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HANDBOOK
OF
GRADUATE STUDY
FOR
PhD AND MD/PhD STUDENTS

DEPARTMENT OF BIOCHEMISTRY
&
MOLECULAR BIOLOGY

THE UNIVERSITY OF OKLAHOMA HEALTH SCIENCES CENTER
OKLAHOMA CITY CAMPUS
OKLAHOMA CITY, OKLAHOMA

Note: This handbook is provided as a reference guide for the purpose of understanding the policies and procedures of the Biochemistry & Molecular Biology Graduate Program. The Department reserves the right to amend its policies and procedures as deemed necessary by the Graduate Program Faculty and within the guidelines of the Graduate College and University policies.

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Other Resources

Graduate College Bulletin

<http://graduate.ouhsc.edu/CurrentStudents/GraduateCollegeBulletin.aspx>

Graduate College Forms and Guidelines

<http://graduate.ouhsc.edu/CurrentStudents/FormsandGuidelines.aspx>

1. INTRODUCTION

Welcome to the Department of Biochemistry and Molecular Biology Graduate Program. We offer two resources for up-to-date information about the Department.

1. Our website basicsciences.ouhsc.edu/biochemmolbiol: We recommend that you set your Internet Browser to open with this page.
2. Email: We e-mail information about seminars, upcoming deadlines, etc. to all graduate students. Please check your OUHSC e-mail at least twice a day.

This handbook is designed to supplement the Graduate College Bulletin and to summarize the goals and additional requirements of the Biochemistry and Molecular Biology Graduate Program.

These guidelines follow a general sequence of events starting with joining the Biochemistry and Molecular Biology program as a first or second-year graduate student and ending with graduation. However, each student has a unique background, so our program has some flexibility to accommodate the specific needs of each student. In all cases, we are required to meet the Graduate College guidelines.

If this handbook does not address a particular question or problem, you should consult the [Graduate College Bulletin](#), your mentor, the Graduate Program Director, Department Chair, or Graduate Dean.

2. OUTLINE OF PHD DEGREE REQUIREMENTS

2.1 General Information

2.1.1 Credit Hours

A candidate for the doctorate must complete at least 90 credit hours of academic work, consisting of coursework and research. Most students will have ~30 hours from the GPiBS or Biochemistry & Molecular Biology first year curriculum. The remainder is satisfied with Physical Biochemistry (3 hours), journal clubs (1 hour each Fall and Spring semester), Student Seminar (1 hour each Fall and Spring) and Dissertation Research hours (variable).

Transfer of coursework: A student who has completed graduate courses in biochemistry or a related field of study may transfer up to 44 hours of credit from OU, OUHSC, or another university. The Graduate Education Committee and the Graduate College will determine which courses are eligible for transfer.

MD Students: MD/PhD candidates should work with the MD/PhD Director to apply appropriate hours from their medical school curriculum towards their PhD requirements.

Enrollment Requirements: Students in the Department of Biochemistry & Molecular Biology are usually classified as “Graduate Research Assistants.” Minimum enrollment in Fall and Spring semesters is 6 credit hours. Minimum Summer enrollment is 3 hours. Students should track their total credit hours closely to ensure they have sufficient hours to graduate by the end of the fifth year and should be flexible in the number of dissertation research hours they enroll in each semester.

2.1.2 Time Limitation

A candidate entering with a bachelor’s degree must complete all requirements for the doctorate within *five* calendar years *after* admission to candidacy. Financial support is not guaranteed and may be restricted to a shorter time.

2.1.3 Scholastic Requirements

All students must maintain satisfactory progress (defined below). A student with unsatisfactory progress will be placed on probation by the Graduate College. Graduate assistantship awards may be withheld until probation is removed. If the student fails to restore the GPA to 3.00 in all completed graduate-level work by the end of the first probationary period, a student may be denied further enrollment (as defined in the Graduate College Bulletin). The total number of C grade credit hours applied toward a graduate degree cannot exceed 25% of the total letter-graded course work required for the degree.

Satisfactory progress means both:

- a. Earning a B or higher in all letter-graded courses and “Satisfactory” in all “Satisfactory/Unsatisfactory” courses *and*
- b. Designing and carrying out laboratory research work on a full-time basis, as documented by the student’s Dissertation Committee on the annual progress report. Failure to meet these standards or an adverse evaluation by the Advisory or Dissertation Committee may result in termination of enrollment in the Biochemistry & Molecular Biology Graduate Program.

2.1.4 Financial Support of Graduate Students

Students in good standing in the Biochemistry & Molecular Biology Graduate Program receive a 12-month stipend and a tuition waiver.

Funding for Stipends

Research Assistantships from the mentor's research grants or Department resources. Most first-year students are supported by GPIBS funds through Fall and Spring semesters. In rare instances, students accepted by the Admissions Committee may plan to enter a particular laboratory and are supported from the mentor's research funds from the beginning. The student is still required to do rotations. Neither student nor mentor is obligated to maintain the mentor-trainee relationship if incompatibilities become apparent, so there is some risk to this arrangement and it is not recommended.

Fellowships: Students are encouraged to apply for national fellowships from NIH, NSF, Howard Hughes, etc. The [Office of Research Administration](#) has current information on these and other agencies that may provide support for students. Award of a national fellowship carries considerable esteem and will enhance a student's career.

Supplements to NIH grants may be available to cover the stipend of minority students. This opportunity should be discussed with the mentor.

Funding for Research Space, Equipment, and Supplies

It is the responsibility of the Mentor to supply sufficient resources from grants or other funds for the student to perform the required dissertation research.

2.1.5 Outside Employment

PhD studies in Biochemistry & Molecular Biology are extremely demanding and time-consuming, requiring a full-time commitment. Consequently, students may not work elsewhere, even part-time, while enrolled in this graduate program. Assistantships and fellowships are available. An exception to this rule would be if the employment constitutes professional improvement such as a teaching assistantship or a biotech internship off campus that would significantly improve the student's training record without hindering progress towards graduation. In this case, the mentor and Graduate Education Committee must agree to the terms and duration of the outside employment.

