

Neuroscience Graduate Handbook

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Neuroscience Handbook

I. Introduction

Neuroscience research at West Virginia University takes place in over 50 laboratories across campus, utilizing animal, human and computer model systems. Research topics encompass embryonic and postnatal development, neurodevelopment, sensory, motor and cognitive function, nervous system diseases and disorders, injury and stroke, normal aging and neurodegeneration. Under the organizational umbrella of the Blanchette Rockefeller Neurosciences Institute (BRNI), Neuroscience researchers at West Virginia University strive to expand knowledge of brain function and improve the lives and health of citizens of the state, the country and the world. We welcome students to the Neuroscience Graduate Program as they join us in this endeavor and train to become the next generation of Neuroscience researchers.

II. Neuroscience Student Training Goals:

- Develop skills to acquire and integrate knowledge in molecular and cellular structure and function of the nervous system;
- Gain an understanding of the functional complexities of systems neurobiology, including motor and somatosensory systems, behavior, cognitive function, developmental biology and diseases of the nervous system;
- Read and critically interpret current scientific literature, both generally and specifically in Neuroscience;
- Develop skills in critical thinking and problem solving;
- Learn technical skills essential in conducting scientific research in Neuroscience;
- Gain experience in conducting experimental protocols, collecting scientific data, making accurate interpretations based on the evidence and drawing appropriate scientific conclusions;
- Become proficient in formulating scientific hypotheses and designing experiments to test them;
- Learn the basics of scientific writing and practice these skills while writing research proposals, dissertations and scientific publications;
- Develop awareness of the ethical issues related to animal and human experimentation and the laws and regulations that apply to them and practice responsible and ethical research;
- Learn to identify what qualifies as scientific misconduct and how to avoid it and gain an appreciation for the critical need for intellectual honesty and scientific integrity in research;
- Practice responsible and ethical research;
- Engage in beneficial collaborations with peers and colleagues; and
- Develop skills in oral, written and visual communication to facilitate the transfer of information and knowledge to the scientific community and the public.

III. Selection of Your Dissertation Advisor:

Students typically enter the Neuroscience Graduate Program after successful completion of the core curriculum in the first semester followed by the selection of a dissertation advisor as described in the 1st Year Handbook (<http://www.hsc.wvu.edu/resoff/graduate-education/phd-programs/biomedical-sciences/1st-year-handbook/>). In the first semester, students will have the opportunity to have three research rotations in the laboratories of potential mentors. Selection of rotation advisors is at the discretion of the students; they may choose from the list of available mentors provided each year by the HSC Office of Research and Graduate Education (see 1st Year Handbook), but discussions with their temporary advisor, graduate program directors or the Assistant Vice President for Graduate Education is strongly encouraged. Approval of each rotation advisor is required from the Office of Research and Graduate Education. After completing the rotations, students may request to join the advisor and laboratory that best fits their career and scientific plans. This process is coordinated by the Assistant Vice President for Graduate Education and the selection must be agreed upon by the advisor and approved by the Office of Research and Graduate Education (see Handbook for First Year Students). For students interested in joining the Neuroscience Program, the advisor selected should typically be a member of the program and the chair of the dissertation committee. In some circumstances, a student may choose to receive their academic training and PhD degree in Neuroscience but select a dissertation advisor who is not a member of the Neuroscience Graduate Program. In these cases, a separate dissertation committee chair is appointed who is a member of the program and familiar with the requirements of the Neuroscience Program.

Changing Your Dissertation Advisor

Students may need to change mentors while completing their dissertation research. The protocol for changing mentors depends on the reason for the change:

1. *The mentor has left WVU, and the student is remaining at WVU.* In advance of the initial mentor leaving the University, the student should meet with the Neuroscience Graduate Program Director to set up a plan to select a new advisor. The new advisor must fulfill the requirements described in the section titled Selection of dissertation committee and research advisor. A wide range of options is available when choosing a new advisor, ranging from continuing the student's current dissertation research to completely redesigning a research plan with a new dissertation committee. Decisions will be made on a case-by-case basis with the student's best interest being the primary goal.
2. *The student and mentor have irreconcilable differences.* Student displeasure with their laboratory and/or mentor does not necessarily mean that the student will need to leave the laboratory. The key to handling this situation effectively is for the student to act quickly after sensing a problem. First, the student must discuss with the mentor what is troubling them. The mentor may not realize that the student has a problem and may be willing to work with the student in developing a solution. The student should consider that they might be expecting the mentor to fill too many roles and additional mentors may be helpful for concerns that are less "research based." Second, if talking with the mentor or

spreading mentoring roles to other individuals does not solve the problem, the student should discuss the issue with the Neuroscience Graduate Program Director. Third, if continuing in the mentor's laboratory is not an option, the student will need to consult with the Neuroscience Graduate Program Director and the Assistant Vice President for Graduate Education to identify a new mentor. A new Dissertation Committee Form (see appendix) must be completed identifying the new research advisor and any changes in the composition of the dissertation advisory committee. Any additional complications should be resolved in consultation with the Neuroscience Program Director and the Assistant Vice President for Graduate Education such as, obtaining an extension on the deadline to pass the candidacy exam.

