

CURRICULUM

A. DOCTOR of PHILOSOPHY DEGREE

The awarding of a PhD degree requires the successful completion of formal courses and demonstration of accomplishments in basic research, qualifying exams, scientific writing, and formal presentations of research data. A student admitted to Graduate Studies for the PhD is considered an *aspirant* for the degree. After passing the Comprehensive Oral Exam, you will become a *candidate* for the PhD degree.

The general mission of graduate education for the PhD degrees within Molecular Biosciences is to enhance your academic knowledge base, teaching ability, communication ability, and in-depth basic research ability within a particular scientific area in the discipline.

Specifically to:

1. Provide academic training in current knowledge in the field through graduate-level coursework
2. Develop in-depth basic research ability in a particular area within the discipline, through basic bench research, which will advance the knowledge in the field and allow the student to operate as an independent investigator in applied or basic research
3. Develop instructional skills through teaching undergraduates
4. Develop substantive writing ability through completion of a dissertation and most probably manuscripts as well on the research performed
5. Provide overall training which will:
 - a. Allow you to obtain further training in a post-doctoral program
 - b. Qualify you for an instructional/undergraduate research position in a four-year college or university academic unit which offers both bachelor's and master's degrees
 - c. Qualify you for a research scientist or postdoctoral position in industry

GENERAL REQUIREMENTS for ALL PhD STUDENTS

1. Completion of Core Curriculum (*see below*).
2. Beginning second year, students will enroll in one of the following every semester:
 - a. **BIOL 701** – Cellular and Molecular Proteins (CaMP) Seminar
 - b. **BIOL 905** – Genetics of Development (GoD) Seminar
3. Two semesters (minimum) of graduate teaching are required.
4. By the beginning of the second year of graduate study, an Examination/Advisory Committee will be established. This committee will meet **at least once per year**. Annual committee meetings are **mandatory** for graduate students. The [Annual Report Form](#) with signatures of committee members will be sent to the Graduate Academic Advisor after each meeting.
5. Students will enroll in "Research Grant Proposal Preparation" (**BIOL 925**) in the fall semester of the second year.
6. In December of the second year students will have an Examination/Advisory Committee meeting. One week prior to this meeting you will submit your summary of specific aims (1-2 pages) to your Major Advisor and committee. During this meeting your specific aims will be discussed and approved, possibly after modification in light of the discussion. Once approved you will write the full proposal for the Oral Examination.
7. Students will submit a full draft of the proposal to your "readers" (this will be your Major Advisor, the Chair of your committee, and typically one other member) by the end of March.
8. The Comprehensive Oral Examination should be scheduled between **May 1** and **June 30**.
9. Upon successful completion of formal coursework and research, candidates present, for evaluation by an Examination/Advisory Committee, a dissertation based on original research. The dissertation is presented and defended in a formal public lecture.
10. Students will complete the degree within seven years. Exceptions to this requirement require a recommendation for extension of study by the Department's Graduate Director and Chairperson, and approval by Graduate Studies.

CORE CURRICULUM for ALL 1st Year PhD STUDENTS

1. Topics in Molecular Biosciences (MB Seminar) – **BIOL 701** (fall and spring)
2. Graduate Molecular Biosciences – **BIOL 807** (fall)
3. Rigor, Reproducibility, and Responsible Conduct in Research – **BIOL 817** (fall)
4. Laboratory Rotations – **BIOL 985** (fall and spring)

SPECIFIC COURSE REQUIREMENTS by DEGREE

Biochemistry and Biophysics PhD

Each of the following courses (usually completed by the end of the second academic year):

BIOL 750	Advanced Biochemistry
BIOL 918	Modern Biochemical and Biophysical Methods
BIOL 925	Research Grant Proposal (fall of 2 nd year)
BIOL 952	Introduction to Molecular Modeling

BIOL 985 will be taken to reflect bench research. BIOL 999 will be taken once you pass your comprehensive orals exam (replacing BIOL 985). Your Graduate Examination/Advisory Committee may recommend that additional courses be taken.

Microbiology PhD

Each of the following five courses (usually completed by the end of the second academic year):

BIOL 811	Advanced Molecular & Cellular Immunology
BIOL 812	Mechanisms of Host Parasite Relationships
BIOL 814	Advanced Molecular Virology
BIOL 815	Advanced Molecular Genetics

And

BIOL 925	Research Grant Proposal (fall of 2 nd year)
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BIOL 985 will be taken to reflect bench research. BIOL 999 will be taken once you pass your comprehensive orals exam (replacing BIOL 985). Your Graduate Examination/Advisory Committee may recommend that additional courses be taken.