2.1.6 Holidays and Vacations

The full-time commitment includes semester breaks. Student stipends are paid for 12 months and students should be in the lab when classes are not in session, except for official holidays listed in the annual "University of Oklahoma Holiday Schedule" (<https://hr.ou.edu/Employees/Holidays-Time-Off-Leave>) and vacation time or other absence agreed to by the mentor (MS students and senior PhD students) or Program Director (students in rotations). If the time off exceeds 3 weeks, the mentor should consult the Department Chair or Business Manager about suspending pay for additional time out of the lab. The Graduate College has short-term and long-term leave of absence policies and forms:

(<http://graduate.ouhsc.edu/CurrentStudents/PoliciesandProcedures.aspx>).

2.2 Curriculum

The curriculum for the first year consists of coursework, laboratory experience, journal club and attendance at all Departmental seminars. Students complete three lab rotations before selecting a Dissertation Mentor. A fourth rotation can be taken if necessary. Under exceptional circumstances the student may petition the Student Advisory Committee to take the third rotation in the same lab as the first or second and thus enter their dissertation lab early.

Note: MD/PhD students begin their PhD training with the “Year 2—Fall Semester” curriculum.

2.2.1 Courses

Year 1 – Fall Semester – GPIBS

For details see the GPIBS [website](#)

| Course Number | Credit Hours | Name | Coordinator |
|---------------|--------------|-------------------------------------------|---------------|
| BMSC 5001 | 1 (S/U) | Integrity in Scientific Research | Webb |
| BMSC 5021 | 1 | Methods in Biomedical Research | Howard |
| BMSC 5031 | 1 | Laboratory Animal Use and Care | Budda |
| BMSC 6012 | 2 | Molecular Systems I | Lin/Myers |
| BMSC 6023 | 3 | Molecular Systems II | Lin/Myers |
| BMSC 6053 | 3 | Cellular Systems I | Lin/Myers |
| BMSC 6052 | 2 | Cellular Systems II | Lin/Myers |
| BMSC 5221 | 1 | Journal Club | Gorbsky |
| BMSC 6100 | 4 | Bioscience Interdisciplinary Lab Rotation | Howard/Mentor |

Year 1 – Fall Semester – Direct Admits

| Course Number | Credit Hours | Name | Coordinator |
|---------------|--------------|----------------------------------|------------------|
| BMSC 5001 | 1 (S/U) | Integrity in Scientific Research | Webb |
| BMSC 5021 | 1 | Methods in Biomedical Research | Howard |
| BMSC 5031 | 1 | Laboratory Animal Use and Care | Budda |
| BMSC 6012 | 2 | Molecular Systems I | Lin/Myers |
| BMSC 6023 | 3 | Molecular Systems II | Lin/Myers |
| BMSC 6053 | 3 | Cellular Systems I | Lin/Myers |
| BMSC 6052 | 2 | Cellular Systems II | Lin/Myers |
| BIOC 6221 | 1 | Journal Club: Noddy Tern | Pioszak |
| BIOC 6220 | 4 | Advanced Biochemistry Laboratory | DeAngelis/Mentor |
| BIOC 5970 | 1 | All Department Seminars | Rodgers |

Year 1— Spring Semester

| Course Number | Credit Hours | Name | Coordinator |
|----------------------------|----------------------------------|-------------------------------------------------------------------------------|------------------|
| BMSC 6100 or BIOC 6220 | 4 | Bioscience Interdisciplinary Lab Rotation Advanced Biochemistry Laboratory | Howard DeAngelis |
| BIOC 6321 | 1 ¹ | Enzyme Catalysis & Modulation | DeAngelis |
| BIOC 6341 | 1 ¹ | Metabolic Regulation | Various |
| Selective Courses | 7 ¹ | Selective Modules (at least two BIOC) | Various |
| BIOC 6221 | 1 (S/U) | Journal Club: Noddy Tern | Pioszak |
| BIOC 5970 | Attendance Required ² | Student Seminar | Rodgers |
| BIOC 5970 (not for credit) | Attendance Required | Departmental Seminar | Various |

Year 1— Summer Semester

| Course Number | Credit Hours | Name | Coordinator |
|---------------|--------------|--------------------------------------------|-------------|
| BIOC 6960 | 3 (S/U) | Research Project | Mentor |
| BMSC 5011 | 1 | Experimental Design and Applied Statistics | Garman |

¹ Students choose 9 of the offered 1-hour courses. Of these 9 modules, 4 will come from the BMB department and must include BIOC 6341 Metabolic Regulation & BIOC 6321 Enzyme Catalysis & Modulation. The other 5 can be from BMB, from GPiBS, or from other departments. The Student Advisory Committee will help you choose the most appropriate modules. Additional modules can be taken in later years.

² Presentation and credit in year 3 and above. One presentation per year. Prior to year 3, attendance is required. Students enroll in student seminar every semester. Students must enroll in student seminar every semester.

Year 2— Fall Semester

Note: MD/PhD students enter the curriculum here

| Course Number | Credit Hours | Name | Coordinator |
|-------------------------------|---------------------|-----------------------------------------|-------------|
| BIOC 6210 | 3 ³ | Physical Biochemistry of Macromolecules | Rodgers |
| BIOC 6221 | 1 (S/U) | Journal Club: Noddy Tern | Pioszak |
| BIOC 5970 | Attendance Required | Student Seminar | Rodgers |
| BIOC 5970 (Not for credit) | Attendance Required | Departmental Seminar | Various |
| BIOC 6960 | 2 (S/U) | Research Project | Mentor |

Year 2—Spring Semester and thereafter

Note: The General Exam is taken in the Spring Semester of Year 2

| Course Number | Credit Hours | Name | Coordinator |
|----------------------|------------------------|----------------------------------------------|-------------|
| BIOC 6221 | 1 (S/U) | Journal Club: Noddy Tern | Pioszak |
| BIOC 5970 | 1 (S/U) | Student Seminar | Rodgers |
| BIOC 5970 | Attendance Required | Departmental Seminar | Various |
| BIOC 6960 or 6980 | ≥ 4 (S/U) ⁴ | Research Project or Dissertation Research | Mentor |
| BIOC 6970 | 2 (S/U) ⁵ | Biotechnology | DeAngelis |

Year 5—Fall Semester

| Course Number | Credit Hours | Name | Coordinator |
|---------------|--------------|---------------------------------------|-------------|
| BMSC 6001 | 1 (S/U) | Scientific Integrity Refresher Course | Carr |

³ MS students should enroll in 2 or 3 hours of Physical Biochemistry. PhD students are required to take 3 hours.

