval must be received from all members of the committee. The Graduate College strongly encourages the student to participate in person.

Registration Requirement:

Students must be enrolled for the entire academic term in which the preliminary exam occurs.

Committee Membership Requirements:

- The preliminary examination committee must include at least four voting members, at least three of whom must be members of the Graduate Faculty, and at least two of whom must also be tenured at the Urbana-Champaign campus of the University of Illinois.

- Departments may request the inclusion of non-Graduate Faculty members who make a significant contribution as voting members of the committee. The dean of the Graduate College must approve, in advance, individuals who are not members of the Graduate Faculty who will serve as voting members of the committee. To request the approval of a non-Graduate Faculty member to vote, a curriculum vitae for the individual and a justification from the chair of the committee must accompany the request for appointment of the doctoral committee. Voting members, must have earned a terminal degree in their field of study and must have demonstrated expertise that qualifies them to judge the quality of the student's research and its contribution to the field. Each voting member must be well-positioned to vote independently and must be free from conflicts of interest. Additional guidance for nominating external members is available at <http://www.grad.illinois.edu/exams-committees>.
- The tenure requirement can be met by term members of the Graduate Faculty who retired or resigned with tenure for a period following their resignation or retirement, according to the Policy on Graduate Faculty Membership.
- The chair must be a member of the Graduate Faculty. At the department's discretion, a co-chair may be appointed. If appointed, a co-chair must meet all the requirements that apply to the chair.
- If there are more than four voting members on the committee, at least half of the voting members must be members of the Graduate Faculty.
- Non-voting members may be appointed but are rare on preliminary examination committees.

Role of the Committee Chair: The chair of the preliminary examination committee must be a member of the Graduate Faculty. The committee chair is responsible for convening the committee, conducting the examination, and submitting the Preliminary Exam Result form to the unit in which the student is enrolled and to the Graduate College. If appointed, a co-chair must meet all the requirements that apply to the chair.