IV. Selection of Your Dissertation Committee

Each student must assemble a dissertation committee and have it approved by the end of the spring semester of year 2. Dissertation committees must follow the University and HSC requirements in the WVU Graduate Handbook. Additional Neuroscience program requirements are as follows:

- A dissertation committee must have a minimum of 5 members;
- A dissertation committee must include a minimum of 3 Neuroscience Graduate Program faculty members;
- A majority of the members must be regular members of the Neuroscience Graduate Faculty Program, including the chair or one of the co-chairs*;
- No more than one member may be a nonmember of the WVU graduate faculty* (e.g. from another institution);
- The responsibility of the chair is to ensure that program guidelines are followed;
 - The advisor may serve as the chair of the committee if the advisor is a regular member of the Neuroscience Graduate Program;
 - If an advisor is not a member of the Neuroscience program, the committee chair will be selected by the advisor from one of the program members on the committee;
 - If an advisor is a member with associate status, they will be a co-chair of the committee and a second co-chair will be selected from one of the program members on the committee who has regular graduate faculty membership;
- At least one member of the committee must be from a program other than the one in which the student is seeking a degree;
- It is “recommended” that clinical scientists should be considered for committee membership when appropriate. (NOTE: It is possible that an appropriate clinical scientist may not have graduate faculty status, or associate graduate status. This would be acceptable under the rule stating that one member can be without graduate faculty membership. However, even a non-member is subject to program review and approval and should demonstrate qualifications equivalent to the qualifications for associate or full graduate membership); and

- The chair and members of the dissertation committee must be approved by the Neuroscience Program Director and the Assistant Vice President for Graduate Education.

* WVU Requirement

IV. The Neuroscience Program Curriculum

A. **Curriculum:** The following are required (course syllabi in Appendix):

- Three specific courses in Neuroscience:
 - Fundamentals of Neuroscience 1 (NBAN 770);
 - Graduate Medical Neurobiology (NBAN 771); and
 - Fundamentals of Neuroscience 2 (NBAN 772);
- A minimum of two elective courses in neuroscience or other areas relevant to the degree;
 - Electives should be identified and approved in consultation with the advisor and dissertation committee;
- Enrollment in Neuroscience Journal Club (NBAN 761) during the first three years;
 - Beginning year 4 through completion of degree, student should enroll in/attend a journal club selected by the student and advisor;
- Enrollment each year in Neuroscience FORUM (NBAN 760), this includes one presentation of a research seminar to the program faculty and fellow students each year;
 - The first presentation will be in the second semester of year 2;
- Attendance at all BRNI-sponsored Seminars;
- A scientific writing course;
- Dissertation research:
 - Students must register for research credits each semester as NBAN 797. Performance is graded satisfactory, unsatisfactory or incomplete by their dissertation advisor. The expected learning outcomes, mechanism of evaluation and criteria for grading for this course is described in the NBAN 797 syllabus. Students are expected to make progress on their research while engaging in course work, journal club, teaching, and seminar attendance;
- A dissertation proposal presented to the dissertation committee and successfully defended prior to beginning the 4th year;
- Successfully conduct an original research project resulting in at least one first author publication in a nationally or internationally recognized scientific journal;
 - Notification of publication acceptance is required prior to the dissertation defense;
- A written PhD dissertation that is successfully defended in an open forum leading to the approval of both the oral defense and the written dissertation by the dissertation committee and subsequently submitted to the WVU Theses and Dissertations (ETD) office;
- Teaching: participation in teaching is not a requirement of the program. However, students are encouraged to gain experience in teaching. One experience available for

neuroscience students is to participate as a Graduate Assistant in Graduate Medical Neurobiology (NBAN 771);

- Individual Development Plan (IDP) (see below for more information); and
- Beginning in year 3, there must be at least one dissertation committee meeting per year and a Committee Meeting Report submitted to the Program.

B. Individual Development Plan (IDP)

The IDP provides resources to help students evaluate skills and interests in:

- Scientific Knowledge
- Research Skills
- Communication (writing and speaking)
- Professionalism
- Management and Leadership
- Responsible Conduct of Research
- Career advancement
- Networking with professional in the student's field of study.

This information will help the student build the necessary skill set to achieve career success and to make decisions regarding future career options. The role of the dissertation mentor is to help the student to achieve these skills. Students need to review their IDP annually with their advisor.

All Biomedical Sciences Graduate programs will use the IDP template found at Science Careers (<http://myidp.sciencecareers.org/>). All incoming Biomedical students will complete this IDP and discuss it with a faculty advisor during Boot Camp, the week before fall semester begins. Once the student joins a laboratory, he/she is to review the IDP with the dissertation mentor. The IDP needs to be reviewed annually and reported using the IDP Annual Review form (available under Forms). Once the form has been submitted, it will be filed in the student's file in the Office of Research and Graduate Education.

C. Neuroscience MD-PhD Students

The Neuroscience Graduate Program welcomes students in the MD-PhD program. MD-PhD students typically join the Neuroscience Program after successful completion of the USMLE Step 1 National Exam at the end of the second year of the medical school curriculum.

- Successful completion of the two-year medical school curriculum at WVU will satisfy the Common Core Curriculum and Neuroscience course requirements (NBAN 770, 771, 772). MD-PhD students are required to take two additional electives recommended by the dissertation committee.
- Laboratory rotations, leading to the selection of the dissertation advisor, are chosen through the MD-PhD program and are completed prior to the entry of the student

into the PhD portion of the curriculum. Selection of the dissertation advisor should be completed prior to entering the Neuroscience Graduate Program.

