

**U.W. Graduate Students  
in Physics  
Handbook**

August 2008

In summary, the steps to the Ph.D. are:

- 1) Pass the Departmental Qualifying Examination
- 2) Acquire a major professor and start research
- 3) Complete the required course work and a minor program
- 4) Pass the Preliminary Examination
- 5) Complete thesis research and present dissertation
- 6) Deposit dissertation with the Graduate School

These steps are described in detail below (See also the chart on page 2):

The Ph.D. is a *research* degree and is awarded for substantial original research, presented in the form of a dissertation. The requirements listed above are for the purpose of expediting the student's contribution to research in physics.

The responsibility to acquire (choose and be accepted by) a major professor is entirely with the student, who should visit professors doing research in the areas of the student's interest. Acceptance for Ph.D. research by a professor depends on the professor's appraisal of the student's potential for research and on the ability of the professor to accept a student at that time. Usually the major professor will be able to offer support in the form of a research assistantship, but this is not always the case, and occasionally a student may have to get support as a teaching assistant while doing thesis research. To aid the student in the choice of a field of research and of a major professor, a weekly "**Introductory Seminar**" is held in the fall semester. During the seminars, professors from each of the research groups describe their research, show their laboratories, and discuss matters of general interest to graduate students. First-year students are expected to attend these seminars.

Graduate students should begin research work as early as possible. Students are encouraged to make arrangements with a professor to start research work by the end of the second semester. The following summer is the ideal time to get started on research unencumbered by course work or teaching.

### • **Qualifying Examination**

Every student, with or without a Master's degree from another institution, *must* take and pass the Qualifying Examination. The Qualifying Exam is a written examination covering undergraduate physics, and is offered in September and February of each year. A list of exam topics (Appendix A), recent Qualifying Examinations, and an information sheet for students are available at our web site ([www.physics.wisc.edu/grads/qualifiers/qualifiers.html](http://www.physics.wisc.edu/grads/qualifiers/qualifiers.html)).

The exam must be taken in the student's first semester and must be passed by the fourth semester. New students are required to take the Qualifier in September as a placement test or "free try" at the beginning of their first semester. Students who pass will satisfy the Qualifier requirement. Students who do not pass will receive advice and feedback by discussing with their advisor, members of the Qualifier Committee, and/or other members of the physics faculty. Students planning to take the Qualifying Examination must sign up with the Graduate Program Coordinator at least one week prior to the exam date. Notices of the date and times of the exam will be distributed to the students' mailboxes and/or via email.

## Steps to Ph.D.

<i>Sem 1</i>	<i>Sem 2</i>	<i>Sem 3</i>	<i>Sem 4</i>	<i>Sem 5</i>	<i>Sem 6+</i>
<b>Introductory Seminars</b>					
	<b>Qualifier</b>				
	<b>Required 700 Level Courses</b>				
	<b>Choose Major Professor</b>				
			<b>Pre lim</b>		
			<b>Research</b>		(Working towards final defense of dissertation → )

## ● *Ph.D. Course Work*

Before completing the minimum credits requirement for the Ph.D., a student holding a regular half-time teaching or project assistantship is expected to register for at least six credits. A student holding a research assistantship or a fellowship is required to carry at least eight credits (this can be partly or entirely Physics 990) each semester until dissertator status is achieved. Those who have achieved dissertator status must register for three credits (typically Physics 990, but can be upper level courses related to research with advisor approval) each semester. To remain in good standing, a student must maintain a B average in course work.

Entering graduate students should check that their undergraduate work was equivalent to a complete physics major. Students without the experience of a senior advanced laboratory course could take Physics 507. Physics 623 (Electronic Aids to Measurement) and 625 (Applied Optics) are important for an understanding of experiments in most research areas and should be taken as soon as possible. The remaining 500 and 600 level courses in the student's area of interest should also be taken as early as possible. Physics 551 (Condensed Matter Physics) should be taken by students interested in Condensed Matter Physics or related areas such as spectroscopy. Students interested in space physics or astrophysics should take courses in astrophysics which are at least equivalent to the requirements for a minor in Astronomy. Physics 545 (Introduction to Atomic Structure) gives a good general introduction to atomic physics. Those interested in plasma physics should begin the sequence of plasma courses with Physics 525 (Introduction to Plasmas). Physics 535 (Introduction to High Energy Physics) and /or Physics 735 (Particle Physics) should be taken by students interested in high energy physics.

