

PRELIMINARY QUALIFYING EXAMINATION GUIDELINES

THE GOAL

The primary goal of the Preliminary Qualifying Examination (PQE) in BBS is to ensure that you are able to assemble an effective research proposal and then discuss the details of this project with a team of faculty that you select. Research proposal development is a skillset essential for the vast majority of research careers that our students pursue after degree completion. Developing your PQE proposal will challenge you to put into practice many of the concepts, skills and approaches that drive your field of research forward. BBS PQE examiners are asked to assess whether you have achieved an appropriately high standard of scientific scholarship and experimental design skills for successful completion of your independent Ph.D. thesis research and career development. In addition to assessing your foundational knowledge in key areas such as genetics, molecular biology, cell biology, and biochemistry relevant to your proposed research, the PQE will also help you develop your ability to:

- Develop hypothesis or technology driven research plans likely to advance your chosen field.
- Prepare a detailed and compelling research plan to test these hypotheses or technologies, including describing the overall strategy, specific methodology and rigorous analyses to be used to accomplish the aims as well as discussing potential problems, and alternative strategies and contingencies.
- Generate creative and forward-thinking aims that will advance a given field.
- Orally explain and defend these ideas and the particular design of your research plan.
- Critically analyze and interpret data, including the application of relevant statistical tests.

PROCEDURAL ISSUES

All students must successfully take and pass **BBS330QC: Critical Thinking & Research Proposal Writing** prior to taking their qualifying examinations. In BBS330qc, students work in small groups to develop a research proposal relevant to their thesis topic, which includes two specific aims. The course begins with an initial outline and progresses through multiple drafts. Exams are scheduled during the second half of the G2 year, from January through June. HMS MDP students may request permission to enroll in BBS330qc and take the PQE during their G1 year. If their request is approved, they are required to attend the PQE Informational Meeting of their G1 year. **All BBS students are required to complete their qualifying exams by June 30th of their G2 year.**

- The PQE will be based on the two aims developed during BBS330qc **PLUS** a third aim, derived outside of the course, which is specific to the PQE proposal.
- Changes made to Aims 1 and 2 for the PQE version of the proposal are allowed, for example especially if new data are obtained, new paper(s) are published that affect the aims, rationales, or approaches – if major, non-cosmetic changes are made, students must include an introductory cover page that summarizes the changes from the BBS330qc proposal to the PQE proposal. This cover page is not included in the final page count.
- As part of our protocol for the BBS PQE proposal submission, BBS requires a simple but explicit data management plan (DMP) outline for the proposed project (about one page). Unlike the current NIH requirement, the PQE DMP will focus mainly on practical issues relevant to the experimental study design.

PQE Informational Meeting

All students are required to attend a PQE informational session before taking their qualifying exams. The session's date and time will be provided to students prior to the start of the academic year.

PQE Proposal Form

The due date will be communicated to students by email.

Describe the topic (one concise paragraph)

1. Briefly outline the major question(s) that will be pursued.
2. Briefly describe the experimental system and approaches (with a few sentences and by choosing keywords).

3. Identify potential exam chairs and examiners.
4. PI must sign the form so plan accordingly.

PQE COMMITTEE

Your examination committee will consist of 1 chair and 2 examiners, and you should try to identify a chair from the PQE Chair list below. However, any BBS faculty that has served on three or more PQEs can serve as chair, if needed. The office will provide a list of faculty and their PQE service history after the conclusion of the PQE Informational Meeting. Try to identify faculty whose expertise fits closely with your topic. For example, if the project involves studying the cell cycle in *Drosophila*, pick at least one examiner with expertise in the organism and another with expertise in the cell cycle. It may not always be possible to find examiners with closely related expertise. However, and it must be emphasized, this is not a necessary condition for a fair exam. As is common in the NIH grant review system, some committees might include faculty with expertise in the broad area of the student's project but not exactly the same system or topic. You should therefore strive to make the proposal accessible to anyone in the general area of the project. **Your PI cannot be on your committee, nor can they be in the room during your PQE.**

Role of Examination Committee Chair

PQE chairs are experienced examiners and are responsible for keeping the exam on course and ensuring that examiners pursue an appropriate line of questions. The chair is also responsible for completing the PQE Evaluation Report and following up with students if they receive a conditional pass or fail.