- Dissertation committee must be selected during the first year of the PhD phase.
- Passing the USMLE Step 1 National Board will satisfy the written and oral qualifying examination requirement.
- A proposal defense is required and will follow the format listed for regular graduate students. It is recommended that this exam be taken during the first year after entering the PhD phase of the program, but it must be completed by the end of the fall semester of the second year in the PhD phase. Failure to pass the proposal defense by this deadline will result in dismissal from the doctoral graduate program unless prior approval is provided by the Graduate Studies Committee.
- MD-PhD students will register for the Neuroscience Journal Club and Neuroscience Forum during the PhD phase. An alternative Journal Club may be selected after two years of the Neuroscience Journal Club.
- Students will take the course in scientific ethics taught by the Office of Research and Graduate Studies.
- MD-PhD students are required to attend all Neuroscience-sponsored seminars.
- Requirements for the dissertation proposal, candidacy, dissertation research, dissertation defense and graduation requirements are identical to those described for regular Neuroscience PhD candidates.

A timeline of the Neuroscience Curriculum requirements is provided on the next page:

REGISTERING FOR CREDITS: To receive a stipend, students are required to register for a minimum of 9 credits for the fall and spring semesters and a minimum of 1 credit for the summer semester. Students may find it more cost effective to register for more credits during the summer session; a calculator for this is available on the Office of Graduate Education and Life website. Credit hours exceeding 16 require prior approval by the Associate Provost for Graduate Education of WVU.

Once candidacy is achieved, the student must be enrolled for at least one credit in all semesters and summer sessions until they defend; this is regardless of whether they are receiving a stipend.

V. Work Schedule, Sick Leave, Vacation and Leave of Absence Policy

The PhD degree is awarded based on completion of original dissertation research, not on time served in the program. Undue time spent away from the University will hamper your progress in research.

A. Work Schedule

The first year of study focuses primarily on didactic education. In the fall semester, students can expect to follow the academic calendar of the University for the December holidays. During the week of Thanksgiving, University classes are not in session, but research is considered on-going. The student is expected to discuss their work schedule for this week with the faculty member with whom they are rotating. The same is true in the spring semester; students still rotating in laboratories should discuss expectations for spring break with the host mentor. Expectations vary between laboratories; students and mentors should discuss this at the beginning of rotation. Mentors are made aware of the guideline of approximately 20 h per week in the laboratory during the short rotations (Biomedical Lab Experience). For safety, students should avoid working in the laboratory alone.

B. Sick Leave

Graduate students do not receive a specified number of sick days per pay cycle or calendar year. Absenteeism from classes, graduate program activities and the laboratory should be reserved for true illnesses that are contagious or completely block the ability to function. Headaches and small malaises should not be used as reasons to miss class or lab time. The student's responsibilities remain the same, and missed work will need to be made up possibly by working weekends and evenings. Absenteeism from classes and other events needs to be communicated to each faculty member coordinating a class or event.

C. Vacation

Once a student enters a specific graduate program, the vacation schedule for the University calendar no longer applies. Expectations regarding vacations need to be discussed with the mentor. These expectations are likely to vary among research laboratories so it is important to establish these expectations upon entry in the laboratory.

D. Leave of Absence

The Health Science Center has a defined policy to deal with extended periods outside of the laboratory or class, generally greater than 2 weeks. Termed a leave of absence, a student may need to take such a leave due to issues, such as grave illness, pregnancy or family crisis. Students should consult this policy * <http://www.hsc.wvu.edu/resoff/graduate-education/policies-and-forms/> when considering such a leave. In some circumstances, the leave may be imposed upon the student administratively due to academic issues or policy violations. Procedures for this are detailed in this policy, and there are forms for documenting all types of leave and any expectations or requirements upon the student's return.

Grading and handling of courses during a leave of absence

When a student goes on a leave of absence, issues develop regarding the grading of courses when the leave begins mid semester. Largely, this will need to be handled on a case-by-case basis. For defined courses, the student will need to work with the instructor to come up with a strategy and generally will need to take an "I" (Incomplete). Courses like research and seminar (when used to monitor attendance) generally do not have a mechanism to fulfill an incomplete. If the length of the leave is known and it is before the deadline to withdraw, it would be best for the student to withdraw from these courses during the semester. If that deadline has past, a student in good standing should be able to receive a grade reflecting their participation prior to the leave, especially when the course is graded S/U (Satisfactory/Unsatisfactory) or P/F (Pass/Fail). Journal clubs can be handled by having the student write summaries of papers that were missed. If the student is having a major medical crisis and cannot work during the leave, then the student should be graded for the time in the course or given an incomplete and a protocol developed for making up missed work.

VI. Academic and Professional Standards

A. Academic Standards

1. Standards

It is expected that students will perform satisfactorily on all required courses. To remain in good standing in the PhD program, a student is required to maintain the following standards:

- An overall grade point average of 3.0 in graduate level coursework. Note that this is higher than the university standard of 2.75;
- Removal of any incomplete grades within one semester or summer session of receiving it, unless special permission is granted by the Assistant Vice President for Research. Failure to remove an incomplete within one semester results in a permanent F on the student's transcript and this F figures into the GPA; and
- Satisfactory written comments describing the student's performance in short rotations.
- Students have one semester to raise their overall GPA to 3.0 or higher.