⁴ Variable – When no other courses are being taken, students should enroll for more research hours. Enroll in BIOC 6960 until you have passed the General Exam, then in BIOC 6980.

⁵ Elective credit – Please check with the Program Administrator for the most current offering availability

2.2.2 General Examination

Guidelines and Format for the General Examination for PhD Candidacy in Biochemistry and Molecular Biology

The successful completion of the General Examination (GE) is required for admission to candidacy for the Doctor of Philosophy degree. The General Examination will be given during the second year and will consist of a written part and an oral part.

The written portion of the GE is a grant proposal (with no budget or facilities pages) based on the projected dissertation research. The student will develop an overall goal and **two** specific aims based on the research that they plan to carry out for their dissertation. The proposal will be in the student's own words, and not plagiarized from an existing grant application. Plagiarism is as defined in the Academic Misconduct Code found in Appendix C, section 12.1 of the OUHSC Faculty Handbook:

<http://www.ouhsc.edu/provost/documents/FacultyHandbookOUHSC.pdf>.

While it is clear that the dissertation mentor will have had significant input into the research project, the student will be required to develop at least one specific aim without direct consultation from the dissertation advisor.

At the pre-proposal stage, students are encouraged to speak with faculty members in addition to the mentor to obtain help and advice formulating the initial question or problem. It is important that the students approach faculty with their own ideas about hypotheses and experimental aims, preferably in written form. Such consultations are essential for all scientific endeavors.

The oral portion of the GE occurs after the student submits and passes the written examination. It is an oral defense of the proposed research that was presented in the written portion of the GE.

The GE will be scored by the Individual Student Examining Committee (ISEC). This committee will consist of five members. The same five-member committee will typically serve for both the written and the oral exam of the student. With permission from the Chair of the General Examination Committee, the oral exam can proceed when only four members of the committee are present. The committee will be chaired by a member of the General Examination Committee to ensure that each exam is comparable and fair. The remaining committee members will be chosen with regard to balance and fair representation across the different areas of biochemistry and molecular biology and will not include the student's mentor. Students will be able to select two of the committee members. At least two committee members must have their primary appointments in the Department of Biochemistry & Molecular Biology and at least three must have Graduate Faculty status of Level 4. The composition of each ISEC is the responsibility of the General Examination Committee and will be assembled by November/December.

Overview of the General Examination Procedure

1. **October:** students will meet with the General Exam chair to discuss procedures for the General Examination.
2. **November/December**
 - a. The student will submit their top three choices for Individual Student Examining Committee (ISEC) members from the list of full-time and adjunct faculty members of the Department, via email, to the General Examination chair.
 - b. In early December, the student will submit their exam questions/hypotheses to the General Exam Chair. The question/hypothesis should be formulated by the student with the help of their mentor. The question/hypothesis will include a brief

overview of the research topic, followed by the specific question or hypothesis, approaches to be used to address the question, and selected references. The question/hypothesis write-up should be no more than ½ page in length.

- c. An ISEC will be chosen by the General Examination Committee.
3. **January**
 - a. Each student will submit a pre-proposal to the General Examination chair and to the ISEC members.
 - i. Students are strongly encouraged to talk about their hypothesis and experimental aims with as many of their committee members as possible before submitting their pre-proposal.
 - ii. The pre-proposal will be a concise presentation (3-4 double spaced pages) of the rationale for the problem or question, the hypothesis or hypotheses to be tested, the specific aims, and a concise statement of the approach or approaches to be taken.
 - iii. In general, pre-proposals do not get revised.
 - b. Students will meet with their ISEC to discuss any issues before writing their full proposal. Advice and comments from this meeting should be recorded by the student and incorporated into the full proposal.
 - c. It is recommended to contact committee members to determine possible dates for the proposal oral defense.
4. **March**
 - a. The full written proposal should be submitted in the second half of March (details below).
 - b. The ISEC will submit reviews/evaluations of the proposal.
5. **April**
 - a. If an average score of 1 – 2.5 is awarded on the written proposal, the student will orally defend their proposal in April.
6. **May** – The oral examination should be complete by early May

Written Examination

***For exemplary grant examples please refer to these grant applications on the National Institute for Allergy and Infectious Disease webpage: <https://www.niaid.nih.gov/grants-contracts/sample-applications>. For additional tips in writing grant applications refer to: <https://www.niaid.nih.gov/grants-contracts/prepare-your-application>.*

General Instructions for the Written Proposal⁶:

- a. Total length – Do not to exceed 20 pages (double-spaced, 11 point Arial font, ½ inch-margins) excluding title page, abstract, and bibliography. Figures should be embedded in the text and are included in the page count.
- b. Parts of the proposal:
 - i. Title page – proposal title, student’s name, name of faculty mentor, date of submission
 - ii. Abstract (one-half page)
 - iii. Specific Aims—No more than **two** specific aims, but each aim may include multiple sub-aims (suggestion: one page)

⁶ The overall goal and specific aims should not be taken from of any grant on campus, either authored by a faculty member or by a postdoc.

