

Policy on the Preliminary Examination:

The preliminary examination is designed to ensure that students command a broad spectrum of undergraduate physics prior to their engaging in graduate research. The preliminary exam is a written exam composed of four sections, grouped by general subject areas of undergraduate physics. All four sections of the preliminary examination are offered at the beginning of both Fall and Spring semesters. A student who has passed all four sections of the exam will have passed the preliminary examination. The Department expects students to pass the examination within the first three semesters of graduate study (see further notes on this below).

The preliminary exam is intended as one tool for helping the Department evaluate that students are making adequate progress towards their PhD. The determination of a student's academic standing in the Department will be based on a student's entire record, including performance on the prelim exam, undergraduate coursework, graduate coursework, and research performance where appropriate. Consequently, a student would not be asked to leave the Department based solely on performance on the written preliminary exam.

The written exam has four sections, covering (1) classical mechanics, (2) electromagnetism and optics, and special relativity, (3) thermodynamics and statistical physics, and (4) quantum mechanics. Note that these divisions do not preclude the possibility of questions on one section that draw from subject matter emphasized in a different section. (For example, a question that touches on thermodynamics in the quantum mechanics section.) A student who passes any section of the written exam need not take that section again. Each section lasts three hours and covers traditional, textbook style problems, as well as more comprehensive questions that specifically test physical and numerical insight (e.g. order-of-magnitude estimates including physical constants, analyzing physical situations by application of general principles instead of complex calculations, etc.). *A student's individual performance on each section of the exam, and not ranking relative to other students, will determine whether that student has passed or failed the section. In other words, there is no predetermined percentage of students to pass/fail the exam.*

Students are encouraged, but not required, to attempt the examination during their first semester. Students are required to have attempted all of the written sections in their second semester. The status of students who have not yet passed all sections of the preliminary examination will be reviewed by a faculty committee each semester, beginning in the student's third semester, and recommendations of further action will be made. The Department Chair must approve exceptions to this schedule; all exceptions, except those due to illness or emergency, must be approved in advance.

The academic record of a student in their *third semester* who has not passed all four written sections will be reviewed. Near the beginning of the third semester (as prelim exam results become available) a faculty committee, in consultation with the student's faculty mentor, will review the student's academic record and performance on the prelims to determine whether a sufficient breadth of undergraduate physics has been demonstrated. This review may include meeting with the student to ask questions to further assess the student's understanding of undergraduate physics, focusing primarily although not exclusively on the not-yet-passed sections of the exam, to discuss the student's background and how best to address remaining deficiencies. If their determination is that the student has a sufficient breadth of undergraduate physics, the student will be determined to have *passed* the prelim exam, and will be allowed to proceed with research. If the committee's determination is that this understanding is *not* yet demonstrated, they will recommend that the student be sent a warning letter by the Department Chair, and will specify requirements (including a timeline) for the student to return to making sufficient academic progress. These requirements could include taking and passing with a B or better grade specific

undergraduate courses during the third and/or fourth semester, and/or retaking and passing sections of the prelim exam not yet passed at the start of the fourth semester. This review could also result in additional recommendations to the student, such as serving as GSI for a course deemed appropriate to reinforce previous undergraduate coursework. *The intent of this third-semester review by the faculty committee is to determine if deficiencies exist in a student's knowledge of undergraduate physics, and if so, what actions are required of the student to address these deficiencies.*

A faculty committee will then review the student's efforts towards returning to good academic progress at the beginning of the *fourth semester*. This 4th semester review may also include meeting with the student to ask questions to assess the student's understanding of undergraduate physics. This faculty committee will review the student's entire academic record – including performance on the preliminary exam, coursework, and intended research plans – and recommend to the Department Chair whether the student is making sufficient academic progress and may be allowed to proceed with research. The Head Graduate Adviser or Department Chair will report the results to the Graduate Division. If requirements established in the 3rd semester review include undergraduate courses taken in the fourth semester, this 4th semester review can be deferred until the grades in these courses are determined, but in no case can this review be extended past the end of the student's 4th semester. This review is not intended to create additional requirements, but to determine if previous requirements have been met, and in particular should not require any further attempts at passing any section of the preliminary exam. *The intent of this fourth-semester review by the faculty committee is to determine whether a student has mastered sufficient undergraduate physics to start PhD level research by the end of the 2nd year. If the committee concludes that such mastery is not present, they will recommend to the Department Chair that the student be asked to leave the program due to inadequate progress towards the PhD.*

A revision in this schedule can be granted, for one or more sections of the preliminary exam, for any student with an incomplete undergraduate physics education as determined by consultation between the student and the student's faculty mentor. Both the Head Graduate Advisor and the Department Chair must approve this revised schedule. Any student exercising this option is expected to take one or more undergraduate physics courses at UC Berkeley during the first one or two semesters. This student should follow the regular schedule outlined above for any sections of the exam *not* affected by the revised schedule, and is allowed to attempt the delayed section(s) at the start of their first one or two semesters for practice, in which case the student would not be required to repeat any sections that have been passed during this period. The student would then be expected to take all sections of the exam not yet passed at the beginning of the 3rd semester, and to repeat any unpassed sections at the start of the 4th semester. A faculty committee will be asked to assess this student following this exam if there are still sections not passed, following guidelines above, and can either determine that the student has demonstrated a sufficient breadth of undergraduate physics, and hence has *passed* the prelim exam, or to recommend that the student be sent a warning letter with specific requirements and a timeline for being returned to making sufficient academic progress; the most likely requirement and timeline for this is to be asked to study over the following summer and to attempt the still unpassed sections a final time at the start of the 5th semester. *The intent of this 4th and potentially 5th semester review by the faculty committee is that a student shall either be determined to have mastered sufficient undergraduate physics to start PhD level research by the start of their 3rd year, or else be asked to leave the program due to inadequate progress towards the PhD. Delays in this decision beyond the start of the 3rd year are highly discouraged and will only be considered under exceptional circumstances.*

Students are encouraged to affiliate with a research group as soon as possible but may not enroll in Physics 299 until the preliminary exam is passed. Until such time, if they wish to receive credit for research, students may enroll for no more than 3 units of Physics 295.