Ph.D. candidates are *required* to take a total of five core courses. Physics 715 (Statistical Mechanics) as well as 731 & 732 (Quantum Mechanics) *must be included* in the five; the remaining two may be chosen from Physics 711 (Dynamics), 721 (Electrodynamics), and 722 (Advanced Classical Theoretical Physics). Each course must be repeated until a grade of at least a B is earned. See Appendix B for the suggested sequence of core courses. Evaluations of physics graduate level courses, beginning with the Spring 2001 semester, are on file in the Physics Department Administration Office (Room 2320B Chamberlin Hall).

**Waivers of core courses:** Credit earned at other universities in equivalent graduate level courses may be counted toward this 5-course requirement if approved by the Graduate Program Director. A new graduate student who believes he or she qualifies for a waiver of the course requirement for a core graduate course based on past graduate course work must request the waiver form from the Graduate Program Coordinator during the first month he or she is enrolled in the graduate program in Physics. (See sample in Appendix D)

**Testing out of core courses:** Students can also demonstrate proficiency by passing an exam. A new graduate student who believes that he or she has had graduate level work in a subject comparable to that in a core course, but who does not clearly qualify for a waiver of the course requirement, has the option of testing out of the course. This will require passing the exams for the course at a level which would clearly lead to a grade of B or better, even in the absence of other information. Requests to test out of core courses must be made to the Graduate Program Director during the student's first month in the graduate program in Physics. The testing, to be arranged by the Chair of the Prelim Committee, must be completed during the student's first semester in the graduate program.

All graduate students should attend the weekly colloquium, Physics 900. Students are expected to regularly attend at least one of the weekly research seminars numbered above 900.

- **Minor**

Each Ph.D. candidate in physics must complete a minor program with at least a B average, normally in a field (or fields) related to the candidate's activities in physics. The minor is intended to broaden the candidate's knowledge of physics or related fields, or to support the candidate's research or prospective professional activities. The program selected should therefore be coherent and directed toward an identified objective. There are three options for satisfying the minor requirement: the Option A minor in a single department other than Physics, as well as interdepartmental and internal versions of the Option B Distributed Minor.

Minor Option A consists of a program of courses in a **single department** (for example: Astronomy, Biophysics, Chemistry, Computer Science, Geophysics, Mathematics, Atmospheric & Oceanic Science, Radiology, or one of the departments in Engineering). The requirements for Minor Option A and suitable course programs are specified by the minor department, but the Graduate School requires a minimum of 10 credits.

Minor Option B (called the Distributed Minor) consists of a program of 12 or more credits of course work from at least two departments. Up to nine of these credits may be from courses taken within the Physics Department numbered 500 or above, but must be outside the student's area of research specialization. Required core courses are generally excluded from this minor. However, if all six core courses are taken, 722 can count toward the minor. The program must be approved by the student's major professor and the Physics Department chair.

The Option B Internal Minor in Physics requires 12 credits in graduate physics courses numbered 500 or above in an area distinct from the major area of research specialization. Required core courses (711, 715, 721, 722, 731, 732) and prerequisites for these core courses are excluded from this minor. However, if all six core courses are taken, 722 can count toward the minor. The Option B (Internal Distributed) minor program must be coherent, and cannot include courses in other departments. The choice of one of the standard internal minor programs (see Appendix C) requires only the approval of the major professor, who must certify that the courses selected in the minor program do not significantly overlap the major area, and the department chair.

For both **Option A and Option B**, a Minor Agreement form must be completed, signed, and submitted to the Graduate Program Coordinator and reported to the Graduate School **at (or before) the time the Preliminary Warrant is requested**. It is advised that the student discuss his/her minor with the major professor before any of the minor classes are taken, regardless of which minor option is chosen.

The minor requirement in Physics for non-Physics students is 12 credits numbered above 300, each passed with a B or better. The program must be approved by the Physics Minor Advisor before it is completed.