- iv. Background and Significance (suggestion: less than five pages)

This section provides a review of the literature that pertains to the problem and critically evaluates and identifies gaps in knowledge that the proposal is intended to fill. This section should complement the Specific Aims and should include both a statement of the importance of the proposed hypothesis/hypotheses to be tested and a rationale for the study. It may include results obtained by other people in the student's lab, published or unpublished,⁷ that have led to the student's hypothesis. *Unpublished observations may be cited only with permission of the person to whom the data belong.*
 - v. Preliminary Observations (suggestion: up to three pages)

Preliminary data collected by the student in the thesis lab should be included in this section. The amount of preliminary data will vary from project to project. Like any new investigator or seed grant application, preliminary data will not be required, but will be seen as an enhancement. Students are encouraged to include their preliminary findings to support the application even if these are trouble-shooting experiments rather than definitive results.
 - vi. Experimental Design and Methods
This is a detailed discussion of the experimental design, including a succinct presentation of the methods and procedures to be used, and the specific experiments proposed to achieve each specific aim. Include the form in which the data will be obtained and emphasize how they will be interpreted. Describe appropriate controls. Discuss potential difficulties and limitations of the proposed methods/approaches and give alternative approaches for achieving the aims.
 - vii. Timeline
A brief description of how long it will take to accomplish each proposed specific aims, sub-aims, or experiments. The time limit to accomplish the entire project is 3 years.
- c. Bibliography – The student is expected to have read all the references listed in the Bibliography. The literature cited will be listed at the end of the paper, in order of appearance and must include: names and initials of all authors, year, paper title, journal, volume, first and last page numbers). It is best to learn to use a bibliography program such as **End Note**, which can be downloaded at no cost from the library.

Pre-doctoral fellowship provision: Because the general exam is designed not to have the mentor involved in the direct supervision of the writing of specific aims or any portion of the proposal (see above), *a pre-doctoral fellowship cannot be used VERBATIM for the general exam proposal.* The fellowship proposal can be used as a skeleton in the sense that an entirely new specific aim will be devised by the student to convert the fellowship into a proposal suitable for the General exam. For example, the research question for the pre-doctoral fellowship may be the same as for the general exam proposal, but the student might choose to answer that question using a different model system or experimental approach in the new specific aim than the one used for the fellowship application. The student will then significantly alter the introduction and background as well as the methods of the modified pre-doctoral proposal to be in line with this completely new specific aim. The student should submit the pre-doctoral fellowship to the chair of the ISEC to confirm the novelty of the new aim in the pre-proposal. The

⁷ Unpublished data and figures may be cited only with permission of the person to whom the data belong.

fellowship application should be submitted with the pre-proposal to the ISEC chair on the pre-proposal deadline. In the event the pre-doctoral fellowship is not yet finished by the pre-proposal deadline, then it should be submitted to the ISEC chair upon its completion.

Evaluation of the Written Proposal

The student's ISEC members will review the proposal in a timely fashion, within 10 working days of receiving the proposal. The student's ISEC members will give the proposal a numerical rating between 1 and 5 (1 being the best rating), along with detailed comments. Proposal critiques and scores will be distributed among the ISEC members to gauge overall quality of the proposal. In case of disagreement,⁸ the ISEC will meet to reach a consensus. The reviews will be returned to the GE Chair who will evaluate, coordinate, and summarize the results and the overall performance in a written statement. This statement, together with the reviews and the reviewers' names, will be transmitted to the student and other committee members with copies to the Department Chair, the Graduate Program Director, and the General Exam Committee.

The possible results of the written proposal (with point-value ranges) are:

Pass – 1.0 - 2.5

Revision – > 2.5 - < 4.0

The proposal must be revised and resubmitted within 14 days, along with the original proposal, the reviews of the original, and a 1-page response to the reviewers' criticisms. Only one revision is allowed for the proposal.

Non-pass⁹ – 4.0 – 5.0

The student will be allowed to re-submit a proposal the following year

Failure

After failing to pass the Written Examination on two independent tries with two different proposals, the student is terminated from the PhD program

Oral Examination

The Oral Examination is a defense of the written research proposal.

General Instructions for the Oral Examination:

- a. Student Presentation – A twenty-minute oral, power-point presentation will be given by the student at the beginning of the exam.
- b. Questions – Wide-ranging questions will be asked by the ISEC members.
 - i. Possible questions include those that arose during the preproposal and proposal review process.
 - ii. General knowledge will be an important component of this exam.
- c. It is expected that the Oral Exam will last about two hours with a five-minute break after the first hour.

Evaluation of the Oral Examination:

Each ISEC member will assign a numerical score between 1 and 5 (1 being the best rating) based on following:

⁸ Disagreement is defined at 2 or more points difference in the scores given by committee members

⁹A non-pass of the written portion is considered a failure of the General Exam as defined by the Graduate College regulations and the Graduate Dean must be notified by the Program Director.

- a. How well did the student summarize and defend the rationale behind the proposal?
- b. How well did the student describe and defend the experimental design, including a description of the controls and their meaning?
- c. How well does the student understand the approaches and methods, including the pitfalls and limitations of each, and alternative approaches that might be used?
- d. Does the student understand the significance of the problem in relation to this field of knowledge?
- e. How good is the student's general knowledge related to this topic, the background, and the approaches and the methods used?

At the end of the oral exam, committee members will discuss the student's performance and then vote their overall scores (the five items above are equally weighted).

The possible results of the Oral Exam, based on average scores, are:

Pass – 1.0 – 2.5.

Repeat - > 2.5 - < 4.0

The oral must be repeated after a stated interval, and specific deficiencies will be noted for correction during the repeat exam. The oral exam is not complete until after the repeat exam. *The student is allowed to retake the General Examination one time.*

Failure – 4.0 – 5.0 or failure to achieve a score of 2.5 or better on a repeat exam

In most cases the student will be notified of the unofficial results immediately following their presentation. Committee members will provide detailed comments to the ISEC chair within 24 hours of completion of the Oral Exam or the repeat Oral Exam. The ISEC chair will submit, within another 24 hours, a summary of the comments of the committee members and a compilation of their scores, to the General Examination Committee.

Following the oral defense, The General Exam Committee will review the ISEC reports of the completed written and oral parts of the exam. The Committee Chair will forward the General Examination results to the Graduate Program Faculty. The chair of the General Exam Committee and the Program Director will forward the final results and report listing all members of the Individual Student's Exam Committee to the Graduate Dean and to the student.