Failure to comply with these standards will result in the student being placed on academic probation and may result in dismissal from the graduate program.

2. Grading System and Reporting of Grades

Graduate courses are graded as follows: A, B, C, or F, and P (pass) or F (fail). The course coordinator may submit letter grades with + or -, but the grade point average (GPA) is calculated using the basic letter grade. Grades of F are not acceptable for course credit toward a graduate degree but are used in calculating the GPA. Letter grades are given for the Biomedical lab experience (BMS 702; also known as rotations) in Year 1. Research NBAN 797 is graded S/U; U's in research are not counted for the calculation of the GPA. The first unsatisfactory (U) grade for NBAN797 results in placement of the student on probation; a second U in research NBAN 797 grounds for dismissal from the graduate program.

The grade of Incomplete (I) is given when the instructor believes that the course work or other required programmatic activity is incomplete. All incompletes must be removed within the next semester of the calendar year; however, an individual instructor may require their removal within a shorter period. Students who receive an incomplete grade must contact the faculty member who issued the incomplete to discuss its removal. If an incomplete is not rectified within the next semester, it will be changed to a grade of F (IF).

NOTE: Students cannot graduate with an F grade on the Plan of Study. The course must be retaken and the grade brought into the acceptable range. Both grades will count toward the GPA on the transcript, and the higher grade will be placed in the Plan of Study.

B. Professional Standards

Graduate students in the seven Biomedical Graduate Programs, the MS in Biomedical Sciences, the MS in Health Sciences and first year students in the Biomedical Science Graduate Program are expected to adhere to the following standards of behavior throughout their tenure in graduate school. This code governs student behavior in classrooms, research endeavors, academic and professional gatherings, travel and in their daily conduct outside of the University. In addition to the code outlined below, all students will uphold the WVU

Student Conduct and Discipline Policy. This code can be found at:
http://campuslife.wvu.edu/office_of_student_conduct

1. Academic Integrity

Student Expectations:

- Students will not plagiarize the work of others, either by directly copying that work or by summarizing the thoughts of others as their own;
- Students will not cheat on any examinations, on academic assignments and activities and will not provide unauthorized help to others during an examination or graded academic assignment;
- Students will not alter examination scores, answer sheets, other graded materials or their academic record;
- Students will adhere to the University policies on academic integrity, found at: (<http://catalog.wvu.edu/graduate/enrollmentandregistration/#academicdishonestytext>)

2. Scientific Integrity

Students will:

- Accurately report how experiments were carried out;
- Represent their best understanding of their work in their descriptions and analyses of it;
- Accurately describe methods used in experiments;
- Abstain from falsely representing the work of others as if it were their own;
- Adequately summarize previous relevant work in their publications;
- When acting as reviewers, students will treat submitted manuscripts and grant applications confidentially and avoid inappropriate use; and
- Disclose financial and other interests that might present a conflict-of-interest in their various activities, such as reporting research results, serving as reviewers and mentoring students;
- Adhere to the University Research Integrity Procedures that can be viewed at: <http://www.wvu.edu/~lawfac/mmcdiarmid/aic/Final%20RIC%20Policy%20WVU%205-9-11.pdf>

3. Scientific citizenship

Students will:

- Strive to provide timely, efficient and high-quality work;
- Function as an effective and respectful team member in the performance of collaborative research;
- Strive to always acknowledge the contributions of their co-workers;

- Strive to keep all work areas clean, organized and conducive to high-quality research;
- Respect shared work areas and reagents and insure that steps are taken to replenish reagents when they are in low supply;
- Refrain from activities that might be disruptive to the work of others, including playing music, conversation and telephone calls;
- Be attentive in presentations by colleagues and provide constructive criticism as appropriate;
- Seek and accept criticism without reprisal or defensiveness;
- Strive to address and remedy situations as they arise and follow through on all promises and commitments to co-workers;
- Wear appropriate clothing in the laboratory and other research settings that is consistent with federal, state and University regulations;
- Speak-up and report any practice, condition or situation that may cause harm or that is against federal, state and University regulations;
- When traveling as a representative of the University and laboratory, the student will behave in a professional manner, uphold the rules of the laboratory with respect to the sharing of data, report expenses in a truthful manner, and refrain from frivolous use of travel funds for meals or modes of transportation that are unnecessary.

4. Professional interactions

Students will:

- Strive to increase their knowledge and expertise to maintain qualifications consistent with the highest standards available in their discipline;
- Accept and adapt to the continual change inherent in the creation and delivery of knowledge;
- Be appropriate in dress, language and demeanor at all times and avoid language and dress that is offensive to others;
- Respect and protect the rights to privacy and confidentiality of all students, staff, faculty, study participants and patients;
- Minimize personal text messaging, e-mailing, telephone calls and social media while at work;
- Respond to all communications in a timely manner;
- Listen carefully and be thoughtful and respectful in all forms of communication and during the attendance of seminars;
- Provide training and experience to advance the scientific skills and knowledge of ethical research practices for any trainee under their supervision;
- Treat all individuals in a caring, respectful, professional and empathetic manner.

C. Graduate Programs Committee on Academic and Professional Standards (GP-CAPS)

1. GP-CAPS Membership

During the first year in graduate school, student compliance with these academic and professional standards is monitored by GP-CAPS. This committee has representatives from all seven Biomedical PhD programs and the clinical and translational science graduate programs. Following the first year, issues related to academic or professional standards are first evaluated by the program faculty and then for issues of dismissal or appeals by GP-CAPS.

