Comprehensive Exam Guidelines

Ph.D. Graduate Students

Purpose

The Graduate Program for Biochemistry and Neuroscience (B&N) is a statewide graduate program administered through the Department of Chemistry and Biochemistry with faculty and students from UAF, UAA, and UAS. The format for the PhD comprehensive exam outlines a consistent procedure across all campuses (UAF, UAA, UAS) with the intent to increase both the quality and stringency of the examination process. The format of the PhD comprehensive exam also generates a tool to assess the B&N core courses and prerequisites, which will ultimately benefit our student's education. The goal of the B&N core courses is to provide an understanding of biochemistry and neuroscience, which will benefit the student's research and future career.

Timeline

Register for the PhD Comprehensive Exam by completing the registration form in this packet and sending it to kdrew@alaska.edu. Follow up with additional e-mail or phone messages if you do not get a reply acknowledging receipt of the registration form. Students take the PhD comprehensive exam after the second year of entering the program or once the B&N core course requirements are fulfilled. The core requirements for each individual student are determined by the student's committee with the goal to provide the academic education most pertinent to the benefit of the student's thesis research field. You will be contacted after completing your second year and will be asked to provide a timeline for taking your exam.

The written examination (proposal) must be submitted by 5:00 pm August 10th or by 5:00 pm February 10. If the due date falls on a Saturday or Sunday the proposal will be due the Monday following the stated due date. The proposal should be emailed to Kelly Drew at kdrew@alaska.edu by the due date and time. The date and time for the oral examination is determined by the student in consultation with the student's graduate committee and should be held no later than four months after submitting the written proposal. The student should contact the graduate school to arrange for an outside examiner as soon as a date is set for the oral exam.

Format of Exam

Written

The written portion of the exam consists of writing a research proposal. The proposal can be your thesis proposal, but it must be your own work. For example, it would not be appropriate to copy from a funded proposal written by your PI, even if a lot of your experiments are from that proposal. Research proposals must contain the following sections

1. Specific Aims (no longer than one page)
2. Research Strategy (at least five single-spaced pages and no more than six single-spaced pages (not including references).
3. Biosketch formatted according to the instructions required for the type of proposal. NIH and NSF have specific biosketch instructions.
4. Description of Facilities where the work will be done
5. Vertebrate Animal or Human Subjects section (if appropriate). The Vertebrate Animal and Human Subsections should conform to current NIH requirements.

We encourage students to use the format of an NIH RO3 or R21 proposal. A rubric, included in this packet, details how the proposal will be evaluated. Students should pay attention to the rubric when writing the proposal.

If a student wishes to use another format, the format must be ***pre-approved*** by the student's graduate committee. The written proposal must be submitted to the graduate advisory committee four weeks prior to the oral defense of the proposal. The oral defense constitutes the Oral Comprehensive Exam and requires that the student request an outside examiner at least 3 weeks prior to the oral exam.

Oral

The oral portion of the comprehensive exam consists of formally presenting the proposed research to the graduate committee and defending the research plan. Students will prepare a set of slides. On one slide, in one to three sentences describe the overall research goal(s). In additional slides illustrate and defend the significance, innovation, approach, expected results and interpretation of the proposed research. Be prepared to answer questions that challenge the strength of the scientific premise, strategies to ensure a robust and unbiased approach and general knowledge of the field. Also be prepared to discuss unexpected results and interpretation of these results.

Outcome

All committee members complete the Comprehensive Exam Review form and return it to kdrew@alaska.edu. Once all of the forms are received the forms will be forwarded to the chair. The chair distributes the forms to the student and to the committee. The committee evaluates the student's performance and will determine an overall score based on the student's performance in the written and oral examination and establish the final grade *pass/fail*.

The purpose of the comprehensive exam is to insure that the student is prepared to succeed with his/her proposed research plan and career objectives. Outcome of the comprehensive examination will thus be used to guide the direction of future studies. It is the responsibility of the major advisor to submit the "Report of Examination" to the Graduate School, with copies to the Dean and Department, and the student within 15 days of the examination (oral). *Poor performance on the comprehensive examination will result in a conditional pass or failed exam. A conditional pass will result in probationary status. Students who fail the comprehensive exam may retake the exam one time as recommended by the graduate committee. Two failures will result in termination from the program although this is rare.* Students with probationary status will receive clear guidelines of expectations to be met within one semester and the student's committee determines the successful completion of expectations.