Role of the Dissertation Mentor During the General Examination

The role of the dissertation mentor in this process is limited in terms of preparation of the written proposal. Student proposals should not to be copied from an existing grant application (currently funded or in preparation). The mentor should be working to provide a suitable intellectual environment in which the project can be developed. Writing of the specific aims or any specific portion of the proposal should not be supervised by the mentor. Intellectual guidance and teaching will continue as usual.

Summary Timeline with Appropriate Forms

October

Students meet with General Examination Chair and Student Representatives to discuss the exam

November

1. Student submits to General Examination Chair

- a. Exam Question
 - b. Names of three desired faculty to sit on ISEC
2. Fill out [Application for General Exam form \(Appendix I\)](#)
- December**
General Examination Chair notifies students of their ISEC members
- January**
Students submit pre-proposal to ISEC
- February**
Deadline for students to meet with ISEC to discuss pre-proposal
- March**
 1. Submission of full written proposal
 2. Date set for oral examination
- April**
 1. Evaluation of full proposal by ISEC
 2. Oral Examination Scheduled
- May**
 1. Complete oral examination
 2. Receive Admission to PhD Candidacy

2.2.3 Research Prospectus

After successful completion of the General Examination and being admitted to candidacy for the PhD degree, each student, with the aid of his/her Mentor and the Dissertation Committee, prepares a prospectus of the dissertation research program. The dissertation research prospectus can be modified from the general exam proposal if the student and Mentor deem it suitable. The prospectus should be brief (ten double spaced pages or less), consisting of a description of the research problem, overall goals and specific aims, a survey of the relevant literature, and a specific outline of the research plan. The main goal of the prospectus is to provide an organized plan for completion of the research program. This plan may, however, be modified as the program progresses and as data is obtained. The prospectus must be completed and approved by the student's Dissertation Committee by the end of Fall semester of the third year.

2.2.4 Research Dissertation

The doctoral dissertation is the final and most important component of the doctoral degree. Three major functions are fulfilled by the dissertation experience:

1. It is a work of original research that makes a contribution to existing knowledge.
2. It demonstrates the candidate's scholarship and mastery of research methods and tools of the special field.
3. It demonstrates the student's ability to address a significant intellectual problem and to arrive at a successful conclusion.

See [Section 6](#) for details

2.3 Assessment of Progress

The Graduate College requires that the progress of all graduate students be reviewed annually. The Biochemistry & Molecular Biology Program requires that the review process be completed before June 30 each year.

Students from GPIBS or another institution who enter the Biochemistry and Molecular Biology program before June 30 will meet with the Graduate Education Committee to complete the [First Year Progress Report \(Appendix II\)](#), the [Graduate College Report of the Doctoral Advisory Conference \(Appendix I\)](#), and the [Graduate College Annual Evaluation \(Appendix I\)](#).

Students in their second year meet with the Graduate Education Committee before June 30. The [Second Year Progress Report \(Appendix II\)](#) and the [Graduate College Annual Evaluation \(Appendix I\)](#) must be completed and signed.

Students in their third year and above must meet with their Dissertation Committee at least once a year. The time of year does not matter but must occur before June 30th. The student makes a formal presentation of work accomplished since the last committee meeting, and, after discussion of progress and further research plans, the student and committee jointly complete the [Third Year and Above Progress and Committee Report \(Appendix II\)](#) and the [Graduate College Annual Evaluation \(Appendix I\)](#).

Completed Progress Reports and Graduate College Annual Evaluations are signed and sent to the Program Administrator, who forwards the Annual Evaluation to the Graduate College and keeps the Progress Reports in the Department. A summary of the annual Progress Report is presented to the faculty by the Program Directors. If significant problems are apparent, the Program Directors will prepare a written statement for the student, summarizing the problems and how these may be overcome. Copies are sent to the student's Mentor and the Department Chair.

3. ATTENDANCE AT SCIENTIFIC MEETINGS

Students are strongly encouraged to attend and present their data at national scientific meetings in the student's area of research. The department has some funds set aside to assist with student travel costs as needed. Applications should be made to the Student Awards Committee.

The Graduate College provides travel awards to winners of GREAT sessions, and most scientific societies offer travel awards to student presenters.

4. THE MENTOR

The Mentor must be a member of the Biochemistry & Molecular Biology Graduate Program Faculty in full standing (Level 4). The student will conduct research leading to the PhD degree under the supervision of the chosen Faculty member.

The Mentor's primary duty is to assist the student in planning and completing a program of graduate study that will provide suitable training for a career in academic or corporate biomedical research, teaching or science administration, and which satisfies the requirements of the Department and of the Graduate College. The Mentor, with the Dissertation Committee, must keep track of the student's progress at all times and ensure that the student maintains a program that appropriately exercises his or her capabilities. If the student's performance is unsatisfactory, the Mentor should counsel the student on how to improve performance, the appropriateness of changing Mentor or program, or selecting another career path. The Mentor is expected to maintain close professional contact with the student at all times.

The Biochemistry and Molecular Biology graduate program does not presently limit the number of students that can be in any one-faculty member's laboratory or that can enter a lab in the same year. The funding status of that laboratory, enabling it to support the student's stipend and research project largely determines the ability of the lab to accept the student. The student, however, should consider whether there are sufficient independent projects.

Changes in the Mentor and/or members of the Dissertation Committee can be initiated by the student, the Mentor, or the Program Director using the [Change of Supervisory Committee form \(Appendix I\)](#) and must be approved by the Graduate Program Committee, the current and proposed Mentors, and the Graduate College Dean.