Adrian Salic
Alan Cantor
Andi McClatchey
Ann Hochschild
Anna Greka
Bruce Zetter
Carla Kim
Dan Finley
Dipanjan Chowdhury
Emanuela Gussoni
Josh Kaplan
Lee Gehrke
Marcia Haigis
Martha Bulyk
Pat D'Amore
Ralph Scully
Steve Gygi
Tom Rapoport

The following faculty should be excluded from your proposed list:

- Current or recent collaborators of your PI who have been closely involved in the project
- Recent trainees of your PI (within the last 5 years)
- BBS Program Advisor
- BBS330qc Section Leaders
- PQE Steering Committee Chair, Raul Mostoslavsky
- BBS Program Director, Davie Van Vactor

Once the BBS Program Office receives your Exam Proposal Form and list of potential examiners, the office will review the list and determine if any should be excluded due to a conflict of interest. **Only BBS faculty are eligible**

to serve on BBS exams. The office will ensure that the same faculty are not excessively tapped as examiners. The list of approved faculty will be submitted back to you within one week of submitting your PQE Proposal Form and you may only contact the faculty after the proposal form has been approved by the BBS office. If additional names are needed, please contact Danny Gonzalez at daniel.gonzalez@hms.harvard.edu.

You are responsible for contacting faculty and scheduling your own PQE committee, date, and time. You should begin scheduling your exam at least one month before you would like to take your PQE. **Please note - the exams are usually two hours and take place at the HMS campus.** It is also strongly recommended that you secure a chair first and then use his/her availability as a starting point for scheduling your PQE. Once you've obtained your chair's availability, contact the two examiners you wish to serve on your committee and provide them with the dates and times. The websites www.doodle.com or <https://whenisgood.net/> are helpful tools for aiding in the scheduling process. Parking will be provided for faculty outside the Longwood Medical Area. Please contact the BBS Office to schedule parking for faculty. You can book a room for the exam through Room Scheduling at: <https://hms.emscloudservice.com/web/>. We recommend booking a tutorial room at TMEC but you may also book a conference room in your department if preferred.

After you have scheduled your PQE, you must register your exam in my.harvard. Please refer to the step-by-step registration [instructions](#).

Role of the PQE Steering Committee Chair

The Chair of the PQE Steering Committee, Raul Mostoslavsky (rmostoslavsky@mgm.harvard.edu), offers an overview meeting each fall semester. In addition, Raul is available to answer questions, clarify expectations, and provide guidance at any point during the exam preparation process. For students that receive a "fail" - Raul will serve as examination chair during the retake.

THE PROPOSAL

You must submit your proposal to your committee (please CC Danny as well) one week before your exam.

The BBS Program Office will send your student file and course grades to your committee once your proposal is received. The exam chair will contact the examiners 72 hours before the exam to determine whether they find the proposal generally acceptable. If one or more examiners feel that there are substantive deficiencies that must be remedied to make the proposal acceptable, the chair must contact or meet with the examiners, the dissertation advisor, and the student to discuss the situation and whether to proceed with the examination as scheduled.

Topic

The PQE proposal will follow logically from the on-topic thesis proposal developed in BBS330qc. The expectation is that 2 aims will be developed as part of BBS330qc and will be focused on your thesis topic or related to your thesis project, and a substantial proportion of the work should be hypothesis- or technology-driven. For the PQE proposal, one additional specific aim must be developed that is driven by your own ideas. This third aim is an opportunity to be creative, so we encourage students to take risks and think 'outside the box', provided the rationale(s) are sound and logically-derived. Even if any of the aims involve screening or other open-ended efforts, at least one aim must test a hypothesis. Technology-driven or screen-based proposals are allowed and encouraged; however, for such approaches it is essential to emphasize rationales, as well as efforts directed at validation of data sets and expected outcomes. You should submit your PQE proposal comprising the 2 aims developed in BBS330qc, plus a new third aim. You are allowed to update the two BBS30 aims for the PQE proposal (e.g., to encompass new preliminary data, or newly-published studies), but if you do so, please include a summary paragraph, not more than one half page, as a cover page where you describe the major changes made to the BBS330qc proposal for the PQE proposal. The aim(s) are expected to be creative and thought-provoking yet must be balanced with feasibility. They do not necessarily have to be the exact aims of your dissertation research.