Registration for PhD comprehensive examination

Student:	Date:	Campus:

Core Course	Semester	Instructor	Grade

Proposal will follow format described for (circle one):

NIH NSF Other _____

Tentative title of proposal:

Research Strategy Section Headings:

Final length of Research Strategy:_____pages

Signatures (may be obtained via e-mail)

Committee Chair:

Committee Member:

Committee Member:

PhD comprehensive Examination

Pay attention to the following detail when writing your proposal and preparing for your oral defense of that proposal:

☐ Identify the rigor (or lack thereof) of published studies and your own preliminary data
☐ Use proper scientific terminology
☐ Be prepared to explain basic principals
☐ Be able to apply principals of biochemistry and neuroscience when discussing the rationale for the approach proposed, expected results and alternative interpretations to your proposed research design.
☐ Be able to synthesize answers and defend your answers based on your own understanding. No answer is right or wrong if you can defend it.
☐ Make a clear statement of hypothesis in the context of a working model. Propose and defend a means to test the hypothesis. If your research is not hypothesis driven be prepared to convince your committee that a hypothesis driven approach is not appropriate.
☐ Demonstrate that you are able to critically analyze scientific literature by explaining the bias or lack of rigor in prior work to justify why additional study is required.
☐ Explain why your proposed approach is the best approach to test your hypothesis. Have a practical and theoretical understanding of techniques and be able to provide and discuss detailed methods.
☐ Insure that all graphs include axes labels with units. Graphs must be large enough to read in the written proposal and on slides used for the oral defense. Note sample size on graphs or in figure legends. If sample size is greater than two, data should be expressed as mean or median with indications of variation about the mean or median. Annotate statistical significance and be prepared to defend statistical analysis in preliminary and in proposed studies.
☐ Explain the rationale, strengths and weaknesses of your experimental design, expected results and interpretation of expected results.
☐ Insure that your written explanations conveys complex concepts or models in a manner that your committee members will understand.

Comprehensive Exam Review

Student name:

Thesis Advisor(s):

OVERALL IMPACT

Reviewers will provide an overall impact score to reflect their assessment of the likelihood for the project to exert a sustained, powerful influence on the research field(s) involved, in consideration of the following five scored review criteria, and additional review criteria. An application does not need to be strong in all categories to be judged likely to have major scientific impact.

Overall Impact *Write a paragraph summarizing the factors that informed your Overall Impact score.*

SCORED REVIEW CRITERIA

Reviewers will consider each of the five review criteria below in the determination of scientific and technical merit, and give a separate score for each.

1. Significance
Strengths • **Weaknesses** •

2. Investigator(s)
Strengths • **Weaknesses** •

3. Innovation
Strengths • **Weaknesses** •

4. Approach
Strengths

-

Weaknesses

-

5. Environment

Strengths

-

Weaknesses

-

ADDITIONAL REVIEW CRITERIA

As applicable for the project proposed, reviewers will consider the following additional items in the determination of scientific and technical merit, but will not give separate scores for these items**.**

— Responses for Protections for Human Subjects, Vertebrate Animals, and Biohazards **are required for all applications**.

— A response for Inclusion of Women, Minorities and Children **is required** for applications proposing Human Subjects Research.

Protections for Human Subjects

Click Here to Select

Comments (Required Unless Not Applicable):

-

Data and Safety Monitoring Plan (Applicable for Clinical Trials Only):

Click Here to Select

Comments (Required Unless Not Applicable):

o

Inclusion of Women, Minorities and Children **Applicable Only for Human Subjects research and not IRB Exemption #4.**

- Sex/Gender: Click Here to Select
- Race/Ethnicity: Click Here to Select
- Inclusion/Exclusion of Children under 21: Click Here to Select

Comments (Required Unless Not Applicable):

-

Vertebrate Animals

Is the proposed research involving vertebrate animals scientifically appropriate, including the justification for animal usage and protections for research animals described in the Vertebrate

Animal section?