5. THE DISSERTATION COMMITTEE

The student, in consultation with their mentor, should choose their Dissertation Committee after passing the General Examination and before the beginning of their third year. The composition of the committee should be approved by the Biochemistry and Molecular Biology Program Director. The committee is chaired by the Mentor, and includes three or more additional members of the Department's Graduate Program faculty (with a total of at least three Biochemistry & Molecular Biology primary faculty), and *at least* one member from another graduate program. Only one member of the Committee can lack authorization to direct a doctoral dissertation (ie less than Authority Level 4 faculty; faculty authorization levels are provided at <http://graduate.ouhsc.edu/Faculty/ApplytoBeaFacultyMember.aspx#14572437-appointment-application--guidelines>).

The charge of the Dissertation Committee is to provide expertise and scientific advice that will help the student carry out the research project, and it should regularly evaluate the student's progress. In addition, the Dissertation Committee serves to safeguard the student if the research project fails or if the relationship between the student and the Mentor does not develop satisfactorily. The Dissertation Committee must meet with the student at least annually and can be called together at other times at the request of the student, the Mentor, the Program Directors, or Committee members. If the student, in consultation with their Mentor, needs to change the members of the Advisory Committee, the [Change of Supervisory Committee form \(Appendix I\)](#) should be completed.

It is particularly important for students to have a committee meeting before preparing their dissertation, to ensure that the committee agrees that the experimental work is sufficient and the dissertation plan is acceptable. The dissertation committee must approve the student request to defend using the [Request to Set Defense Date form \(Appendix I\)](#).

6. THE DISSERTATION

The doctoral candidate prepares a “reading copy” of the dissertation. The reading copy must be in an acceptable dissertation format, including all figures and tables, numbered pages, and a complete bibliography. It is the responsibility of the student to ensure that the dissertation format complies with the Graduate College standards as defined in the [Guidelines for the Preparation of the Master's Thesis and Doctoral Dissertation \(Appendix I\)](#). After a degree check indicates that the student has completed all course work with acceptable grades and the reading copy has received preliminary approval from the mentor and the dissertation committee, it should be electronically submitted to the Graduate College along with all appropriate forms (i.e. [Request to Set Defense Date \(Appendix I\)](#), [Talent Release Form \(Appendix I\)](#), and [Permission to Use Published Material \(Appendix I\)](#)) using the ProQuest ETD Administrator (<http://www.etsadmin.com/cgi-bin/home>). The reading copy must be submitted at least 10 working days (i.e. 2 weeks) before the desired defense date. Reading copy deadlines are printed in the Class Schedule Bulletin for each semester (www.ouhsc.edu/admissions). Please refer to the Graduate College Bulletin and check with Graduate College staff for additional information on deadlines and forms to be filed.

The reading copy will be reviewed by the Graduate College and any needed changes will be requested to the student directly via email. After making the necessary changes, the student will re-submit the dissertation PDF, again through the ETD Administrator.

Note: At the time of the initial dissertation submission, students are given the opportunity to purchase bound copies of the dissertation. The printed dissertation will be the final, revised copy that meets all Graduate College requirements and any committee requests following the oral defense (not the first submission).

Final Oral Examination – Dissertation Defense

The final oral examination is a defense of the dissertation and is open to the public. At least 10 working days before the defense, the candidate must submit to the Graduate College an Announcement for the Final Exam and a double-spaced abstract of no more than 350 words. The student must be enrolled in at least two hours the semester he/she is to take the final oral examination. Authority for the Defense of the Doctoral Dissertation and other forms must be picked up from the Graduate College at least one day prior to the examination. All members of the committee must sign the form and signify whether the examination was satisfactory or unsatisfactory. If there are dissenting opinions, the procedures are outlined in the Graduate College Bulletin. The majority of the doctoral committee, including the mentor and outside member must be physically present to conduct the examination. If committee members will be participating remotely, via audio or video media, the Graduate College must be notified. The Graduate Dean must approve any changes in the doctoral committee. The Graduate Dean may exercise a prerogative and appoint an observer for the Graduate College who would not be a voting member. Per the Graduate Bulletin: “Copies of electronic signatures for committee members who have been approved to participate remotely will be accepted on the Authority Report Form for the Dissertation Defense. Original signatures from all members are required on the final written dissertation signature page.”

7. THE FACULTY AND THEIR RESEARCH

7.1 Primary Faculty

Gillian M. Air, George Lynn Cross Professor; PhD, University of New South Wales (Australia), 1971. Molecular biology of influenza virus; mechanisms of antigenic variation; development of antiviral agents.

Paul DeAngelis, Professor; PhD, University of California, Irvine, 1990. Protein/carbohydrate interactions using the tools of biochemical analysis and molecular biology.

Jay S. Hanas, Professor; PhD, SUNY at Stony Brook, 1981. Molecular biology; expression and regulation of ribosomal genes.

Franklin A. Hays, Assistant Professor; PhD, Oregon State University, 2005. Mechanisms of anticancer drug efficacy and transport; membrane protein expression, purification, crystallization, and functional analysis

Martin Levine, Professor; B.D.S., 1964, PhD, 1973, University of Glasgow. Biochemical and immunological approaches to the study of dental caries and periodontal disease; immunochemistry.

Guangpu Li, Associate Professor; PhD, Washington University (St.Louis), 1991. Vesicular transport of proteins and lipids: molecular mechanisms and role in virus infection and hormone secretion.

Jialing Lin, Assistant Professor; PhD, University of Tennessee, Memphis, TN, 1994. Assembly and interaction of oncoprotein Bcl-2 at intracellular membranes; molecular mechanisms of programmed cell death; membrane protein integration into the endoplasmic reticulum.

Hiroyuki Matsumoto, Professor; PhD, Kyoto University (Japan), 1977. Molecular mechanism of visual excitation; role of protein phosphorylation in neuronal function; molecular biology of cellular regulation in neurons.

Blaine Mooers, Associate Professor; PhD Oregon State University, Corvallis, 1997. RNA Structure and Editing, Protein Structure, Stability, Evolution & Redesign, Crystallography at Atomic/Subatomic Resolution, *Ab initio* Structure Determination of Proteins by Direct Methods.

Ann Louise Olson, Professor; PhD, University of Iowa, 1986. Transcriptional regulation of the insulin-regulated facilitative glucose transporter (GLUT4) gene; mechanisms of insulin-mediated GLUT4 translocation.