2. Student Review and Appeals Policy

Students have the right to due process in all decisions regarding their grades, evaluations and status in graduate school. Appeals regarding the above must follow a standard set of procedures. Procedures for student appeals can be found in the Graduate Catalog <http://catalog.wvu.edu/graduate/>

VII. ADVANCEMENT TO CANDIDACY: QUALIFYING EXAM AND PROPOSAL DEFENSE

I. Advancement to Candidacy

Advancement to Candidacy is a process of validation by the Neuroscience Program Faculty to determine whether a student enrolled in the PhD program has acquired sufficient core knowledge and academic skills to initiate dissertation research leading to the PhD degree.

The Advancement process involves two separate activities:

1. The Qualifying Exam

This exam will evaluate students to determine if:

- A.** An acceptable level of core knowledge in Neuroscience has been accomplished;
- B.** The ability to read and evaluate scientific literature is sufficient;
- C.** Both oral and written communication skills are sufficiently developed;
- D.** There is sufficient core knowledge in Neuroscience and sufficient understanding in formulating a scientific hypothesis, creating a sound experimental design, interpreting data and forming conclusions based on data.

2. Proposal Defense

This exam constitutes a presentation and defense of the student's proposed dissertation research that will form the basis for the PhD degree.

II. The Qualifying Exam

The Qualifying Exam consists of two exam components: written and oral.

1. Written Exam

The written exam will assess writing skills, ability to read and critically evaluate scientific literature and ability to comprehend current topics in Neuroscience research.

A. Procedure

- i.** The written exam will be conducted over three consecutive business days.
- ii.** All students taking the exam will take the written exam during the same three-day period.
- iii.** The exam will be scheduled to occur in December of the second year after the core courses have been completed.
- iv.** One original research paper selected by the examining committee will be given each day.
- v.** In any one year, the exam questions will be the same for the group taking the exam.
- vi.** The research papers selected by the committee are intended to cover a range of topics and breadth of knowledge in Neuroscience.

- vii. The written response is expected to be the original expressions of the student and not plagiarized.
 - A plagiarism checker will be used to validate all responses.
- viii. Each day, the student(s) will be instructed to read the paper assigned for that day and provide a written assessment/evaluation of the paper using the following format:
 - **HYPOTHESIS/SPECIFIC AIMS:** Identify the hypothesis being tested or the specific aims and scientific goals of the paper. Describe the scientific rationale or background of the hypothesis/goals. Assess the significance or scientific impact of the study (how it moves the field forward).
 - **EXPERIMENTAL DESIGN:** Describe the quality of the experimental design. Did the design adequately address the hypothesis or proposed aim? Describe strengths and weaknesses of the design. Indicate how the design might be strengthened, for instance to address a more definitive outcome or improve the reliability of the data.
 - **DATA AND INTERPRETATION:** Describe the major findings of the study and the author's interpretation. Comment on the quality of the data and discuss whether the interpretation reached by the authors is appropriate. Describe the adequacy of experimental controls, and if they are inadequate, suggest alternatives. Are there any concerns with human subjects or animal welfare?
 - **CONCLUSIONS:** Are the conclusions of the authors justified based on the findings? Do the authors describe the importance of this study to the field and does it fairly represent findings of the experiments?
 - **FUTURE EXPERMENTS:** What do you see as the next scientific question to emerge from this study? Design an experiment to test it.
- ix. The critique must be typed in a current version of MS Word and must not exceed 2 pages. It must be single spaced, with 1 inch margins, in Times New Roman 12 font. A template for the critique will be provided. A limited number of relevant references may be included to emphasize or document specific and critical points in the response.
- x. The exam will begin at 9 am and end at 5 pm each day, although students finishing before 5 pm may submit and leave when they finish.
- xi. The response must be submitted in SOLE following the instructions provided.
- xii. The student may take breaks anytime during the exam.
- xiii. The student may consult any resources except another person.
- xiv. Faculty and designated staff will serve as proctors.

B. Evaluation of the Written Responses

- i. The committee members will independently evaluate each response based on the rubric for the written exam.
- ii. The committee members will be blinded to the identity of the students.
- iii. A final score of 100% is possible for each critique.
- iv. Each committee member will score all three critiques.
- v. Written Rubric:

