DEPARTMENT OF PHYSICS

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1. **Format and Content of the Ph.D. Comprehensive Exam**

The intent of the Comprehensive Exam is to demonstrate that the student has achieved a working knowledge of the typical Canadian B.Sc. Honours physics degree. It is NOT the intention to examine only the specialty area within physics of the student, nor to examine material at the graduate level: final exams for the required graduate courses serve that function (as at other schools) and as well as the minimum grades required by the Faculty of Graduate Studies for a student to continue in the graduate program.

The Comprehensive Exam consists of three parts: two 2-hour written exams, written on the same day, followed in two weeks by an oral exam, provided the student passes the written exam. All examinations follow closed-book format. The Ph.D. candidates must pass the written and oral components of the exam separately in order to pass the Ph.D. Comprehensive Exam. The written and oral components of the Ph.D. Comprehensive Exam will be weighted equally (50% each) in calculating an overall grade for the Ph.D. Comprehensive Exam. The final mark will be quoted as Pass or Fail.

Suitable problems for all three exams will be solicited from the faculty by the Department Head. The Department Head or Graduate Coordinator will assemble the written exam and approve the questions to be used in the oral exam by the Ph.D. Comprehensive Examining Committee. Each question of each part will be marked by the person who submitted it, and the scores will be tallied by the Department Head or Graduate Coordinator.

Should a student fail the exam on his/her first attempt, a second attempt will be allowed four months following the first attempt. A student may apply to the Department Head to extend the interval between the second and first attempts to longer than four months. Approval from both Department Head and Graduate Co-ordinator is required to grant such an extension. *Any student who fails the second attempt will be required to withdraw from the graduate program*.

Written Component:

The first two sections of the Comprehensive Exam consist of two written exams, each in two parts, as shown in Figure 2. The student will be allowed two hours to complete Parts A and B, and then two hours to complete Parts C and D.

FIGURE 2 - WRITTEN COMPREHENSIVE EXAM SECTIONS **First Section:**	
Part A:	Complete 2 of 3 problems/questions in Quantum Mechanics and Electricity and Magnetism (1 hour, 50% of section 1)
Part B:	Complete 2 of 4 problems/questions in Statistical Mechanics, Nuclear Physics, Particle Physics, Solid State (1 hour, 50% of section 1)
Second Section:	
Part C:	Complete 4 of 5 problems from junior undergraduate courses (80 min., 70% of section 2)
Part D:	Complete 2 of 3 problems from intermediate and advanced classical mechanics (40 min., 30% of section 2)

The first part of the written exam, part A, will include three questions, of which the student should complete two. The three-part A problems will be drawn from the subjects of quantum mechanics and electromagnetic theory. The level of problems/questions will be comparable with the discussion of these topics in the "Feynman Lectures of Physics". Each question should be completed in about 30 minutes and will be worth 25% of the part A/B written exam grade.

The second part of the written exam, part B, will include four questions from four subjects, of which the student should complete two questions. The four areas are statistical mechanics, nuclear physics, particle physics and solid state physics. As in part A, the level of the problems/questions will be comparable with the discussion of these topics in the "Feynman Lectures of Physics". Each question should be completed in about 30 minutes and will be worth 25% of the written part A/B exam grade.

The third part of the written exam, part C, will include five questions based on the junior undergraduate texts used in Physics 111 through 292 (e.g. "Physics" by Halliday, Resnick, and Krane), of which the student should complete four questions. Each question should be completed in about 20 minutes and the four questions will be each worth 17.5% of the written C/D part of the
exam.

The final part of the written exam, part D, will include three questions, of which the student must do two, based on the intermediate and advanced mechanics classes, Physics 202, 301 and 411. Each question will be worth 15% of the written C/D part of the exam.

Oral Component:
The final section of the Comprehensive Exam is an oral examination administered by four faculty members selected by the Department Head for this purpose. The questioning shall last at least 60 minutes and not last more than ninety. Individual examiners will question the student between 15 minutes and not longer than twenty-five minutes. The questions will be chosen from those submitted to the Department Head for the oral exam and will be based on the junior undergraduate books as discussed above for section C of the written exam. Each member of the Ph.D. Comprehensive Examining Committee will judge the answer to every question, and keep a record of the scores for discussion after the student has left the examination room.

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