- **Preliminary Examination**

The Preliminary Examination must be passed for admission to candidacy for the Ph.D. It must be taken no later than the end of the fifth semester in residence. If the Preliminary Examination is failed the first time, it may be repeated once and it must be passed before the end of the sixth semester. Before, or soon after the Qualifying Examination, the student should identify an area of research and choose a major professor who will act as chair of the student's Preliminary Examination committee. The exam will test whether the student has mastered the

physics and technology necessary for research in the proposed general area of research. The format of the examination is left to the major professor (subject to approval by the Departmental Prelim Committee). Ordinarily, the exam begins with a 1-hour talk covering a subject in the student's chosen area of research. The talk is then followed by a question-and-answer period intended to assess the student's background knowledge and research potential.

For each PhD student, a thesis committee is assembled at the time of the Preliminary Examination which consists of three faculty members, normally the major professor and two physics faculty members chosen by the major professor (subject to approval by the Prelim Committee). The thesis committee remains standing for the duration of the student's dissertation work. It judges the student on the Preliminary Examination and the PhD oral examination, and provides regular advice during the duration of the dissertation. The thesis committee is augmented by one member of the Departmental Prelim Committee for the Preliminary Examination and additional faculty members as required by the Graduate School for the PhD oral examination.

A student planning to take the Preliminary Examination should inform the Graduate Program Coordinator at least three weeks before the date of the examination. The minor agreement form is submitted to the Graduate Program Coordinator and reported to the Graduate School when the Preliminary Examination Warrant is requested. A warrant from the Graduate School is required before taking the Preliminary Examination. The warrant will not be issued if the student has any grade of "Incomplete." It is the responsibility of the student to check with the Graduate Program Coordinator to ensure that such a grade does not appear on the record.

### • ***Final Examination***

The Final Examination is an oral defense of the thesis, and must be taken within five years of passing the Preliminary Examination.

### • ***Satisfactory Progress as a Graduate Student***

A student is making satisfactory progress toward the Ph.D. degree if the student does all of the following:

- 1) Carries at least six credits if a TA (until dissertator status) and eight credits if a Fellow or an RA (until dissertator status) unless granted special permission by the Chair to register for less (in recognition of substantial outside commitments)
- 2) Does satisfactory course work (average grade B or better overall, and achieves at least a grade of B in each required course)
- 3) Passes the Qualifying Examination by the fourth semester of graduate work in physics. (Students are allowed to take the exam each of the first four semesters in the program for a total of four attempts)
- 4) Acquires a major professor or at least begins work with some research group by the beginning of the third semester.
- 5) Takes the Preliminary Examination no later than the end of the fifth semester in residence, and passes it before the end of the sixth semester.
- 6) Makes satisfactory progress in research work as judged by the major professor.

A student who fails to make satisfactory progress in graduate studies may be dropped from the Department.

- ***Delays***

Delays in the Qualifier or Preliminary deadlines can only be granted by the chair of the Department. Delays in passing the Qualifier by the student's fourth semester must involve unusual circumstances. Delays in taking the Preliminary Exam beyond the 5<sup>th</sup> semester in the program may be granted on a semester basis. The extension request for the Prelim Exam must be submitted to the Department Chair, in writing, from the student's major professor and must confirm the student is making satisfactory progress in their research. The major professor should also include a general timeline for taking the prelim. Failing to pass the Qualifier on the first attempt does not normally constitute grounds for delaying the Preliminary Examination schedule. The use of delays for the Preliminary Exam is intended (for example) to aid those students who encounter unavoidable delays in the choice of a permanent major professor.

- ***Leave of Absence Policy***

Graduate Students may request a leave of absence by submitting a statement of their timeline for the leave and general reasons for the absence. The advisor of record must agree that the student is leaving in good standing and may re-enter the program in a reasonable stated length of time.

While in most cases participation in the program is continuous through time, students sometimes find it necessary to take a temporary leave of absence. Written requests for a one semester or full year leave of absence should be addressed to the Department Chair and turned into the Graduate Advisor. If a student is granted a one semester leave of absence, the milestone due dates and terminal deadlines are pushed back approximately one semester. If a student is granted a full year leave of absence, all due dates and deadlines are pushed back one year.

Students may be granted a leave of absence for no more than one year. Students who do not register for more than one year will be considered inactive. Students should follow the following process when requesting a leave of absence.