Rubric: Written Qualifying Exam

Written Exam in Neuroscience			
	Excellent	Acceptable 8.5	Unacceptable
<p>Hypothesis/Specific Aims 20 % Identify the hypothesis being tested or the specific aims and scientific goals of the paper. Describe the scientific rationale or background of the hypothesis/aims.</p>	<p>Excellent</p> <p>Hypothesis and aims clearly explained and fully understood. Thorough description of impact and significance.</p>	<p>Acceptable</p> <p>Good grasp of hypothesis/aims and significance except for minor gaps</p>	<p>Unacceptable</p> <p>Hypothesis/aims and significance not adequately explained</p>
<p>Experimental Design 20 % Describe the quality of the experimental design. Did the design adequately address the hypothesis or proposed aims? Describe strengths of weaknesses of the design. Indicate how</p>	<p>Excellent</p> <p>Provides detailed assessment of the adequacy of the experimental design, methods and expected outcomes. Identifies strengths and weaknesses and</p>	<p>Acceptable</p> <p>Describes experimental design but lacks full assessment of their contribution to the hypothesis or missing elements of the approach. Strengths and</p>	<p>Unacceptable</p> <p>Fails to describe how the experimental design supports the hypothesis. Strengths and weaknesses are lacking or inadequate</p>
<p>Data and Interpretation 20 % Describe the major findings and the author's interpretation. Discuss the strengths and limitations of the data presentation and whether or not the interpretation is appropriate and based on the data</p>	<p>Excellent</p> <p>Evaluation of data and the interpretation are accurate and clearly presented; strengths and limitations are clearly and accurately evaluated. Assessment of controls is</p>	<p>Acceptable</p> <p>Evaluation of the data and interpretation is addressed, but some minor points are poorly presented, incomplete or unclear, or strengths and limitations are not fully evaluated. Adequacy of controls is only partially</p>	<p>Unacceptable</p> <p>The answer does not clearly evaluate the adequacy of the data interpretation; strengths and limitations are inaccurate or not adequately addressed</p>
<p>Conclusions 20 % Are the conclusions of the authors justified based on the findings? Do the authors describe the importance of this</p>	<p>Excellent</p> <p>Describes how conclusions and implications are correctly or incorrectly</p>	<p>Acceptable</p> <p>Describes how the conclusions are reached but misses some minor strengths or weaknesses in the</p>	<p>Unacceptable</p> <p>Fails to adequately assess the quality of the conclusions and implication stated by the</p>
<p>Future Experiments 20 % What do you see as The next scientific question to emerge from this study? Design an</p>	<p>Excellent</p> <p>Identifies a logical next question and a feasible experiment.</p>	<p>Acceptable</p> <p>Gives some suggestions for the next experiments but</p>	<p>Unacceptable</p> <p>Future experiments suggested are not logical extensions</p>

C. Scoring the Written Exam

- i.** The critique scores from all evaluators will be averaged for each paper.
- ii.** The score of each paper will be averaged for a final score.
- iii.** A final average score of 90% or greater with no “unacceptable” evaluations will receive “Pass with Distinction.”
- iv.** A final score of 80% to 89% will receive “Pass.”
- v.** A final score of 79% or less will receive “Fail.”
- vi.** Passing the written exam is required to proceed to the oral exam.
- vii.** The exam committee will provide written feedback to the student regarding the strengths and weaknesses of the written exam.

D. Failure to pass the Written Exam

- i.** A student who fails to pass the written exam will be allowed to take the exam a second time.
- ii.** The student will be placed on academic probation with the recommendation that failure to pass the exam a second time will result in a recommendation for dismissal from the Neuroscience program.
- iii.** The second exam will be scheduled to take place three months from the initial exam.
- iv.** Different papers will be selected for the second exam.
- v.** During the three-month period, the student is expected to take steps to acquire the skills and knowledge required to successfully pass the written exam.
- vi.** The student and major advisor are responsible for designing a program to acquire the skill and knowledge to pass the second time.
- vii.** Recommendations and Actions will follow procedures outlined in the Student Review Policy for Graduate Programs in the School of Medicine.
<http://www.hsc.wvu.edu/resoff/graduate-education/policies-and-forms/>

2. Oral Exam

- A.** The Oral Exam will be administered individually to each student in January of the third year.
- B.** The intent of the Oral Exam is to determine if a student has sufficient knowledge and competencies to advance to the Proposal Defense and will cover all material covered in the student’s courses to-date, with emphasis on the three core Neuroscience courses.
- C.** It is the responsibility of the exam committee chair to ensure the quality and clarity of the questions in the oral exam.
 - i.** Questions should be submitted to the chair by the exam committee and reviewed by the committee prior to the exam.
- D.** The oral exam will specifically:
 - i.** Evaluate each student’s depth and integration of knowledge and understanding in Neuroscience as presented in the core Neuroscience courses.
 - ii.** Determine their ability to address questions appropriately and independently.
 - iii.** Assess their ability to use their knowledge to synthesize research questions, formulate appropriate scientific hypotheses and develop rational experimental

approaches with specific data endpoints that address the hypothesis and lead to conclusions.

- E.** The oral exam will last for no more than 3 hours with one required 10- minute break after 90 minutes.
- F.** Procedure:
- i.** The first question of the oral exam will be provided to each student 2 weeks prior to the exam date.
 - The student is expected to develop a response to the question that will be presented to the committee as the first question of the exam.
 - The intent of providing a question ahead of the exam is to provide the student with an opportunity to prepare the initial response to the first question. This should help build confidence and set a positive tone for the remainder of the exam.
 - Students should not prepare an extensive visual presentation, such as power points or handouts; it is only meant to give the student an opportunity to review and organize the information important for the response to this first question.
 - There will be follow-up questions from the committee that will not be provided ahead of the exam, and will in fact originate, at least partially, from the initial response.
 - It is expected that the student will use this opportunity to develop a sense of the organization and level of detail that will be used to answer subsequent questions during the exam.
 - ii.** Committee members will pose open-ended questions intended to provide an opportunity for the student to:
 - Demonstrate depth and understanding of core knowledge in Neuroscience.
 - Provide experimental evidence supporting current understanding.
 - Discuss the scientific impact and significance of the subject.
 - Identify critical gaps in knowledge and describe possible experimental directions that might provide new discoveries to move the field forward.
 - iii.** The response is expected to be initiated by the student without prompting from the committee members.
 - iv.** Follow-up questions from committee members are allowed, but should not be used to guide the student in a given direction.
 - v.** Prompting by the committee should be minimal. The student is expected to provide a thorough, organized and lucid summary of the topic area.
 - vi.** As a guide, the response period should take about 15-20 minutes, including follow-up questions from the committee.
 - vii.** A time limit of 30 minutes per question will be enforced to allow time for questions in at least 6 topic areas during the 3- hour exam.
 - viii.** The committee should exercise judgment and flexibility for different styles and approaches to responses, including:
 - Allowing students time to mentally organize their response.
 - Beginning with an outline to be subsequently elaborated on.