Augen Pioszak, Assistant Professor; PhD, University of Michigan, 2003. Structural biology of cell surface receptors and their ligands; molecular mechanisms of G protein-coupled receptor signaling; structure-based development of therapeutic agents.

Karla Rodgers, Associate Professor; PhD, University of Illinois, Urbana-Champaign, 1991. Biochemical studies of proteins that catalyze DNA recombination and repair. Biochemical and biophysical investigations of nucleic acid-interacting proteins.

7.2 Research Faculty Members with Graduate Appointments

William Rodgers, Associate Professor of Research; PhD, University of Illinois, Urbana-Champaign, 1992. Analytical cell imaging of protein localization and mobility.

7.3 Adjunct Faculty Members¹⁰ with Graduate Appointments

Jasimuddin Ahamed, Assistant Professor; PhD, University of Calcutta, India, 2000. Cardiovascular Biology Research Program, OMRF. Thrombosis and fibrosis.

Sanjay Bidichandani, Associate Professor; MBBS., PhD, University of Glasgow (U.K.), 1994. Pediatrics. Molecular genetics and pathophysiology of Friedreich's ataxia; Molecular biology of the GAA triplet repeat expansion; Mutational mechanisms in inherited human disease.

Charles T. Esmon, Professor; PhD, Washington University (St. Louis), 1973. Coagulation Biology Laboratory, OMRF. Blood coagulation and endothelial cell function.

Timothy Griffin, Assistant Professor; PhD, University of California, Berkeley, 2002. Aging and Metabolism Research Program, OMRF. Contribution of obesity to osteoarthritis development.

Kenneth M. Humphries, Assistant Professor; PhD, Case Western Reserve University, 2000. Aging and Metabolism Research Program, OMRF. Diabetes induced changes in cardiac mitochondria and metabolism.

Robert E. Hurst, Professor; PhD, Florida State University, 1969. Glycosaminoglycans; biochemical markers for cancer; artificial intelligence.

Rodger P. McEver, Professor; MD., University of Chicago, 1974. Cardiovascular Biology Research Program, OMRF. Structure and function of blood and vascular receptors; interactions of leukocytes with platelets and endothelium; protein targeting.

Ray Rezaie, Professor, PhD Boston University, 1989. Cardiovascular Biology Research Program, OMRF. Blood clotting and thrombosis.

Johathan Wren, Assistant Professor; PhD, University of Texas Southwestern Medical Center, 2003. Arthritis and Immunology Research Program, OMRF.

Lijun Xia, Professor; MD, Binzhou Medical College, China 1982; PhD, Soochow University Medical College, China, 1995. Cardiovascular Biology Research Program, OMRF. Biological functions of O-glycans using global or tissue-specific gene-targeted mice as models.

¹⁰ Adjunct Faculty appointments are subject to renewal. Please look at the Department website for the current list of Adjunct Faculty in Biochemistry & Molecular Biology.

8. THE GRADUATE PROGRAM COMMITTEES

These are the departmental committees that are involved in the graduate program. Please see our web site for the most up-to-date details and committee members.

8.1 Graduate Education Committee

This committee is responsible for screening applicants for the Department's Master's and PhD Programs and for recommending qualified applicants to the faculty for graduate program admission. It also coordinates any advertising of department graduate programs. The Committee will make recommendations to the Program faculty or, where appropriate, will implement the development of special recruiting efforts and programs. This committee will meet and counsel new students joining the BMB program, prepare the Report of the Doctoral Advisory Conference, and serve as the advisory committee until the students assemble thesis or dissertation committees. For advanced students joining the PhD Program, the Committee will evaluate prior courses taken to determine the level at which the student will enter the program, what credits should be transferred to OUHSC, and what courses will be required.

This committee reviews all policies and operating procedures of the BMB Graduate Program, as well as graduate course offerings by the Department and makes recommendations to the Chair and full-time faculty about changes in the program, the curriculum, addition of new courses and deletion of old courses, etc. This committee also reviews the GPIBS Fall curriculum and makes recommendations to the GPIBS General Education Curriculum Committee on changes. The Graduate Program Director chairs this Committee. Members of this committee will include faculty currently serving on GPIBS committees to act as liaisons between both programs.

8.2 Student Awards Committee

This Committee is responsible for reviewing and selecting student candidates for Department and University awards. Specifically, the Committee will:

- a. Review and act on applications for BMB Travel Awards
- b. Meet shortly after winter break to review departmental theses for the prior year and select possible candidates for the Outstanding Master's Thesis and Doctoral Dissertation Awards of the Graduate College. The Committee will work with the Mentor of the selected students to assemble and submit the nominations in a timely manner.
- c. Meet each spring to review the achievements of all PhD students using recent Progress Reports and Graduate College Annual Evaluation Forms. From this pool, the Committee will identify 1-3 top candidates for the BMB Student Research Award. For the BMB Student Research Award, the Committee will solicit support letters from each candidate's Mentor and one other faculty member as well as other materials needed to complete the nomination process. Based on evaluation of the students' academic achievement, publications, presentations, and other research accomplishments, the Committee will recommend a final candidate for the BMB Student Research Award to the full faculty for their approval.
- d. Take appropriate action to nominate or select candidates for other graduate student awards given by the Department or the University that may become available.

Advisors or other faculty members may also nominate a student for any of these awards at any time of the year by submitting a letter that draws the Committee's attention to that student's accomplishments.

8.3 General Examination Committee

This Committee will help to develop guidelines for, and to administer the General Examination for the Biochemistry & Molecular Biology Graduate Program. The Committee will determine if students have selected appropriate proposal topics and will assign a faculty committee to oversee each student's progress and grade the written and oral exam for each student. The Committee will meet with graduate students who plan to take the General Examination in order to counsel them on how to prepare for the examination. After the exam is graded, the Chair will forward a written recommendation to the department Chair and the faculty will vote on the pass/fail status of each student.