Molecular, Cellular and Developmental Biology PhD

Along with BIOL 925 (fall of 2nd year), **three** graduate-level courses (numbered 600+) that total 9 credit hours. These are acceptable courses though there may be others. Consult with the DGS.

BIOL 650	Advanced Neurobiology (every spring)
BIOL 688	Molecular Biology of Cancer (every fall)
BIOL 750	Advanced Biochemistry (spring of odd years)
BIOL 752	Advanced Cell Biology (fall of even years)
BIOL 754	Brain Diseases & Neurological Disorders (every spring)
BIOL 755	Mechanisms of Development (spring of even years)
BIOL 757	Carcinogenesis & Cancer biology (spring of odd years)
BIOL 772	Gene Expression (spring of odd years)

MCDB students can solicit advice from their current and future rotation advisors on courses that may be most beneficial to them. BIOL 985 will be taken to reflect bench research. BIOL 999 will be taken

once you pass your comprehensive orals exam (replacing BIOL 985). Your Examination/Advisory Committee may recommend that additional courses be taken.

ORAL PRESENTATION REQUIREMENT

The ability to clearly communicate scientific results is an essential component of doctoral training. Beginning in the second year, graduate students are required to make an oral presentation of their data at least once every academic year. This will take place in either **BIOL 701** – Cellular and Molecular Proteins (CaMP) Seminar or **BIOL 905** – Genetics of Development (GoD) Seminar.

RESEARCH PROPOSAL REQUIREMENT

Students will enroll in **BIOL 925** – Research Grant Proposal Preparation in fall of the second year, and will complete and submit a research proposal **at least two weeks prior** to the Comprehensive Oral Exam in late spring. The proposal will follow the formatting guidelines of any federal agency (e.g., NSF, NIH), and should develop a research topic related to the general area of molecular biosciences. The topic for the proposal will be determined by the Major Advisor, with input from the student and the Examination/Advisory Committee.

COMPREHENSIVE ORAL EXAMINATION

Once PhD aspirants have successfully completed the required formal courses and research proposal requirement, the Comprehensive Oral Examination will be scheduled. **This examination should be held from May 1 to June 30 of the second year of graduate study.** Exceptions to this deadline require approval by the student's Examination/Advisory Committee. Your **Examination Committee** will give the exam. You will provide each committee member with a final copy of the proposal **at least 2 weeks before** the exam takes place. Your Major Advisor does not attend the exam but will instead submit a letter to the Chairperson of the committee, providing a detailed justification of your preparedness for the exam or your absence of qualifications for admission to PhD candidacy. After the exam and discussion of the Major Advisor's letter, committee members will decide whether or not you passed, thus becoming a *candidate* for the PhD degree. The Graduate Academic Advisor will forward this decision to the College Office of Graduate Affairs.

IMPORTANT: The exam will be scheduled with the College Office of Graduate Affairs **at least two weeks before** the exam actually takes place. This means that, after receiving approval from your Major Advisor and Examination Committee, you will notify the Graduate Academic Advisor for scheduling assistance (date, time, location) and so that he can complete the Progress to Degree (PTD) form to send to the College Office of Graduate Affairs in a timely manner.

Exam Format - You will defend your research proposal to the Examination Committee. The committee will also examine you with respect to more general subject areas (not necessarily related to the research proposal) associated with your research, formal coursework and scientific literature of all areas of the discipline. [Proficiency Levels](#) on the orals exam are divided up into eight separate skill components.

Performance on the examination will be rated as “Satisfactory,” or “Unsatisfactory” and this rating will be submitted to the College Office of Graduate Affairs. If you receive a rating of “Unsatisfactory”, you may retake the exam a second time. Timing of the retake is at the discretion of the Examination Committee. *Under no circumstances will you be allowed to take the Comprehensive Oral Examination more than twice.* If you fail to receive a rating of “Satisfactory” after the second attempt, you will not be allowed to complete the PhD program. In this case, there is a possibility that you could switch to the MS program.

FINAL ORAL DEFENSE of DISSERTATION

Once the Comprehensive Oral Exam has successfully been completed, your Examination/Advisory Committee comes back. This committee is responsible for giving you permission to begin writing of the dissertation. At least three members of this committee will be selected as dissertation readers (one of these being the Major Advisor). Once the final draft of the dissertation has been accepted and approved by the Examination/Advisory Committee, the Final Dissertation Defense is scheduled with the Graduate Academic Advisor. All dissertation readers must be present at the exam.

Following the successful defense of dissertation, the committee will decide if the result was deemed “Satisfactory” or “Unsatisfactory.” This decision will be forwarded to the College Office of Graduate Affairs.

Be sure to consult your [Doctoral Degree Checklist](#) during the final stages of completing your degree.