- a) Write a letter requesting a leave of absence that includes the reason and time for the leave.
- b) Obtain a leave of absence form from the Graduate Coordinator.
- c) Get endorsement from the adviser.
- d) Give letter to the Graduate Coordinator. The Graduate Programs Committee decides on all the requests.
- e) Notify the Office of Graduate Admissions, room 217 Bascom Hall, of the semester of reentry.
- f) Return leave of absence form to Graduate Coordinator

- ***Re-Entry Policy for Department of Physics***

Graduate students who leave the program in good standing may request re-entry to the program by completing the Graduate School application for admission. The Department Admissions Committee in consultation with the student's advisor will review the request and approve the request based on information provided. A leave of absence request on file will enhance the re-entry approval process.

- ***Time Limits***

If you have not enrolled in the past 5 years, students must submit an online application to the Graduate School and pay the application fee.

Master's Degree students: If you are applying to resume your studies after five years to complete a degree that was in progress, you must fulfill the Graduate School's minimum credit requirement. Credits earned while previously enrolled are not counted toward this requirement.

Ph.D. students: If you did not take the final oral examination within five years after passing the preliminary examination, you must take another preliminary examination to be awarded dissertator status.

Appeals to Time Limit Policy (after 5 years): The department can submit a written request to the Graduate School Office of Academic Services if they believe an appeal is appropriate. An appeal should provide information demonstrating that you have remained current in your field of study, for example, a resume showing applicable work experience in your field of study and/or official transcripts from other schools attended. At the time of re-admission, the department should recommend to the Graduate School which credits, if any, should be counted toward the Graduate School Minimum Credit Requirement for work done more than five years ago.

## • **Master's Degrees**

Students may be admitted directly to the Masters program in Physics or earn either a Master of Arts (M.A.) or Master of Science (M.S) en route to a Ph.D. in Physics.

### **Professional Master of Science Program:**

The M.S. program is a terminal professional program designed to strengthen the student's physics background, and enhance his or her opportunities for employment as a physicist or in physics education. The program should normally be completed in two years or less by full-time Master's students.

To earn the M.S. degree in Physics, a student must satisfy the Graduate School's Minimum Graduate-Level Credits requirement (16 credits at the 300 level or above). The Physics Department requires at least 18 credits of graduate work with a GPA of 3.0 or better. At least 12 of the 18 credits must be in physics courses other than Physics 990 which are numbered above 500 (the remaining six credits may include Physics 990). The courses should be selected in consultation with the student's advisor to best meet the student's professional objectives. The student must also present satisfactory evidence of scientific writing and speaking skills. This will normally be done in connection with the Master's project through the submission of a Master's Thesis written at a satisfactorily professional level, together with an oral presentation of the project in a departmental seminar. A Master of Science Degree is awarded to a student who has:

- 1) satisfied the graduate-level credits requirements and Physics course requirements,
- 2) passed the Qualifying Examination in Physics at the Master's level,
- 3) completed a Master's project, and
- 4) made an oral presentation of the master's thesis.

The **Master's project** is a directed physics research project which can be completed in one to two semesters. It is intended to give the student direct experience with real physics problems, and a chance to demonstrate his or her ability to carry a project through to completion and prepare a description of the results written at a professional level.

No later than the end of the second semester in residence, every Master's student should acquire an advisor who agrees to supervise the Master's project. The project must be written up in a Master's Thesis. The thesis must be approved by the student's advisor and a second faculty member appointed by the Graduate Program Director. If the Master's project is to be used to satisfy the scientific communication requirement, the results must be reported orally in a departmental seminar, and the advisor and second faculty member must certify that the student's writing and speaking skills are at a satisfactory professional level.

**Academic Master of Arts Program:**

The M.A. program is an academic, course-based program designed to strengthen the student's physics background, and to enhance his or her opportunities for employment as a physicist or in physics education. The program should normally be completed in two years by full-time Master's students.

To earn the M.A. degree in Physics, a student must satisfy the Graduate School's Minimum Graduate-Level Credits requirement (16 credits at the 300 level or above). The Physics Department requires at least 24 credits of graduate course work with a GPA of 3.0 or better. At least 18 of the 24 credits must be in physics courses other than Physics 990 which are numbered above 500 (the remaining six credits may include Physics 990). The courses should be selected in consultation with the student's advisor to best meet the student's objectives. A Master of Arts Degree is awarded to a student who has:

- 1) satisfied the graduate-level credits requirements and Physics course requirements, and
- 2) passed the Qualifying Examination in Physics at the Master's level.