8.4 Professional Education Committee

This committee of course directors meets at least each Spring to review the Medical courses that include Biochemistry faculty (currently Metabolism and Nutrition, Molecular and Cellular Systems, the enrichment topics and the Capstone Course themes) and Pharmacy/ Dental Biochemistry course curricula and evaluate, review, and make recommendations to the Department Chair and faculty regarding course content. Representatives from the Colleges of Medicine, Pharmacy and Dentistry will be involved in any significant changes to the courses.

The course directors are responsible for decisions regarding the operation of the courses. The committee will present for discussion by the full-time Department faculty a review and evaluation of these courses including their coordination, effectiveness and appropriateness regarding content.

9. CHECKLIST FOR PHD STUDENTS IN BIOCHEMISTRY & MOLECULAR BIOLOGY

1st Academic Year

Year 1 Spring Semester

By the end of Spring semester, GPiBS students will usually have chosen a mentor, and they join the corresponding program immediately after the end of Spring semester, or by June 30 if they complete extra GPiBS rotations.

Forms to complete:

The enrollment form for Biochemistry & Molecular Biology

[Appendix III: Change of Major Form](#)

Year 1 Summer Semester

1. Enroll in Pre-dissertation research BIOC 6960 and in Experimental Design and Applied Statistics BMSC 5011.
2. Before June 30 meet with the Graduate Education Committee to plan your program of study. Secure the signature of each committee member and forward the Report of the Doctoral Advisory Conference and the First-Year Progress report to the Program Directors. The Report of the Advisory Conference is sent to the Graduate College. Return completed Progress Report to The Program Administrator.

Forms to Complete:

[Appendix I: Graduate College Report of the Doctoral Advisory Conference](#)

[Appendix I: Graduate College Annual Student Evaluation](#)

[Appendix II: First Year Student Progress Report](#)

3. Continue research project

2nd Academic Year

Year 2 Fall Semester

1. Complete enrollment form: Enroll in core curriculum (Physical Biochemistry), Pre-Dissertation research and Journal Club; consider enrolling in elective course work (if desired)
2. Attend Student Seminar and Departmental Seminar (*i.e.* "Visiting Seminar")
3. In late Fall, begin General Exam

Year 2 Spring Semester

1. Complete enrollment: Journal Club, elective course if desired (not advised because of General Exam), and BIOC 6960 (Research Project). Attend Student Seminars and Department seminars

2. File the "[Application for Permission to Take the General Examination](#)" ([Appendix I](#)) with the Graduate College at least two weeks prior to submitting your written proposal

Forms to Complete:

[Appendix I: Application for Permission to Take the General Examination](#)

3. Complete General Exam.

WHEN YOU PASS THE GENERAL EXAM:

4. Verify you receive "Admission to Candidacy" notification from the Graduate Dean

Year 2 Summer Semester

1. Complete enrollment form: Journal Club, electives, dissertation hours.
2. Complete 2nd year Progress Report. Schedule a meeting with the Graduate Education Committee to complete the Progress Report and discuss your Dissertation Prospectus

Forms to Complete:

[Appendix I: Graduate College Annual Student Evaluation](#)

[Appendix II: 2nd Year Progress Report](#)

Return to The Program Administrator when completed. Deadline: June 30th

3. Choose your Dissertation Committee and have it approved by the Program Directors. After the selection process, please forward the name of your committee members to The Program Administrator

Forms to Complete:

[Appendix I: Request to Approve Doctoral Committee](#)

Return this form to the Graduate College

4. Prepare Dissertation Prospectus.
5. Continue dissertation research project.

3rd Academic Year through Graduation

Fall Semester

1. Complete enrollment form: Include the following: dissertation research, applicable electives, Journal Club, enroll and participate in Student Seminar.
2. Attend Visiting Seminar (*i.e.* "Departmental seminar").
3. Continue dissertation research project, meet with Dissertation Committee, present Prospectus if not already completed.

Spring Semester

1. Complete enrollment form: dissertation hours, applicable electives, Journal Club, enroll and participate in Student Seminar.
2. Continue dissertation research project.

Forms to Complete:

[Appendix II: Third Year and Beyond Progress Report](#)

[Appendix I: Graduate College Annual Student Evaluation](#)

Return to The Program Administrator when completed. Deadline: June 30th

Summer semester

1. Complete enrollment form: dissertation hours (continuous enrollment during all semesters is required until graduation).
2. Continue dissertation research project.

Fall semester of Year 5

1. Enroll in Advanced Scientific Integrity (BMSC 6011).

Graduation

1. Submit a reading copy of the Dissertation to each member of the Doctoral Committee for approval.
2. Once the Dissertation has received preliminary approval, it should be electronically submitted to the Graduate College (www.etsdadmin.com) along with the [Request to Set Defense Date Form \(Appendix I\)](#).
3. At least 10 days before the oral defense, submit to the Graduate College a double-spaced abstract of no more than 350 words and a headshot for the Defense Announcement. A final copy of the completed dissertation must be submitted to the Doctoral Committee at least two weeks prior to the final oral examination.
4. Forms pertaining to the final defense must be picked up from the Graduate College at least one day before the defense. The forms are to be completed after the final oral exam and are submitted to the Program Administrator who will forward them to the Graduate College.
5. Once you have passed the oral exam, file an "Application for Graduation" along with the appropriate fees to the Graduate College.

10. APPENDICES

Appendix I: Graduate College forms

Graduate College forms are located at:

<http://graduate.ouhsc.edu/CurrentStudents/FormsandGuidelines.aspx>

Appendix II: BMB Department forms

BMB Department forms are located at:

<http://basicsciences.ouhsc.edu/biochemmolbiol/ResourcesForms.aspx> - 308401461-
[student-forms](#)

Appendix III: Change of Major Form

http://admissions.ouhsc.edu/Portals/1047/assets/ChangeCollegeMajorDegreeOption6_2016.pdf

OR

<http://admissions.ouhsc.edu/CurrentStudents/InternationalStudentsStudyAbroad/FormsHandouts.aspx>