B. MASTER of SCIENCE DEGREE

The general mission of graduate education for MS degrees in Molecular Biosciences based upon *basic research*, is to enhance your academic knowledge base, teaching ability, and communication ability, and to provide you with advanced, but less than, PhD-level, training in at-the-bench research within a particular scientific area. The specific missions within this framework are: (1) to provide academic training in current knowledge in the field through graduate-level coursework; (2) to develop research ability within a particular field, through basic at-the-bench-research following newly developed and existing (scientific literature) protocols; (3) to develop instructional skills through teaching undergraduate laboratories; (4) to develop writing ability through completion of a thesis or manuscript on the research performed; and, (5) to provide overall training which will allow you to obtain or advance to a more responsible and demanding research and/or teaching position (beyond entry-level) within academia (two-year or four-year undergraduate college) or industry.

The general mission of graduate education for MS degrees in Molecular Biosciences based upon *library research of the literature* is to enhance your academic knowledge base, teaching ability, and communication ability. This path of graduate level education is not intended to prepare you for at-the-bench research skills accomplished through basic research. Instead, the specific missions within this framework are: (1) to provide academic training in current knowledge through graduate-level coursework and library research of the literature that pertains to a defined problem; (2) to develop teaching skills through instruction of undergraduate laboratories; and, (3) to develop writing skills through completion of a library research thesis.

GENERAL REQUIREMENTS for ALL MS STUDENTS

Please refer to each degree discipline area listed below to determine specific courses and requirements in conjunction with the following general requirements for the MS

1. A minimum of 30 hours of graduate credit.
2. A minimum of one laboratory rotation is required for each new graduate student.
3. Enrollment in CaMP Seminar (**BIOL 701**) or GoD Seminar (**BIOL 905**) every semester beginning second year.
4. Graduate Advisory Committee of 3 faculty members, including Major Advisor, will meet at least once annually.
5. A public defense of the master's thesis and examination by Graduate Advisory Committee.
5. Students will complete the degree within four years. Exceptions to this requirement require a recommendation for extension of study by the Department's Graduate Director and Chairperson, and approval by Graduate Studies.

SPECIFIC COURSE REQUIREMENTS by DEGREE

Biochemistry and Biophysics MS

BIOL 750	Advanced Biochemistry
BIOL 772	Gene Expression
BIOL 804	Scientific Integrity: Molecular Biosciences
BIOL 807	Graduate Molecular Biosciences
BIOL 818	Techniques in Molecular Biosciences
BIOL 899	Master's Thesis
BIOL 901	Graduate Seminar in Biochemistry (1 semester)

Microbiology MS

BIOL 804	Scientific Integrity: Molecular Biosciences
BIOL 807	Graduate Molecular Biosciences
BIOL 818	Techniques in Molecular Biosciences
BIOL 899	Master's Thesis

And three of the following courses:

BIOL 811	Advanced Molecular & Cellular Immunology
BIOL 812	Mechanisms of Host Parasite Relationships
BIOL 814	Advanced Molecular Virology
BIOL 815	Advanced Molecular Genetics

Molecular, Cellular and Developmental Biology MS

BIOL 752	Cell Biology
BIOL 755	Mechanisms of Development
BIOL 804	Scientific Integrity: Molecular Biosciences
BIOL 807	Graduate Molecular Biosciences
BIOL 818	Techniques in Molecular Biosciences
BIOL 899	Master's Thesis

And one of the following courses:

BIOL 753	Advanced Genetics
BIOL 772	Gene Expression

THESIS OPTIONS

1. Write a thesis resulting from original research in the areas of molecular biosciences.
2. Publish a research paper in a national, refereed journal. *Acceptance* of the paper for publication constitutes publication insofar as the conferral of degree is concerned. Two copies of the publication shall be filed with Graduate Studies as soon as they become available.
3. Write a thesis based upon library research (library thesis) of the literature on a given topic, approved by your Graduate Advisory Committee.

FINAL ORAL DEFENSE of THESIS

Once the final draft of the thesis has been accepted and approved by the MS Graduate Advisory Committee, the Final Oral Defense is scheduled with the Graduate Academic Advisor. Your performance on the defense will be rated as “Satisfactory” or “Unsatisfactory” and this rating will be forwarded to the College Office of Graduate Affairs. If the rating is “Unsatisfactory,” you may be allowed to repeat the examination, with the recommendation of the Department. The repeat examination may not be scheduled sooner than three months after the first attempt. *Under no circumstances will the student be allowed to take the Final Defense Examination more than twice.* If a rating of “Satisfactory” is not achieved after the second attempt, you will not be allowed to continue in the MS program.

Theses are now being submitted electronically. Check out http://www.graduate.ku.edu/04-02_etd.shtml for instructions.