Qualifying Exams: Why, how, and when...and what if...?

Susan M. Barman, PhD
Professor, Department of Pharmacology & Toxicology
Michigan State University
President-elect of The American Physiological Society
Some Questions that Come to Mind...

• What is “the ideal” format for the exam?
• What is the "value-added" based on the exam format we follow?
• What are we trying to measure?
• What metric is used to show a relationship between exam performance and future success as a scientist/researcher?
• Who should evaluate the student’s performance on the exam?
• What advice do we offer the student preparing to take the exam?
• How often do students fail?
• How do we prepare the student in case he/she does not qualify as a PhD candidate?
Goals of the Qualifying Exam

- To test a student’s knowledge of core competency (core concepts)
- Determine if a student has attained the necessary knowledge, skills, and research ability for a successful research career
- To test student’s ability to synthesize and apply knowledge from first principles
- To assess the student's general knowledge ...and ability to reason and communicate
- To allow the students to assemble a complete picture of the interaction of all physiological processes
- To test the student's knowledge...evaluate the student’s analytical and critical thinking, his/her familiarity with the pertinent basic science literature, and whether he/she possesses the qualities of intellect for a scientific/scholarly career
- To test the student's use and depth of core {discipline} through its application to the student’s proposed research
Goals of the Qualifying Exam

- To test the student’s readiness to make the transition from classroom training to thesis research.
- To identify areas that need to be strengthened for the student to be successful as a PhD student, independent scholar, and teacher.
- To test breadth and understanding of knowledge...ability of the student to learn and synthesize new information and apply that information to construct a research proposal or produce a critical review (critical thinking and problem-solving ability).
- To demonstrate a highly advanced understanding of a chosen field...ability to make use of this knowledge to formulate a novel hypothesis and a logical experimental design.
- To evaluate the student’s comprehension of previous course work and ability to synthesize information, integrate the literature in a particular area, and formulate research questions.
Goals of the Qualifying Exam

• To assess each student’s ability to develop a written research plan and to orally defend it in front of a faculty committee
• To permit evaluation of the student’s ability to identify meaningful research problems and design solutions for them
• To motivate students to review and synthesize course work and research material
• To determine the student’s ability to understand and apply fundamental concepts
• To develop and test the student’s ability to communicate orally and to respond to questions and comments
• To evaluate the student’s potential to pursue doctoral research
Format of the Qualifying Exam

Most have both a written and oral component, but content/format varies...

• Most common element (but not ubiquitous)...Oral defense of a thesis proposal
• Didactic components...short answer, essay questions from course content, open book or no resources
• Critical thinking component...critique a publication, experimental design (proposal or within essay questions)
• Communication skills...expressing your thoughts in writing and in the oral defense of a proposal or general concepts
• Who is involved...a large group of faculty, an exam committee, “senior” faculty, a student’s thesis/advisory committee...with or without the research mentor in attendance
Format of the Qualifying Exam

• Written & oral, unrelated to research interest
  ✓ Written exam covering six areas of physiology (cell, cardiovascular, renal, respiratory, gastrointestinal, and endocrine)
  ✓ Oral exam covers same six areas

• Written & oral, unrelated to research interest
  ✓ Written component: Students choose to answer 4 of 8 “thought-provoking questions” that cover biophysics, physiology, biochemistry, and cell biology
  ✓ Oral component: Students are assigned three current research papers to read and are then tested on their understanding of the material (2-3 weeks preparation)
Format of the Qualifying Exam

• Written (format depends on members of exam committee) & oral
  ✓ Written exam can be a request to write a review, test the students analytical skills and ability to come up with research ideas, design experiments to test a hypothesis, interpret data, etc...
  ✓ Oral defense of a thesis proposal

• Didactic written & oral that is related to research interest
  ✓ Day 1: 30 Short-answer, core competency questions; one long answer “principles of pharmacology” question
  ✓ Day 2: Student choses 4 of 5 “long answer” questions to assess the student's knowledge of core concepts needed to be a pharmacologist or toxicologist; includes experimental design & data interpretation
  ✓ Oral defense of a dissertation proposal and an evaluation of the student’s knowledge of related areas of pharmacology & toxicology
Format of the Qualifying Exam

• Student prepares a research proposal; oral defense covers the topic of the proposal “but student should be able to demonstrate a comprehensive appreciation of physiology”

• Oral defense of a grant proposal on a topic approved by the Advisory/Examining Committee that can be an extension of the student's current research problem if it represents a significant advance or novel approach to the problem and distinct from research advisors grant

• Written & oral, a mix of related and unrelated to research interest
  ✓ Essay questions on topics in all aspects of cellular and systems physiology followed by an oral examination on selected topics
  ✓ Test for in-depth knowledge of their field of specialization and their capacity for critical analysis; involves preparation of a written scholarly review of an assigned topic, followed by a formal oral presentation of the topic and oral examination by the faculty
Format of the Qualifying Exam