While it is anticipated that some of the proposal will be based on the ideas of your thesis advisor, **the third aim developed specifically for the PQE proposal must be solely written by you**. Again, we encourage students to derive the third aim by proposing creative, 'risky' and forward-thinking hypotheses that if successful, will propel a

given field forward. Similarly, students are expected to propose work that will advance understanding within the relevant field, and proposals that restrict themselves entirely to obvious extensions of existing work will not be given a clear pass. For aims that have been inspired by the ideas of others, we expect students to cite the sources of ideas and/or information derived from personal communication. **The proposal should be designed so that you could realistically complete the work in approximately four years.**

Input/Advice

You are strongly encouraged to seek advice and help from post-docs and graduate students as you work to develop and craft the proposal and prepare for the oral exam. **We also strongly encourage you to get feedback on your written proposal and the proposal presentation from post-docs, your PI, and students.**

- Students **ARE** encouraged and expected to continue normal, ongoing discussions about the project, experiments and hypotheses with their PI, as they relate to their PQE proposal. However, students are not allowed to simply abstract or copy aims from their PI's proposals.
- Each student's PI **CAN** read proposal drafts and provide feedback but are **NOT** allowed to edit the proposal.
- Other faculty **CANNOT** read proposal drafts and provide feedback.
- You may **NOT** use work that you have submitted for other courses here or at another institution, with the exception of BBS330qc.
- Examples of successful proposals **CAN** and should be reviewed [here](#).

Guidelines for Organization and Writing of the Proposal

Contents

Your PQE proposal should contain the following elements:

- Succinct summary of the current state of knowledge in the field.
- Discussion of how the proposed studies will address key questions in the field.
- Clearly stated and testable hypotheses.
- Independent aims (an aim should NOT be based on the outcome of one specific experiment, or fully dependent upon results obtained in a previous aim).
- A well-reasoned and feasible set of experiments to test the key hypotheses.
- A thorough understanding of the tools and techniques necessary to carry out the experimental plan.
- A discussion of potential pitfalls that may arise and possible solutions/alternative approaches.
- A guide to quantitative analysis and interpretation of anticipated results.
- A discussion of how the results obtained will contribute to the state of knowledge and conceptual understanding in the field.

Format

Cover page of the PQE exam must include student's name, email address, date and location of exam, and committee members; if applicable, it should also include your summary of any substantive changes from the BBS330qc proposal to the PQE proposal. You should also indicate on the cover page which aim(s) you developed independently outside of BBS330qc (it may not always fall chronologically as Aim 3).

The proposal should conform to the same formatting requirements and guidelines as for an NIH F31 fellowship application (Ruth L. Kirschstein National Research Service Award (NRSA) Individual Predoctoral Fellowship). This is to allow you to use the PQE proposal as a framework for future submission as an NIH F31 application, or for other fellowships with similar proposal formats.

Details regarding F31 fellowship application, guidelines, due dates, advice, etc can be found online at:

<https://grants.nih.gov/grants/guide/pa-files/PA-19-195.html>

<https://grants.nih.gov/grants/how-to-apply-application-guide/forms-e/fellowship-forms-e.pdf>

It is neither required nor necessary to view the above NIH guidelines to prepare your PQE Proposal (although this will be essential if/when you prepare an F31 application). For your PQE proposal, simply follow the formatting requirements, in the following order:

- Use 0.5-inch margins throughout, single spacing, Arial 11-point font. Embed all figures in the main text and include figure legends.
- Cover page (see above).
- Abstract: 30 lines of text. Succinctly describe the overall hypothesis, background and significance and aims of the proposal, and if applicable, public health relevance.
- Specific Aims: one page of text. Outline overall hypothesis, background and significance, brief description of Aims and hypotheses to be tested, statements of impact and innovation.
- Research strategy: 6 pages. Sections include Background and Significance, Preliminary Data, Experimental design, Expected Outcomes and Interpretation, Pitfalls and Alternative Approaches.
- Literature Cited (full references with titles). This does NOT count towards the 6-page limit.

Other documents that are required for an actual F31 application (such as training plan, biosketch, letters, project narrative, etc.) are not required for the PQE proposal.

BBS PQE AI Policy

Allowable AI support is limited to mechanical editorial tasks, such as literature searches, spelling checks, citation organization, and reference formatting. All AI resources and use must be cited. AI cannot be used for experimental design, or proposal writing. To be valid, the PQE proposal must reflect your original intellectual work. For more information, please visit our [Graduate Student Policy](#) page.

Data Management Plan for BBS PQE

As part of our protocol for the BBS PQE proposal submission, we require a simple but explicit data management plan (DMP) outline for the proposed project. Unlike the current NIH requirement, the PQE DMP will focus mainly on practical issues relevant to the experimental study design. For the DMP, students are required to:

1. Data types and metadata – Identify the types of data to be collected and the key metadata features associated with each
2. Quality control and processing – Describe the data quality control pipeline(s) and analysis/processing tools to be used
3. Storage and archival needs – Estimate predicted dataset sizes and identify appropriate archival resources
4. Publication readiness – Anticipate required data formats and any open-access obligations associated with eventual manuscript submission

To support students in developing their DMPs, Julie Goldman, Research Data Services Librarian at the Countway Library, will lead a dedicated workshop during the fall semester. The workshop will cover how to evaluate data types, resource requirements, analysis processes, and data repository considerations.