**Time Limits.** A Master's Program should normally be completed in two years or less. The program must be completed in three years. The time limit may be extended by the Chair for Master's candidates who were accepted into the program on a part-time basis, and present an acceptable plan for completing the degree.

Ph.D. candidates who wish to obtain a Master's degree in Physics may do so at any time prior to earning the Ph.D. by completing the requirements for either the M.S. or the M.A.

**Warrants.** A warrant from the Graduate School is required to receive the M.S. or the M.A. degrees. The warrant will not be issued if the student has a grade of "Incomplete" on their record. It is the responsibility of the student to inform the Graduate Program Coordinator at least six weeks before the end of the semester that the degree is expected and to determine that all required work has been completed.

**Transfer to the Ph.D. Program.** Students admitted initially only to a Master's program must reapply to the Physics Admissions Committee if they wish to enter the Ph.D. program. Acceptance into the Ph.D. program is not automatic, and will be decided on the basis of the student's record and prospects for completing the Ph.D.

### • **Minimum Graduate-Level Credits Requirements**

The credit requirement, shown below, reflects the minimum number of UW-Madison graduate-level credits that must be taken in order for the degree to be considered a UW-Madison degree. Graduate-level credits include those courses in physics numbered 500 or above as well as those courses in other departments numbered 300 or above.

<i>Degree</i>	<i>Minimum Graduate-Level Credits</i>
Master's Degrees	16
MFA, Specialists	24
Ph.D., DMA	32

The minimum credit requirement for Ph.D. and DMA students must be completed prior to achieving dissertator status. The Graduate School will not “transfer” any graduate work done at another institution toward fulfillment of the minimum UW-Madison credit requirement. All graduate-level credits, including those taken during the summer, will count toward fulfillment of the minimum credit requirement. Students must have at least a 3.0 GPA in their graduate coursework in order to graduate. Students who receive Graduate School approval for a credit overload (more than 12 credits in a semester) will be able to count all graduate-level credits toward fulfillment of the minimum credit requirement. A graduate-level course taken at a distance will count toward the minimum credit requirement only if the course is considered a UW-Madison course.

### • **Dissertator Status**

A graduate student becomes a “dissertator” when he/she has:

- 1) passed the Preliminary Examination,
- 2) satisfied the Ph.D. graduate-level credits requirement,
- 3) satisfied the minor requirement, and
- 4) completed the required courses (715, 731, 732; and two of 711, 721, 722) with a grade of B or better.

Dissertators must register for **three credits** per semester (including the Summer Session if on an appointment and/or if student is depositing their dissertation with the Graduate School in the summer term). Official determination of dissertator status is made *only* at the Graduate School. Continuous registration is required from the time a student has achieved dissertator status through the filing of the Ph.D. dissertation in the Graduate School. (This includes Fall and Spring semesters, and if holding an appointment, Summers, while on or off the campus.)

\*Note: Students should notify the Department’s Payroll Office of the dissertator status once it is achieved.

- **Normal Course Load**

The normal (full-time) program consists of 8 to 12 credits of graduate work for a semester, and 2-3 credits for the 8-week Summer Session. Students may not register for more than 12 graduate credits during the semester, or more than 8 graduate credits in the 8-week Summer Session, without prior approval from the Graduate School. Every student who uses University facilities *must* be registered for at least two credits during either the regular academic year or the summer.

- **Course Loads for RAs, TAs, PAs, Fellows, etc.**

An RA or Fellow must carry a full graduate load (8-12 credits per semester, and at least 2 credits in the summer) until dissertator status is achieved. TAs and PAs are expected to carry a minimum of 6 credits. It is recommended that TAs take only 6 credits during their first year in graduate school because more than this may affect performance in both teaching and course work.

- **Summer Session Enrollment**

Graduate Students who have served as graduate assistants with tuition waivers during the previous academic year enjoy the same waiver during the Summer Session. **A student holding a research assistantship during a Summer Session must be concurrently registered for at least two credits.** Graduate students who are TA's during the Summer Session do not have to be registered. **Dissertators must register for three credits.** The three credits do not have to be in Research 990; however, coursework taken must reflect strongly on the student's area of research and be an upper graduate level course (numbered 500 or above).