• Written & oral, a mix of related and unrelated to research interest
  ✓ A 2 week take-home exam composed of 2 questions (one from the student's area of specialty; one from an area outside of the specialty)
  ✓ A comprehensive oral exam generally in the areas of physiology other than those areas above
  ✓ Submission of a research proposal

• Submit an original grant proposal (and its revision) and have an oral defense of the proposal; topic of the proposal may be closely related to the student’s dissertation research; however, it cannot incorporate hypotheses or specific aims from the mentor’s grant proposals
Format of the Qualifying Exam

• Dominated by oral exams related and unrelated to research interest
  ✓ Oral Qualifying Exam: Interdisciplinary in nature that covers the entire scope of cellular and integrative physiology; NOT a discussion of student’s research interests
  ✓ Research Proposal Defense: Written proposal of student’s anticipated dissertation research followed by an oral defense of the proposal

• Written & oral, unrelated to research interest
  ✓ Written - questions based on 5 major courses (Cell Biology, System Physiology, Membrane Physiology, Proteins/Nucleic Acids, Cell Signaling); student answers 7 questions
  ✓ Oral - Students are quizzed on a) what they wrote in the written portion (with any possible expansion as fair game) and b) topic of their three research rotations
Format of the Qualifying Exam

• Mix of written & oral; oral is only related to research
  ✓ 3 hours of writing each day for one week; topic areas of physiology for each day are announced in advance
  ✓ Student completes and orally defends an NIH pre-doctoral fellowship

• Written & oral exclusively related to research
  ✓ Written thesis proposal in the format of an NIH proposal
  ✓ Oral presentation of the proposal
  ✓ Post-presentation oral exam chaired by a member of the department (same for all students)
Format of the Qualifying Exam

• Four-step “research proposal” unrelated to thesis
  ✓ Student presents to his/her advisory committee three novel proposals distinct from their mentor’s grant proposals (include abbreviated abstract, hypotheses, specific aims, and significance)
  ✓ Advisory committee selects a proposal in a meeting with the student
  ✓ The student prepares and submits an NIH-format grant proposal based on the proposed idea
  ✓ Oral defense of the proposal

• No “didactic” component
  ✓ Student and Advisory Committee select a recent publication related to the student's major research area; student prepares a written research proposal to be reviewed by the advisory committee (mock grant proposal)
  ✓ Oral exam of a written grant (dissertation) proposal
Format of the Qualifying Exam

• “Research” focus...unrelated to thesis
  ✓ Students submit a one page abstract outlining a research topic, hypothesis and specific aims of a proposal on a scientific topic that is different from their own (thesis) research
  ✓ Graduate Education Committee evaluates appropriateness of topic
  ✓ When the abstract is approved, student prepares the written proposal
  ✓ Oral defense of the proposal; exam is not designed specifically to test fundamental knowledge, but committee may probe for fundamental knowledge in the area

• Critique-driven process followed by thesis proposal
  ✓ Student prepares a 5-page mini-review (topic selected by the student’s dissertation mentor) and approved by the Graduate Program Director; followed by an oral defense of the mini-review
  ✓ Submit and defend (oral) a thesis proposal
Who Are the Evaluators?

• The committee is comprised of 5 program faculty members. Thesis advisors do not participate in the oral defense...
• Qualifying Examination Committee selected by student & mentor
• Comprehensive Examination Committee consists of at least five members of the department: the advisor, the chairman of the Graduate Studies Committee, and faculty members who teach in the core Physiology courses.
• Members of advisory committee (often without major advisor)
• Many have at least one member from outside of the department
• An example in which students choose 3 members of the committee, including one from outside of the department; two additional chosen by the department; thesis advisor is not part of the committee
• Senior faculty members of Physiology and Biophysics with combined expertise to cover exam topics
Prerequisites?

- Maintaining a GPA of at least 3.0 on a 4.0 scale
- Completion of core courses
- Satisfactory completion of all research rotations
When is the Exam Administered?

- A few examples of the exam being completed at the end of 1st year (obviously not those that include defense of a proposal)
- Examples in which a written component (based on core courses) is at the end of the 1st year and the oral defense of a research proposal by the end of the 2nd year
- Common time frame: A written and/or oral exam for evaluating core competency by the end of 2nd year and thesis proposal defense within 6 months
- Examples of completion date by the end of the 3rd year
- Examples in which you need special permission to delay later than end of 2nd year
What Happens if a Student Fails?

• Minimum passing scores range from 70 to 80%
• Examples in which you must pass all questions, must pass all except one question, or just require an overall passing grade
• Examples of remediation: retake within 1 week – few months
• Examples in which they need to wait one year to re-take the exam
• Examples in which only one chance is given or student is subject to dismissal from program
• Examples in which failure to pass on first try or a remediation exam means automatic dismissal from the program
• Transfer to status of an MS candidate
Some Questions that Come to Mind...

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- ...If we require a “didactic” component...are we wasting precious time in the lab?...Are we making them do it because I *had to do it*?