- Providing limited guidance if students are struggling, not focused or are providing a response that is not the intent of the question.

G. Grading the Oral Exam:

- i.** Based on their individual experience and knowledge, each committee member will subjectively evaluate the student responses, taking into consideration performance in categories that include knowledge, ability to organize and explain difficult concepts, quality of oral presentation and effective use of diagrams or figures.
- ii.** After the exam is finished, discussion of performance will be conducted among the committee members.
- iii.** Each committee member should determine a pass, marginal pass, or unsatisfactory for each question and then formulate an overall decision as pass, marginal pass or unsatisfactory.
- iv.** The final determination of pass, marginal pass or unsatisfactory should reflect the assessment of each committee member based on their own evaluation of the student's performance adjusted by any compelling opinions or points raised during the committee discussion.

The exam committee chair may provide feedback to the student regarding the strengths and weaknesses of the exam, especially if the student did not pass the exam and a retake is anticipated. This would normally be done as verbal comments directed to the student and advisor in a meeting immediately after committee deliberations.

H. Determining the outcome of the Oral Exam:

- i.** The committee chair will bring the committee to a consensus regarding quality of the overall oral exam as one of the following:
 - Pass: the student passed the oral exam
 - Provisional pass: may be designated if the committee feels that a student demonstrated strength in most topics, but was deficient in one or a few topics.
 - In this case, the student will be told exactly which topic area(s) are deficient.
 - The student will be reevaluated at a later date on only the specific, identified deficiencies.
 - Unsatisfactory: the committee agrees that sufficient knowledge and competence was not demonstrated.
- ii.** Failure to pass the oral exam.
 - A student who fails to pass the oral exam will be allowed to take the exam a second time.
 - The student will be placed on academic probation with the recommendation that failure to pass the exam a second time will result in a recommendation for dismissal from the Neuroscience program.
 - The second exam will be scheduled to take place within three months from the initial exam.
 - A different committee will be identified for the second exam.

- During the three-month period, the student is expected to take steps to acquire the skills and knowledge required to successfully pass the oral exam.
- The student and major advisor are responsible for designing a program to acquire the skill and knowledge to pass the second time.
- Failure to pass the oral exam on the second attempt will result in a recommendation for dismissal from the Neuroscience program. Provisional pass is not an option for the second exam.
- Recommendations and Actions will follow procedures outlined in the Student Review Policy for Graduate Programs in the School of Medicine <https://medicine.hsc.wvu.edu/faculty-staff/committees/academic-and-professional-standards-committee/>
- A mentor may attend the oral exam with the understanding that they may not participate in any way.

III. Proposal Defense

Successful defense of a proposal outlining the student's dissertation research marks the entrance to PhD candidacy. Timely completion of this benchmark, not only provides a guide for the remainder of the research, but also provides an excellent springboard from which to apply for an external fellowship. The proposal defense begins with the preparation of a fellowship application in the style of a National Institutes of Health (NIH) F31. Portions of this grant application will be drafted during the Scientific Writing course. The proposed research will be presented in a formal seminar open to the faculty, graduate students and other interested people followed by an oral defense of the proposal to the student's dissertation committee.

The following sections must be included in the dissertation proposal:

1. Abstract and narrative;
2. Table of contents;
3. Biographical sketch;
4. Literature review – suggested 5-page limit;
5. Specific aims – at least 3 aims are recommended – 1-page limit.

It is understood that these aims may change over the course of the research just as they do for the mentor's grants. Likewise, it is not intended that every aim must be accomplished to complete the PhD degree. However, revisions to aims must be presented to and approved by the advisory committee.

6. Research Strategy – suggested 10-page limit;

Each Aim should contain the following sections (length is per aim):

- A. Rationale (1 paragraph);
- B. Experimental plan and specific methods as appropriate (1-2 pages);
- C. Expected results (1/2 page);
- D. Alternative approaches (3/4 page);
- E. Literature cited (no page limit).

Note: The page limits are for single-spaced type. The acceptable fonts are Arial, Helvetica, Palatine Linotype or Georgia and a font size of 11 or 12 points. The type density should be no more than 15 characters per inch and 6 lines per inch. One-half inch margins should be used on all sides but not greater than 1 inch. If the student chooses to convert this proposal to an actual fellowship application, they will need to consult the directions for the additional sections required by the NIH.