- **Teaching Assistantships**

A teaching assistantship is both a teaching position and a means of support for graduate study. Because of the coexistence of these two functions, the relationship between the Department and the individual teaching assistant is complex. It is normally advantageous for a graduate student to hold a teaching assistantship for at least a semester during graduate studies, since the teaching activity solidifies and deepens the teaching assistant's undergraduate education in physics and also helps prepare for a possible career in teaching.

- **Appointments to Teaching Assistantships**

1) Initial appointments to regular teaching assistantships are made by the chairperson on the recommendation of the Department Committee on Admissions and Fellowships.

Criteria for appointment as a teaching assistant include:

- a) A good academic record in an undergraduate physics major, as a graduate student
- b) Working knowledge of oral and written English.
- c) Ability to communicate effectively with undergraduate students.

- d) Good standing as a graduate student at the University of Wisconsin. This is a University requirement for holding an assistantship. “Good standing” is defined in terms of quantity of academic work carried (number of credit hours) and the quality of the work (B average for a graduate student).
  - e) When several candidates are qualified according to the preceding criteria, we give preference to those who show the most promise for Ph.D. research as judged by the Committee on Assistantships and Fellowships.
- 2) Last-minute or short-term appointments may be made on a temporary (one semester) basis by the chairperson. Such limited term appointments do not carry any assurance of continuing support.
- 3) Reappointments (from limited-term status) to teaching assistantships with a guarantee of continuing support are made by the Department after receiving the recommendation of the Teaching Assistant Review Committee. In addition to the criteria listed under (1), the criteria for reappointment as a teaching assistant include:
- a) Satisfactory performance as a teaching assistant,
  - b) Submission of a short (<200 word) research plan
  - c) Satisfactory progress as a graduate student, as discussed above.
- 4) Whenever possible, teaching assistantships are half-time appointments. However, appointments less than half-time may be used to meet a special need of an individual appointee, or to cover special, often last-minute, teaching assignments.
- 5) If a teaching assistant transfers to another department, the commitment to continuing support is terminated. However, exceptions may be made for joint Ph.D. programs or in other special circumstances, at the option of the Department.

### • **Regular Half-Time Teaching Assignments**

The following assignments are typical half-time assignments. A teaching assistant should be able to do a satisfactory job in one of these assignments without exceeding the 360-hour per semester workload for a half-time appointment. The amount of time spent on the assignments may, of course, fluctuate from week-to-week.

<i>Courses</i>	<i>Assignment</i>
103, 104	3 laboratory-discussion sections
109	4 laboratory sections
201, 202, 207, 208	2 laboratory-discussion sections

Representative breakdowns of allocation of the 50%/360 hours among duties such as preparation, meeting classes and labs, attending lectures and course meetings, conferences with individual students, helping with registration, etc., is available in the department office.

- ***Evaluation of Teaching Performance***

The teaching performance of each teaching assistant is evaluated every semester by the TA Review Committee. The appointments of teaching assistants who are given unsatisfactory ratings may be terminated. Outstanding teaching assistants may be nominated for departmental or campus-wide teaching awards. Material considered in the review will include the results of teaching evaluation questionnaires filled out by the students in the teaching assistant's sections, the evaluation of the teaching assistant by the faculty member in charge of the course, and any other relevant information submitted to the Committee by students, faculty, the teaching assistant in question, or other teaching assistants. A summary of the results of the evaluation is sent to each TA, and a copy is maintained by the Department. Teaching assistants are required to look at this information after the review, since it is valuable for self-evaluation and improvement.

- ***Student Code of Conduct***

Students are expected to conform to accepted codes of conduct. This includes avoidance of disruptive or harassing behavior and sensitivity toward issues related to race, gender, disabilities, and sexual orientation.

Grievances on such issues should be referred to your major professor or the Department Chair. Please refer to the "Grievances" section in this handbook for more details on grievance procedures.