ORAL EXAM

The oral exam will last approximately 2 hours. You should prepare a presentation of your entire proposal (that is, the aims developed in BBS330qc plus your new aim) including an abbreviated Background and with a focus on the Experimental Design and Expected Outcomes and Interpretation. **10-15 slides will likely be sufficient.** During the exam, you will defend and explain your hypotheses, methodology, and expected outcomes. At the beginning of the exam, you will be expected to present and discuss all three Aims including those that were developed during

BBS330qc and also indicate and present the additional third aim that was developed independently. Don't be surprised if examiners are curious about the system, aims and questions posed, so they may ask clarifying questions early in the presentation.

You are expected to have a strong command of the primary literature related to your field. You are also responsible for the materials covered in the core courses, including fundamental principles and experimental approaches in the fields of genetics, molecular biology, biochemistry and cell biology.

Questions testing your knowledge in these areas may be framed within or outside the context of your proposal.

You are strongly encouraged to give practice presentations to students and post-docs to help you prepare for the oral exam. No written or editing input from faculty is allowed.

THE OUTCOMES

You will be informed of the outcome (pass, conditional pass, or fail) at the end of the exam (see below). A written evaluation will be provided within 1 week.

- **Pass.** No further work on the PQE will be required
- **Conditional Pass.** A student will receive a conditional pass if the committee feels that the student would benefit from additional preparation or work. This may be due to issues that arise in the written proposal, oral exam, or both. The conditions for changing the grade to “pass” will be determined by the exam committee with guidance from BBS program leadership. After the conclusion of the PQE – examiners will complete the PQE Evaluation Form and propose a set of recommendations for passing the PQE. Program leadership will then review the recommendations and provide feedback. **The final recommendations will be given to the student within one week after the PQE. The plan will be noted in the evaluation form, along with the expected time frame for when the condition will be due.** It may be helpful for the student and the chair to communicate by email shortly after receiving the evaluations in order to make sure that it is clear what the student will be expected to do. The work required to fulfill any conditions should be performed in parallel with your thesis project. A written condition is typically 30 days.

It is important to emphasize that the PQE is not just an exam, but it also is an academic exercise in which the student learns how to write and defend a research proposal. Students come to the exam with different backgrounds, and for most the PQE will be an experience and test like no other they have encountered before. Accordingly, receiving a conditional or even a fail should not be considered necessarily to be a judgment on a student's innate or ultimate abilities. It is extremely important that students begin to master the skills involved in the PQE, a process that will continue even after they graduate. Students should consider a grade of “conditional” simply to mean that they need to acquire additional expertise before they can be considered to have developed these skills to the level expected for passing the PQE. The student will receive a “pass” once this conditional work is completed to the satisfaction of the exam committee. If it is not completed satisfactorily, the student will receive a “fail” and be asked to repeat the entire exam.

- **Fail.** A student will receive a fail if there are serious concerns based on the written proposal and the oral exam. In this case, a follow-up meeting with the exam chair, PQE committee chair, program head, program advisor, and thesis advisor will be scheduled. After this meeting, a set of recommendations will be made to address the identified issues. The student will be given the opportunity to rewrite the proposal and retake the oral exam following completion of the recommended work. Students are typically given 6 months to retake their exam.
- **Feedback.** In addition to determining the outcome of the exam, examiners will be asked to provide students with short comments on their strengths and weaknesses in the following areas. These criteria will be important for determination of the overall outcome:

- Experimental approach and written proposal
- Predicted impact of the proposed work
- Innovation and creativity
- Oral exam
- Knowledge base (proposal-related and general)

THE NEXT STEP

After passing the PQE, you will assemble a Dissertation Advisory Committee (DAC); please contact Anne O'Shea for more details (anne_oshea@hms.harvard.edu). **This meeting must happen within 3-4 months after passing the PQE.** In order to encourage students to apply the constructive critique that they receive during the PQE and address key weaknesses in the original proposal, all BBS students are required to submit a revised version of the PQE proposal to their DAC in preparation for the first DAC meeting. If your aims have changed, you should prepare and submit a new thesis proposal to your DAC. Please see the DAC Guidelines for more information.