Preliminary Examination Guidelines

Overview
The Bioinformatics preliminary exam is usually the final step before candidacy. The aims are two-fold. The first is to demonstrate that students have developed the ability to analyze a scientific problem, develop appropriate strategies to carry out a research plan, and defend it to a committee; the second is to demonstrate that students have the fund of knowledge in Bioinformatics needed to carry out their thesis research.

The preliminary examination in Bioinformatics consists of a written and an oral component. For the written portion of the exam, each student – independently of their thesis advisor – prepares a condensed version of an NIH research proposal on a subject that may be somewhat related to, but is not, their thesis project or another project in their advisors lab. In the oral portion of the exam, the candidate defends the research proposal and is asked questions relevant to the candidate’s proposed area of research.

Eligibility
The student must have clearly identified a thesis advisor who, prior to the examination, has interacted with the Program Directors to discuss advisor responsibilities towards the student.

The student is expected to have successfully completed (or be on track to complete) course requirements. Students must take eight full courses (six with a prior relevant master’s degree), in four areas (computing/databases, biology, statistics/modeling, and bioinformatics), in addition to BIOINF 602 and PIBS 503. If the student has taken seven of the eight required courses (five of six, respectively), s/he may proceed with the preliminary exam, contingent on approval by the Program Directors and with the understanding that the additional required course will be taken the next term available.

Timeframe
A student may take the preliminary exam after the first year of study. A student is expected to have successfully completed the exam by the beginning of the third year. Exceptions need to be requested from the Program Directors to remain in good academic standing in the program. If a student has not successfully completed the preliminary exam by the beginning of the fourth year, Rackham Graduate School may place the student on academic probation.

Step #1: Approval of Topic and Examining Committee
The student is responsible for selecting a topic and writing a one-page abstract describing the proposed research. This is sent to the Bioinformatics Preliminary Abstract Review Committee (PARC), who approve topics and proposal abstracts, and the Student Services Representative. The PARC mission is to help the student identify feasible and novel hypothesis-driven aims.

Together with the abstract submission, the student must also propose the names of four or more faculty members for his/her preliminary examination committee. Dissertation advisors are not allowed on the committee and do not attend the examination. Three of the four must
be Bioinformatics-affiliated faculty. At least one faculty needs to be biomedical, one to have a quantitative focus, and at least one member should have been a BIOINF preliminary exam committee member before. If this criteria is not met, or the abstract needs revisions, PARC will suggest alternates and provide input. The Student Services Representative is cc’ed with this information.

**Step #2: Examining Committee**
Once approved, the student (a) may speak with the faculty individually to request participation and (b) send abstract and committee names to all members, indicating PARC approval.

The committee is responsible for reading the written proposal, attending the student’s oral exam, critiquing his/her proposal, and assessing his/her general knowledge and preparation for carrying out doctoral research. At the time of the exam, members select the committee Chair. The exam committee decides to pass the student or make recommendations for a remedial course of action. The Chair of the student’s committee is responsible for providing the Bioinformatics Program with a 1 page summary of the committee recommendations within 48 hours of the exam. These results are shared with the student.

**Step #3: Written Proposal**
Students are encouraged to seek information from a variety of sources, including the primary literature, seminars, and discussions with other students and post-doctoral fellows. Input from faculty is limited to technical points. Thesis advisors should expect that students will require a six week period of substantially protected time to devote to the preliminary exam.

The requirements for the written preliminary examination proposal in bioinformatics are as follows:

- is independent work by the student,
- emphasizes biological relevance,
- demonstrates the student's ability to identify a scientific problem, experimental design, formulate testable hypotheses, and analyze data,
- conveys the student has the ability to develop a research plan to address these questions.

The student is to design a project which one person could complete in 2-3 years. The subject of the proposal can be in the general area of the student’s thesis project, but should NOT be identical to (a) the thesis proposal, (b) another project in the same lab, (c) a proposed or funded grant of the thesis advisor. In addition, it should not report exclusively on completed work (as in a manuscript). Methodology with current work in the thesis lab may overlap. Budget, budget justification, research environment, or other administrative forms and approvals typically required for an NIH grant are not required.

The layout of the proposal has a twelve page limit excluding references, 12 pt. font, double spaced, 1” margins.
The proposal follows this general format:

- **Abstract**
- **Specific Aims**
- **Background and Significance**
- **Preliminary Data** (not required, may be taken from literature or some own analyses)
- **Research Design and Methods**
- **References**

*This proposal must be submitted at least five working days before the date of the oral exam.*

*The committee reserves the right to cancel the exam if this is not adhered to.*

The Student Services Representative also receives a copy of the proposal.

### Step #4: The Oral Examination

The student should prepare a 30 min. presentation for the oral examination. There are two requirements for the oral exam. First, the student should present and defend their research proposal to the satisfaction of the committee. This includes understanding the algorithms and approaches proposed, and justifying their use over alternatives. Second, the student should demonstrate to the committee that their knowledge base has prepared them to undertake independent doctoral research in their chosen area. Technical details of procedures should not be a major focus of the examination (e.g. if an experimental protocol is used by several groups in the literature, students need not be responsible for the details of the experimental protocol, but they should know the underlying principles of the assay). It is recommended the student prepare back-up slides to help address anticipated questions from the committee.

Bioinformatics is a multidisciplinary field. Core areas of knowledge include molecular biology; macromolecular structure; databases and algorithms; statistics and pattern recognition; and system modeling. Students are expected to acquire a level of knowledge in these areas relevant to their thesis research. The committee should place greatest emphasis on knowledge and skills applicable to the topic a student has chosen for their thesis work.

### Results

The results of the prelim exam must be one of the options listed below:

(a) **pass.** No additional work needs to be done by the student. This does not mean that the proposal was perfect, but that the committee feels the student is qualified to start thesis work.

(b) **conditional pass.** Some revisions need to be made in either the written material or the oral portion for educational reasons. The condition should be fulfilled within 2 – 3 weeks (maximum).

(c) **fail.** The student will need to complete the exam again, on the same or a different topic. This does not mean automatic dismissal from the program. If the recommended remedial course of action requires extended amount of time (such as taking a course), the result should be fail.
Helpful tips:

**Scheduling:**
It is recommended to schedule the exam in advance as much as possible, as finding a compatible time for all committee members may be difficult. Sites such as [http://www.whenisgood.net/](http://www.whenisgood.net/) may be useful in coordinating the exam time.

Once a time and date have been established, please contact the Student Services Representative who can assist with room reservations and other equipment needs.

**Preparation:**
A student may wish to have a “dry run” of the presentation to fellow students. The student should NOT do this in his/her lab as faculty input on design and plan is not allowed.

**Sample research plans:**