- ***Grievances***

A recurrent theme in the sequence of recent reviews and discussions has been the question of to whom one should go to register a grievance, complaint, or just a suggestion. The Department recommends that you inform your advisor, if appropriate, about any concerns you may have about academic issues or the academic environment. This is not meant to discourage a direct approach to the Department Chair, only to provide alternative avenues. Some issues can be discussed with your major professor and others with the Chair. The hope is that this will result in the development of a working environment that all will find supportive. If you have a question of whether or not a situation or discomfort should be discussed, the answer is YES! Any issue which troubles you should be addressed and, if it is within our authority, will be resolved.

- ***Climate and Diversity***

At UW-Madison physics, we are committed to providing an optimal environment for intellectual achievement at both the undergraduate and graduate levels. All members of the physics department are expected to do their part to maintain this positive academic climate. We do not tolerate harassment of any member of our community.

The Office for Equity and Diversity (OED, <http://oed.wisc.edu/>) can assist with concerns about any type of prohibited harassment or discrimination, including harassment based on gender, race, religion, ethnicity, age, disability, and sexual orientation. University guidelines are at <http://www.oed.wisc.edu/sexualharassment/>

Concerns should be first addressed to Luis Pinero, Dir. of Equity and Diversity Resource Center (3-2378). Other resources include the Office of Legal Affairs, Student Advocacy and Judicial Affairs (3-5700), the University Ombudsman office (5-9992), Stephen Appell, complaint investigator, and Steve Pearson, employee assistance.

Less serious concerns about the climate in our department should be referred to your Major professor or the department chair. Advice about conflict resolution is available at

<http://www.ohrd.wisc.edu/onlinetraining/resolution/index.asp>

## **Appendix A**

### **Qualifying Examination - Representative List of Topics**

#### **Part I (10/10 questions - 7 minutes: 200-299 level)**

- Mechanics
- Mechanics, possibly vibrations or sound
- Electric Circuits
- Electromagnetism (not circuits)
- Waves
- Light (possibly geometrical optics)
- Thermodynamics
- Kinetic Theory
- Atomic
- Any subject

#### **Part II (10/15 questions - 12 minutes: 300-499 level)**

- Classical Mechanics (and gravitation, if possible)
- Classical Mechanics (and electromagnetic forces, if possible)
- Classical Mechanics (vibrations and/or sound, if possible)
- Waves (interference and diffraction: not necessarily light)
- Light (possibly including lasers)
- Circuits and Electronics
- Maxwell Equations and/or EM Waves
- Thermodynamics and/or Kinetic Theory
- Particle Detection (not necessarily counting statistics)
- Properties of Matter
- Lab Techniques and/or Instruments
- Quantum mechanics
- Atoms and/or Molecules
- Special Relativity
- Nuclear and/or Particles
- Plasma and/or Space

## APPENDIX B

### Suggested Sequence of Core Courses

The core courses should be taken as soon as possible in the graduate career. Finishing the core courses allows the most rapid entry into research, and you will find that you need to know much of the material for more advanced work in your research specialty. In order to avoid scheduling conflicts, all core courses occur in the morning on Monday/Wednesday/Friday. Usually, students take two core courses in each semester of their first year.

Core courses are typically offered as follows:

Fall Semester: 711, 715, 731

Spring Semester: 715 (may not be offered due to unavailability of faculty), 721, 732

In general, 731 should be taken before 732, and 721 should be taken before 722, but otherwise none of the courses is a strict prerequisite for any other. Most students take 731 and 732 in the fall and spring semesters of their first year. Beyond this, the sequence in which the courses are taken tends to vary slightly, according to the interests of the individual student and his/her research area. In Astrophysics, Space Physics, and Plasma Physics, students may wish to emphasize electricity and magnetism and complete 721 and 722 in the first year. In Particle and Nuclear Physics, students may wish to complete 711 and 721 in the first year. In Atomic, Molecular and Optical, and Condensed Matter Physics, 715 and 721 may be good choices. Individual students should feel free to tailor their choice of courses to their own needs after a discussion with their advisor.