Click Here to Select

Comments (Required Unless Not Applicable):

-

Biohazards

Click Here to Select

Comments (Required Unless Not Applicable):

-

Revision

Comments (if applicable):

-

ADDITIONAL COMMENTS TO APPLICANT

Reviewers may provide guidance to the applicant or recommend against resubmission without fundamental revision.

: Additional Comments to Applicant

Overview: Research Project Grant Applications

Element of Rigor and Transparency	Section of Application	Criterion Score	Additional Review Consideration	Contribute to Overall Impact Score?
Scientific Premise	Research Strategy	Significance	NA	Yes
Scientific Rigor	Research Strategy	Approach	NA	Yes
Consideration of Relevant Biological Variables, such as Sex	Research Strategy	Approach	NA	Yes
Authentication of Key Biological and/or Chemical Resources	New Attachment	NA	Yes	No

Overall Impact:
The likelihood for a project to exert a sustained, powerful influence on research field(s) involved

Overall Impact	High	Medium	Low
Score	1 2 3	4 5 6	7 8 9

Evaluating Overall Impact:
Consider the 5 criteria: significance, investigator, innovation, approach, environment (weighted based on reviewer's judgment) and other score influences (e.g. human subjects)

e.g. Applications are addressing a problem of high importance/interest in the field. May have some or no technical weaknesses.

e.g. Applications may be addressing a problem of high importance in the field, but weaknesses in the criteria bring down the overall impact to medium.

e.g. Applications may be addressing a problem of moderate importance in the field, with some or no technical weaknesses

e.g. Applications may be addressing a problem of moderate/high importance in the field, but weaknesses in the criteria bring down the overall impact to low.

e.g. Applications may be addressing a problem of low or no importance in the field, with some or no technical weaknesses.

5 is a good medium-impact application, and the entire scale (1-9) should always be considered.

Chemistry and Biochemistry Graduate Program Assessment Questionnaire

The purpose of this form is for our department to improve its graduate programs. This form is filled out at every student's annual committee meeting and any other event (*e.g.* defenses, comprehensive examinations, *etc.*). At the end of the academic year, we compile the results to see how well our program is educating all students. If we find that many students fall short of an assessment standard, we will work to improve the curriculum's teaching of that standard. **This form is anonymous and is not used to grade individual students**. However, if we find that a student's performance is beyond expectation or lacking in some areas (compared to expectations for their program / year in program), these areas will be mentioned on the "Annual Report of Advisory Committee" form. The annual report form is the way that our programs formally communicate individual progress towards degree with students.

All graduate students in the Department of Chemistry and Biochemistry will bring this form to all committee meetings. In this way, students can see the areas in which they should be developing as scientists. After the student gives the annual committee meeting presentation, the committee will form a consensus opinion that will be entered onto this sheet. The chair of the committee will bring the completed form to the college's graduate program coordinator in an envelope with the name of the student on the outside of the envelope. The coordinator will check off the student's name to assure we get a form from each student and then separate the form from the envelope, assuring anonymity.

For each assessment standard, the committee should put a mark in the column corresponding to the student's performance level.

Demographic Information:	Value
1. Program (1=BMB, 2=Chem, 3=EChem, 4=other)	
2. Degree (1=MA, 2=MS, 3=PhD)	
3. Year in graduate program (1=1st, 2= 2nd…)	
4. Event Code (1= Annual meeting 2=MS defense 3=PhD Oral 4=PhD Defense)	

Assessment standard	Deficient (-1)	On track (0)	Exceeding (+1)
1. Specific knowledge of literature			
2. Ability to critically analyze literature			
3. Technical abilities			
4. Quantitative abilities			
5. General knowledge of field			
6. Presentation skills			
7. Writing Skills			
8. Ability to formulate hypotheses and articulate methods for testing hypotheses (Ph.D.)			
9. Ability to act as an independent researcher (Ph.D.)			

Masters students are expected to progress in the first seven areas towards successful completion of their M.S. thesis approximately at the end of the second year. A mid-course Ph.D. student should have demonstrated ability to carry out guided research resulting in at least preliminary data and the ability to identify a novel problem and formulate hypotheses relevant to this problem. A Ph.D. graduate will have demonstrated the ability to make a novel impact on their field through their research and express these results and their broad importance in their dissertation and defense. On track is at expectation for a typical student in our program, while deficient / above represents a year or more behind / ahead of expectations.