It is recommended that the proposal be defended in the Fall semester of the student's third year in graduate school. If the proposed defense is not successful, the student may petition his/her dissertation committee to revise the proposal and defend a second time. Successful defense of the research proposal must occur on or before the last working day of Year 3, which is usually the 3rd Friday in August. Failure to pass the defense by this date will result in dismissal from the graduate program. Students with extreme circumstances may petition for a delay in this deadline. The petition must occur in writing to the Assistant Vice President for Graduate Education and must include a strong rationale for the delay.

It is strongly recommended that students use the dissertation proposal to seek a fellowship from a national funding agency. These include agencies, such as the NIH (F31, F31 diversity) and the AHA, among others. Students who choose to apply for a pre-doctoral fellowship should consult the Health Sciences Graduate Programs site on SOLE for helpful hints and guides on how to construct this application.

V. Dissertation Research, Dissertation Defense and Graduation.

With successful completion of the dissertation proposal, the student advances to candidacy for the PhD degree and the 5-year WVU-mandated clock for completion of the degree starts. Note however, that the expectation is that the student will defend his/her dissertation within 5-6 years of entering the program. The graduate program director will recommend to the graduate council that the student be elevated to candidacy for the PhD degree. The committee chair (student's advisor) will submit to the Health Sciences Graduate Programs Office a completed Doctoral Preliminary Examination Form (<http://www.hsc.wvu.edu/media/7504/doctoral-qualifying-preliminary-exam-form.pdf>) indicating the successful completion of the written and oral qualifying exam and a Doctoral Candidacy Examination Form (<http://www.hsc.wvu.edu/media/7503/doctoral-candidacy-exam-form.pdf>) indicating successful completion of the Proposal Defense. The Plan of Study Form (<http://www.hsc.wvu.edu/media/7508/plan-of-study-form-and-guidelines.pdf>) should also be completed and submitted to the Graduate Programs Office at this time. Copies of these forms can be downloaded from the Graduate Program website.

1. Dissertation Research

Students will conduct research with a dissertation mentor during their time in the program. Students will register for research credits each semester. A research grade is determined each semester (including summer) by their dissertation mentor and committee and by completing program requirements in each semester.

2. Dissertation Defense

A. Students must have at least one first-author manuscript, based on their Ph.D. dissertation research, published or accepted for publication in a peer-reviewed

journal before they defend their dissertation research. In the case of joint first-author manuscripts, the manuscript can only fulfill this requirement for one author. This requirement should not be misinterpreted to mean that the student is able to defend once they have a first author publication. The decision of when a student has completed the aims for their dissertation rests with the dissertation advisory committee. With some research projects, this will result in multiple first author publications.

- B. The form of the dissertation will be decided by the graduate advisory committee and must be consistent with the School of Medicine Guidelines for Theses and Dissertations, as well as the guidelines published in WVU's Graduate Catalog. A copy of the dissertation must be delivered to the advisory committee and the graduate office at least one month prior to the defense of the dissertation.
 - C. A Shuttle Sheet Request Form (<http://www.hsc.wvu.edu/media/7510/shuttle-sheet-request-form-and-process.pdf>) must be submitted to the Health Sciences Graduate Programs Office 2 weeks prior to the defense date to allow the Office of Research and Graduate Education sufficient time to process and communicate the Dissertation Defense to the University community.
 - D. The final examination for the PhD degree consists of:
 - i. Orally defending the dissertation in a public seminar and then in a closed session with the graduate dissertation committee;
 - ii. Final approval by the dissertation committee of the written dissertation;
 - iii. The committee will jointly decide if the student's oral defense has passed or failed. Separately, the committee will either approve the written dissertation as is, approve the dissertation with revisions, or refuse to pass the dissertation.
 - iv. If the dissertation is not approved, the dissertation should be rewritten and resubmitted within a deadline decided upon by the committee and approved by the graduate program office and the VP of Graduate Education.
 - v. If approved with revisions, the revised dissertation should be re-submitted to the committee (or to select members thereof) no later than 30 days following the dissertation defense.
 - vi. Final approval of both the oral exam and written dissertation will be conveyed by committee members signing the appropriate forms, which will also constitute permission to submit the dissertation to the WVU Electronic Theses and Dissertations (ETD) office.
- 3. Graduation Requirements: the following is a list of requirements for graduation.**
- A. 3.00 GPA, no D's or F's, and no U's in research;
 - B. Proper registration and payment of fees;
 - C. Passage of the benchmark exams:
 - i. Qualifying (preliminary) examinations (written and oral);
 - ii. Dissertation proposal (candidacy exam);
 - iii. Dissertation defense (written and oral);
 - D. Annual reports of completion of the IDP and advisory committee meetings;
 - E. At least ONE first-author manuscript based on the dissertation research (see above for journal requirements);
 - F. Submission of required approval forms;

- G.** Electronic submission of dissertation;
- H.** Application for graduation and diploma Form; and
- I.** Exit interview with Assistant VP for Graduate Education.

4. Deadline for completion of the degree

The University has a deadline by which the degree must be completed. Once a student has been admitted to candidacy, they have 5 years to complete the degree. The expectation is that the student will finish within 6 years total in the program. To ensure timely progress, the Office of Research and Graduate Education will meet with students at the beginning of their sixth year in the program to inquire as to their progress towards completion. If a student has experienced extraordinary circumstances, they can petition the Associate Provost for graduate education to extend the time to degree but these requests are rarely approved.

I have read, I acknowledge, and I agree to abide by the provisions of this Neuroscience Handbook.

Name

Signature

Date