## **APPENDIX C**

### **Option B Internal Minors in Physics**

#### **Advanced Experimental Physics: suitable for theorists**

546, Lasers  
623, Electronic Aids to Measurement  
625, Applied Optics  
736, Experimental Techniques in Particle Physics  
741, Experimental Nuclear Physics  
746, Quantum Electronics  
805, Special Topics in Physics

#### **Advanced Theoretical Physics: suitable for experimentalists**

522, Advanced Classical Physics  
717, Relativity  
722, Advanced Classical Theoretical Physics  
751, Advanced Solid State Physics  
752, Many-Body Problems in Solid State Physics  
801, Topics in Theoretical Physics  
815, Advanced Statistical Mechanics  
831, Advanced Quantum Mechanics  
832, Advanced Quantum Mechanics  
833, Advanced Math in Quantum Field Theory

#### **Astrophysics:**

717, Relativity  
771, Physics of Space  
772, Physics of Space  
801, Special Topics in Theoretical Physics (if astrophysics, cosmology related)  
805, Special Topics in Physics (if astrophysics, cosmology related)

#### **Atomic Physics:**

545, Introduction to Atomic Structure  
546, Lasers  
547, Atomic Collisions with Applications to Gaseous Electronics  
625, Applied Optics  
722, Advanced Classical Theoretical Physics  
746, Quantum Electronics

#### **Atomic and Condensed Matter Physics:**

545, Introduction to Atomic Structure  
546, Lasers  
547, Atomic Collisions with Applications to Gaseous Electronics  
551, Solid State Physics  
625, Applied Optics  
722, Advanced Classical Theoretical Physics  
746, Quantum Electronics

751, Advanced Solid State Physics  
 752, Many-Body Problems in Solid State Physics

**Atomic and Plasma Physics**

525, Introduction to Plasmas  
 527, Plasma Confinement and Heating  
 545, Introduction to Atomic Structure  
 546, Lasers  
 547, Atomic Collisions with Applications to Gaseous Electronics  
 625, Applied Optics  
 722, Advanced Classical Theoretical Physics  
 724, Waves and Instabilities in Plasmas  
 725, Plasma Kinetic and Radiation Processes  
 746, Quantum Electronics

**Condensed Matter Physics:**

551, Solid State Physics  
 722, Advanced Classical Theoretical Physics  
 751, Advanced Solid State Physics  
 752, Many-Body Problems in Solid State Physics  
 831, Advanced Quantum Mechanics

**Elementary Particle Physics:**

535, Introduction to Particle Physics  
 722, Advanced Classical Theoretical Physics  
 735, Particle Physics  
 736, Experimental Techniques in Particle Physics  
 831, Advanced Quantum Mechanics  
 832, Advanced Quantum Mechanics  
 833, Advanced Math in Quantum Field Theory  
 835, Collider Physics-Phenomenology

**Nuclear and Particle Physics**

535, Introduction to Particle Physics  
 735, Particle Physics  
 736, Experimental Techniques in Particle Physics  
 741, Experimental Nuclear Physics  
 742, Theoretical Nuclear Physics  
 831, Advanced Quantum Mechanics  
 832, Advanced Quantum Mechanics  
 835, Collider Physics Phenomenology

**Plasma Physics:**

525, Introduction to Plasmas  
 527, Plasma Confinement and Heating  
 724, Waves and Instabilities in Plasmas  
 725, Plasma Kinetic and Radiation Processes  
 726, Plasma Magnetohydrodynamics

## Required Course Waiver/Test-Out Form

STUDENT'S NAME \_\_\_\_\_

ADVISOR'S NAME \_\_\_\_\_

*I request that the Graduate Program Coordinator grant me a waiver for the following Physics course(s): (please circle below)*

711      715      721      722      731      732

*Equivalent course work completed at: (give corresponding course number and title)*

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Comments:**



*This section is to be completed by the Graduate Program Coordinator.*

- Course(s) Waived:** (enter course numbers) \_\_\_\_\_
- Waiver Request Denied**
- Approval given for Test-Out try**

**Comments:**

**Graduate Program Coord. Signature** \_\_\_\_\_

**Date** \_\_\_\_\_



*This section is to be completed by Prelim Chair, if testing out.*

- Test-Out successful:**                      **Course**  
**Number(s)** \_\_\_\_\_
- Test-Out not successful:**              **Course**  
**Number(s)** \_\_\_\_\_

**Comments:**

**Prelim Chair's Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

*Please return to: Jane Schimmel, Graduate Secretary, 2320 Chamberlin Hall*