Form "GradProgramAssessmentForm2018.doc"
Revised: 10 May 2018 (wrs)

Frequently asked questions

1. Will the proposal be on our current research or research related to our current research or we are expected to write a completely different proposal?
The proposal can be your thesis proposal, but it must be your own work. For example, it would not be appropriate to copy from a funded proposal written by your PI, even if a lot of your experiments are from that proposal.

3. The outside examiner means someone apart from our committee right?
Yes, the outside examiner is for the oral defense of the proposal. You need to coordinate this through the graduate school. The purpose of the outside examiner is to assess fairness and rigor of the oral exam.

4. Does the score on the evaluation forms for the written proposal count as a grade for the proposal?
No! The score is a quantitative assessment of the scientific merit of your proposal based on NIH review criteria. Feedback on the scientific merit is expected to be an important learning opportunity, but is not a grade for the exam.

A decision of pass or fail will be based on the following criteria

- Is the student able to identify the rigor (or lack thereof) of published studies and his or her own preliminary data?
- Does the student use proper scientific terminology?
- Is the student prepared to explain basic principles?
- Is the student able to apply principals of biochemistry and neuroscience when discussing the rationale,
for the approach proposed, expected results and alternative interpretations to the proposed research design?
- Is the student able to synthesize answers and defend answers based on his or her own understanding?
- Does the student make a clear statement of hypothesis in the context of a working model and propose and defend a means to test the hypothesis? If the research is *not* hypothesis driven does the student provide a compelling argument that a hypothesis driven approach is not appropriate?
- Does the student demonstrate ability to critically analyze scientific literature by explaining the bias or lack of rigor in prior work to justify why additional study is required?
- Is the student able to explain why the proposed approach is the best approach to test the hypothesis? Does the student have a practical and theoretical understanding of techniques and is the student able to provide and discuss detailed methods?
- Do all graphs include axes labels with units? Are graphs large enough to read in the written proposal and on slides used for the oral defense? Are sample sizes noted on graphs or in figure legends? If the sample size is greater than two, are data expressed as mean or median with indications of variation about the mean or median? Are graphs annotated to indicate statistical significance and is the student prepared to defend statistical analysis in preliminary and in proposed studies?

- Is the student able to explain the rationale, strengths and weaknesses of the proposed experimental design, expected results and interpretation of expected results?
- Does the written proposal convey complex concepts or models in a way that the committee members are able to understand?

5. What forms do I bring to the oral defense? Where do I find these forms?
Bring the following three forms to the oral defense

1. *Report on Comprehensive Exam*
2. *Department Program Assessment Form*
3. *Comprehensive Exam Review sheet (page 6-8 of the Comprehensive Exam Packet).* Bring enough copies for all of your committee members.

For the first two forms, go to http://www.uaf.edu/chem/graduate/current-students/timeline-for-a-ph.d/

And download the
Report on Comprehensive Exam. Return this completed form to the Graduate School
And
Department Program Assessment Form. DO NOT PUT YOUR NAME ON THIS FORM and return it to the program coordinator (Kelly Drew)

6. Do I need an outside examiner?
Yes, an outside examiner must be present during the PhD oral comprehensive exam. The student should contact the Graduate School to request an outside examiner at least three weeks prior to the oral exam.

Go to http://www.uaf.edu/chem/graduate/current-students/timeline-for-a-ph.d/
Or to http://www.uaf.edu/gradsch/forms/
And download the
Request for Outside Examiner

7. What is the Oral Exam Process?
At the time of the Oral Exam the committee will meet for about 30min prior to inviting the student to join. During this time the committee will discuss the proposal's strengths and weaknesses for each of the review criteria on the evaluation sheet. At the end of the exam committee members should complete the evaluations and return them to the Program Coordinator (Kelly Drew) within one week so that the student can benefit from the feedback.

After the committee discusses the proposal the student is asked to join the committee and present an oral defense of the proposal. During the oral presentation committee members can ask questions that came up during review of the written proposal as well as questions designed to test the student's ability to defend the rigor of the scientific design and the premise of the work.

After the oral defense, the student leaves the room and the committee grades the written proposal pass/fail and the oral defense pass/fail. The pass/fail grade for each is based on the criteria detailed in the answer to question 4 above.